A factorial randomised controlled trial of a health literacy modified children’s fever education program for parents attending emergency

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Statement of Authentication

I certify that this thesis represents my own work and has not been previously submitted, whether in full or in part, for a degree at this or any other institution. This is further to concede that the thesis in full has been written by me. The support I received during the preparation and designing of the thesis has been acknowledged. I also certify that all information sources and literature used are specified in the thesis.

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Abstract

**Background:** Fever in children is one of the primary reasons for parents/carers to become concerned for their child’s health, and to consequently seek medical assistance. Considered to be one of the most frequent complaints in children’s diseases, fever is usually reported to Emergency Departments (ED) and primary healthcare centres. While fever management education can improve the knowledge and practices of parents/carers, there was no education program that specifically caters for parents/carers who have limited health literacy. This study sought to address this gap by developing a health literacy modified fever education program suitable for parents/carers with varying health literacy levels.

**Aims:** The aims of this thesis were to explore fever management presentations within local EDs, and to develop, implement and evaluate the effectiveness of a health literacy modified fever education program for parents/carers. It was envisaged that informed parents/carers would reduce their inappropriate use of emergency services for children with fever.

**Methods:** This thesis was composed of three major phases: Phase 1 related to the development the educational intervention; Phase 2 explored ED presentations of children to the study site; and finally Phase 3 was the conduct of a factorial randomised controlled trial testing the effectiveness of the education intervention in a sample of parents/carers with limited and functional health literacy attending emergency.
The setting for Phase 2 and 3 was Campbelltown Hospital, South Western Sydney. In Phase 1 the principles of design of health literacy interventions—defining the scope of health information, using pictorial images and plain language, assessing the readability level using established tools, and confirming the content—were utilised. This was followed by secondary analysis of ED presentations for children with fever (N=1581) which highlighted the frequency and seasonal variation in presentation of febrile children during a twelve-month period (January to December 2011), and the non-urgent nature of most presentations (68%).

Finally, a factorial randomised controlled trial (F-RCT) was conducted within Campbelltown Hospital ED. One hundred and fifty-five parents/carers of febrile children aged between six months and five years of age participated in the pre-survey (98.1% response rate). Participants’ level of health literacy was measured using the Rapid Estimate of Adult Literacy in Medicine Short Form. All participants were randomly allocated to one of four groups: intervention or control with limited or functional health literacy. The intervention group received a health literacy modified fever education program (brochure and DVD), while the control group received the existing Fever Fact Sheet and DVD currently in use.

**F-RCT Results:** A total of forty-six parents/carers participated in the follow-up survey. There were no differences between the intervention and the control groups in their baseline demographics. The planned contrasts analysis revealed that there was no statistically significant difference between the four groups (parents/carers with limited health literacy intervention group, parents/carers with functional health literacy intervention group, and parents/carers with limited health literacy control group, parents/carers with functional health literacy control group), in any of the
outcome measures (p > 0.05). Two group analyses (control and intervention) showed improvement in participants’ fever knowledge (mean difference =1.03, 0.2), anticipated fever management practices (mean difference = 1.07, 0.75), and a reduction in the number of visits to the ED (mean difference = -1.57, -1.15) respectively. However, participants in the control group (who received the Fever Fact Sheet) demonstrated a statistically significant improvement in fever knowledge and anticipated fever management practices, and a reduction in the number of visits to the ED/primary care facilities (p < 0.05). No statistically significant difference was found in the intervention group.

**Conclusion:** Providing parents/carers with tailored, appropriate educational interventions improves their fever knowledge and anticipated fever management practices, and thus reduces unnecessary ED/primary care presentations. The Fever Fact Sheet was found to be effective. Further testing of the health literacy modified fever education program, using instruments with improved reliability, within a larger sample of parents/carers with limited health literacy is recommended. Design techniques used in the development of this health literacy modified intervention are supported. Further qualitative research into why parents/carers with children experiencing low grade fevers, continue to attend ED even when well-informed, is recommended.
Chapter One

1. Introduction

1.1. Introduction

This chapter provides the background and introduces the theoretical framework and key elements of this thesis. Firstly, it discusses the issue of fever in children and its impact on parents/carers and health facilities. The role of fever education programs in supporting parents is then described. The issue of literacy and health literacy, a critical aspect of this thesis, is elucidated, and linked to the overall topic of fever in children. Finally, this chapter details the significance of the problem, and explains the concept and intervention strategy that forms the framework for this study.

1.2. Background

Fever in children is one of the main reasons why parents/carers become concerned about their child’s health, and consequently seek medical assistance (Baker, Monroe, King, Sorrentino, & Glaeser, 2009; El-Radhi, 2008; McIntyre, 2011; Pereira, Tavares, Mengue, & Pizzol, 2013). Considered to be one of the most frequent complaints in children’s diseases, fever is primarily reported to emergency departments (EDs) or healthcare centres. Indeed, approximately 20% of children’s cases reported to EDs are related to febrile illnesses (Baker et al., 2009; Steere, Sharieff, & Stenkltyft, 2003; Wammanda & Onazi, 2009). Similarly, around 30% of children’s visits to pediatric clinics centre on fever evaluation and treatment, and up to half of after-hours pediatricians’ calls are in relation to unwell children with fever as one of their symptoms (Crocetti, Moghbeli, & Serwint, 2001). In the United States, there are approximately 5.4 million visits by children to EDs per year that are
attributable to fever (Mahajan & Stanley, 2008). In Australia, a similar pattern of ED presentations is likely and has been anecdotally confirmed (Walsh, Edwards, & Fraser, 2008). Despite the prevalence of presentations of febrile children to EDs, most of these cases are non-urgent and can be actually managed either in the home or by attending a primary healthcare centre (Baker et al., 2009; Herman, Young, Espitia, Fu, & Farshidi, 2009).

Non-urgent presentations of febrile children to EDs have been linked to parents/carers’ poor general knowledge and limited health literacy (LHL). People with LHL will often lack the capacity to determine the degree of an illness and to ascertain whether it is mild, moderate or severe (Herman et al., 2009). Parents/carers with insufficient health knowledge, for instance, may have difficulty differentiating between high and normal body temperature, or between a dangerous and moderate fever; consequently, they cannot know when to seek healthcare assistance, or to call an ambulance or attend an ED (Herman et al., 2009; Walsh & Edwards, 2006; Walsh et al., 2008). This inability to distinguish between varying levels of fever forces parents/carers into inappropriate actions in attempts to make their child comfortable. Some of these actions are: inappropriate antipyretic dose administration (overdosing and underdosing), excessive sponging and cooling of the body, checking the child’s temperature every hour, and waking the child for antipyretic administration (Clinch & Dale, 2007; Walsh, Edwards, & Fraser, 2007). In turn, inappropriate methods of fever management can lead to excessive and unnecessary utilisation of EDs and other healthcare facilities (Herman et al., 2009; Van Ierland et al., 2012; Walsh et al., 2007).

Parents/carers’ concerns and their inappropriate response to a child’s complaint account for 58% to 82% of pediatric ED visits (Berry, Brousseau, Brotanek,
Tomany-Korman, & Flores, 2008). Additionally, in 63% of cases where parents/carers identified their febrile child as requiring urgent assistance, subsequent medical assessment deemed the child’s condition non-urgent and treatable either at home or at a standard appointment at a healthcare centre (Van Ierland et al., 2012). Matziou et al. (2008) found that 25% of mothers would take their child to hospital to treat fever even for a lower temperature, between 37°C and 38°C. Such inappropriate attendance can cause ED facilities to become unnecessarily overcrowded (Herman et al., 2009; Otal et al., 2012) resulting in a reduction in ED staff productivity and an understandable increase in patient and staff frustration (Herman et al., 2009).

In New South Wales (NSW) – the Australian state in which this study has been conducted – there has been a high number of patient attendance to the ED over the last couple of years (2010/2011) due to the population growth and ageing. This demand on the health services has resulted in increased ED admissions, ED overcrowding and sometimes delayed access to emergency care (NSW Department of Health, 2012). Specifically, the number of emergency visits to 11 major hospitals in metropolitan and regional centres across NSW in 2010–2011 was estimated to be more than 50,000 visits per hospital. This included both pediatric and adult patient presentations (NSW Department of Health, 2012). In Campbelltown Hospital ED – the site for this study – which is the major emergency service for the Macarthur area, there are a total of 159 presentations a day- adult and pediatric- (NSW Ministry of Health, 2013) and approximately 15,000 pediatric visits per annum. In recent years, various governmental initiatives have been implemented to address the problem of over-presentation at EDs across NSW (NSW Department of Health, 2012).

Experts around the world agree that education is the most effective means by which the number of inappropriate presentations to ED and healthcare facilities can be
reduced (Baker et al., 2009; Herman et al., 2009; Robinson, Calmes, & Bazargan, 2008; Sorensen et al., 2012). Fever education programs are accepted as the best way to enhance parent confidence, minimise concerns regarding any future fever episodes, and to foster attitudes and knowledge that support the appropriate use of healthcare services (Baker et al., 2009; Cohee, Crocetti, Serwint, Sabath, & Kapoor, 2010; Dawood, Ibrahim, & Palaian, 2010; Herman et al., 2009; Walsh et al., 2008). For this reason, an education program will form the intervention strategy for this study.

1.3. **Fever education programs**

Fever education programs have been shown to improve a parents’/carers’ knowledge and increase their confidence and their ability to manage a febrile illness appropriately (Baker et al., 2009; Herman et al., 2009). Numerous studies have reported the implementation of fever education programs and highlighted their positive impact on parents’/carers’ actions (Baker et al., 2009; Considine, 2006; Herman et al., 2009; Otal et al., 2012). These fever programs appear to be effective in improving parents/carers’ knowledge (Baker et al., 2009) and practice (Herman et al., 2009), and in minimising inappropriate health service utilisation (Herman et al., 2009). Indeed, implementing a fever education program demonstrated an improvement of between 29% and 54% in parents/carers’ fever health knowledge (Baker et al., 2009), a 13% to 46% improvement in terms of adhering to correct fever management practice (Herman et al., 2009), and a 13% to 30% reduction in the inappropriate use of health services for febrile children (Herman et al., 2009).

Although the implementation of a fever education program demonstrates an improvement in patient outcomes, it has been found that the majority of health
education programs are written at a higher level of health literacy (HL) than that which is intelligible to the general population (Potter, 2005; Trifiletti, Shields, McDonald, Walker, & Gielen, 2006). Furthermore, evidence suggests that patients at all levels of HL prefer simple education programs (Ferguson & Pawlak, 2011; Garcia, Hahn, & Jacobs, 2010). Health literacy – related to overall literacy – can be defined as the ‘degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions’ (Baker, 2006, p. 878).

In this study, the term ‘parents’ will refer to the child’s mother or father (biological and/or adoptive), and the term carer(s) will refer to other persons caring for children.

**Issue of HL in education programs**

Despite the fact that education programs play a central role in health promotion, researchers have found that the majority of educational instructions are written at a more advanced level than that which most individuals can understand. Specifically, education programs are usually written at a level that dramatically exceeds what people with LHL are able to comprehend (Ferguson & Pawlak, 2011; Svider et al., 2013). Moreover, individuals at all levels of education prefer simple language for health instructions (Elliott & Shneker, 2009). In order to make educational interventions more accessible to the general community and within hospitals and other health settings, healthcare professionals need to consider a parents/carers’ level of literacy, HL, and their capacity to comprehend any given instructions (Ferguson & Pawlak, 2011; Garcia et al., 2010).

Different strategies have been developed to produce HL education programs for different illnesses and medical contexts. The most common strategies identified in
the literature that improve the usability of health information are: using plain language, reinforcing written material with pictorials where possible, testing the readability of the contents, and validating the program contents (Berkman et al., 2011; DeWalt et al., 2011; Ferguson, 2012; Scudder, 2006). Health literacy education programs have been developed and implemented for a variety of illnesses and complaints such as arthritis (Rudd et al., 2009), depression (Williams Jr et al., 2007), diabetes (Wallace et al., 2009), asthma (Robinson et al., 2008), pain management (Kaasalainen et al., 2010) and chronic diseases (Taggart et al., 2012).

Although educational interventions have been developed and implemented for health clients with limited literacy or LHL in a number of different illness contexts, this researcher’s literature review identified only one small pilot study relating to fever management for parents/carers with LHL (Otal et al., 2012). Since fever is a common childhood illness, a modified fever education program to help parents/carers with varying levels of HL is warranted.

1.4. Health and literacy in Australia

This is an Australian study and therefore the issue of literacy and HL in an Australian context has been detailed. Although literacy is a new concept in the health context, it can significantly affect an individual’s health outcomes (Collins, Currie, Bakken, Vawdrey, & Stone, 2012; Nutbeam, 2006). An individual’s HL level is linked to a number of socioeconomic factors such as age, education level, English proficiency, employment status and income (Adams, Appleton et al., 2009; Australian Bureau of Statistics, 2006; Berkman et al., 2011; Mitty & Flores, 2008). In 2006, 60% of the total Australian population was found to demonstrate an inadequate level of both literacy and HL (Australian Bureau of Statistics, 2006;
Mitty & Flores, 2008). The South Western Sydney Local Health District (SWSLHD), the region in which this study is to be conducted, has a high proportion of health consumers with either English as a second language (39%) or with poor literacy and numeracy skills (Sydney South West Area Health Service, 2008). Campbelltown City is the target site for this study. Forming part of the South Western Sydney metropolitan area, Campbelltown City is the largest local government area in the Macarthur region (Campbelltown City Council, 2011).

Although one third of the population residing within Campbelltown City hold educational qualifications at a degree level, a significant 50.2% of the population have no tertiary educational qualifications (Campbelltown City Council, 2011), which would likely contribute to widespread lower levels of literacy and HL within this cohort. Indeed, the SWSLHD has previously been identified as a region accommodating a significant number of health consumers with poor literacy levels, when compared with the overall NSW population (Sydney South West Area Health Service, 2008).

Extrapolating from this, it is likely that the Campbelltown City population suffers from an inadequate level of HL when compared with that of the overall Australian population (Campbelltown City Council, 2011; Sydney South West Area Health Service, 2008), and this translates to a potential for a higher number of presentations at ED. Given this context, the researcher anticipated that the number of children presenting to Campbelltown Hospital ED with mild to moderate fever and who could have been managed at home or by attendance to primary care centres may be high.
1.5. **What this thesis adds**

This study adds to the existing literature relating to fever in children and methods of fever management by proposing the HL of parents/carers as a major factor in terms of the design and delivery of education programs. The study commences with an examination of the pathophysiology of fever, the various treatments options available, and the deleterious effects of incorrect management on children, families and healthcare facilities. The varying capacity of parents/carers to manage febrile illnesses will be considered. This thesis will also explore the impact of HL on parents/carers’ ability to appropriately manage fever within the home. Measurement of HL within a busy clinical setting such as an ED is examined. Finally, an educational intervention that considers the parents’/carers’ HL level is tested.

1.6. **Significance of this study**

There are a high number of inappropriate presentations to EDs by parents/carers for children with fever that could be better managed within the home (Herman et al., 2009). It is also possible that the HL levels of parents/carers impact on (and to some extent determine) these presentations, with some researchers (Berkman et al., 2011; Herman et al., 2009) noting a direct correlation between an individual’s level of HL and their utilisation of health services.

This study and the health literacy modified fever education program proposed here have the potential to reduce inappropriate presentations of febrile children to the ED. By managing these inappropriate presentations, difficulties such as prolonged waiting times and feelings of frustration experienced by patients and staff (Herman et al., 2009) may be reduced. Similarly, ensuring that only urgent cases of child fever attend the emergency will likely assist ED health professionals to deliver timely care
to the relevant children. This approach could contribute to the National Emergency Access Target (NEAT) within New South Wales of patients being managed at EDs, leaving the ED, being admitted to the hospital or discharged home within four hours (NEAT, 2014). This study has the potential to support this national and state target.

Should it prove effective, this intervention could be applied in numerous settings where children with fever present, including childcare centres, community health services, ED waiting rooms and libraries. Fever education is an ongoing process and is not a single educational experience (Baker et al., 2009; O'Neill-Murphy, Liebman, & Barnsteiner, 2001). In other words, although parents/carers involved in the study may have been exposed to fever education programs in the past, the current intervention will consolidate and/or update parents’/carers’ existing knowledge and practices about fever.

This study is the first in which nurses measure patients’ level of HL within the ED setting. The measurement practices and tools used in this study to assess parents’/carers’ HL levels within the ED will likely have applicability within similar acute settings. Hence, instruments developed in this study will be available for subsequent application in similar studies and across a variety of clinical contexts and environments.

Finally, this program can be of significant benefit to health professionals. The contents of the education program have been extracted from an updated literature review and a systematic review, and are aligned with the international guidelines from the National Institute for Health and Care Excellence (NICE, 2013). Moreover, health professionals may use the information provided in the program as evidence-based guidelines for their daily clinical practice.
1.7. Summary

In summary, fever in children is a major health issue worldwide that causes concern for parents/carers, and can frequently result in inappropriate presentations to EDs and other healthcare facilities. There is evidence that educational interventions are the best way to minimise parents’/carers’ concerns, and to consequently reduce inappropriate presentations to the ED. Significant numbers of fever education interventions are available and may improve parents’/carers’ knowledge, beliefs and behaviours. However, the presented material in existing fever education programs has not been specifically developed with LHL groups in mind; rather, it is designed to cater to the general public. It is evident, however, that people at all levels of HL prefer simple language. Accordingly, this study produces a simple fever education program for parents/carers with varying levels of HL, to be distributed in Campbelltown Hospital, Sydney, Australia. Because Campbelltown is part of South Western Sydney metropolitan area where the majority of the population have low educational levels and low levels of HL, this study aims to implement a modified education program that will increase parents’/carers’ knowledge and fever management practices, and thus indirectly reduce ED presentations for non-urgent fever. Reductions in inappropriate ED presentations can potentially minimise overcrowding, enhance patient outcomes for urgent cases, decrease patient waiting times and reduce health services costs.
Chapter Two

2. Literature Review — Child fever management

2.1. Introduction

Fever is a common childhood illness and has high numbers of annual presentations to EDs and other healthcare facilities (McIntyre, 2011; Pereira et al., 2013). Fever has been found to affect around 70% of all preschool children annually (Hay et al., 2008). Not all fever cases reported to EDs and other health facilities are urgent or require direct actions, some are simple and can be managed at home or by attendance at primary care centres (Van Ierland et al., 2012). Often, parents’/carers’ misunderstanding of fever and its symptoms will force them to take inappropriate actions (Pereira et al., 2013).

This chapter presents the first section of the thesis, with a consideration of fever and child fever management. Opening with a review of literature relating to fever, this chapter then explores the pathophysiology of fever, the underlying causes of fever in young children, different methods of measuring body temperature, and the major reasons for fever presentations to EDs and other healthcare facilities. Different approaches to the management of a febrile child, including pharmacological and non-pharmacological interventions, are considered. Fever education programs and their effectiveness are also examined, and the relevance of the literature to this study is summarised.

An initial search of the literature was undertaken using the keywords or search terms of: fever, fever management, child* Paracetamol, Ibuprofen, nursing, doctors, emergency department, parents and its synonyms, healthcare professionals, mothers,
Panadol, antipyretics. The combinations of these words were then extensively searched in databases held by the University of Western Sydney (UWS). The databases that were accessed in the search were: Scopus, Cumulative Index to Nursing and Allied Health Plus with full text (CINAHL), ProQuest Nursing & Allied Health Source, Science Direct and Medline. Assigning the temporal parameters of the years 2000 to 2013 yielded 25,440 articles. The search was further limited by the presence of the keywords fever and children in the title, resulting in 4,500 articles. Articles in English with full text were retrieved, resulting in 3,340 articles. The majority of these articles were excluded, as they were either unrelated or focused on another topic such as vaccine associated fever, Yellow Fever, Q Fever and Mediterranean Fever. Only articles examining fever in children were then included, resulting in 344 articles. Articles were screened by title and abstract, and finally articles found to be directly relevant to the topic were included. One hundred and nine articles formed the final selection of available literature.

2.2. Background

Fever is one of the main reasons for a child to be taken to the hospital (McIntyre, 2011; Van Ierland et al., 2012). Approximately 20% of children’s cases reported to EDs are related to a febrile illness (Baker et al., 2009; Wammanda & Onazi, 2009), while around 30% of children’s visits to paediatric clinics are for fever evaluation and treatment. Furthermore, approximately half of after-hours paediatricians’ calls are related to fever symptoms in children (Crocetti et al., 2001; Zomorrodi & Attia, 2008). In the United States, fever accounts for approximately 5.4 million visits by children to the ED annually (Mahajan & Stanley, 2008). In developing nations, estimates can be obtained from medication use rather than attendance figures, such as a retrospective study in Uganda (September to December 2006) that demonstrated
that 20–50% of the population in rural areas purchase drugs to treat fever in their children (Ettarh, Galiwango, Rutebemberwa, Pariyo, & Peterson, 2011).

In general, non-urgent conditions account for up to 82% of total ED visits (Berry et al., 2008). Similarly, Baker et al. (2009) claim that there is widespread inappropriate utilisation of EDs and primary health centres by concerned parents/carers of febrile children. A Randomised Controlled Trial (RCT) conducted in the Netherlands between 2006 and 2008 using a sample of 4,609 children with fever reported that 62% of the sample presented to the ED without a referral letter from a general practitioner; and moreover only 27% of this sample were deemed to be urgent, thus requiring direct treatment (Van Ierland et al., 2012). A Greek study conducted between December 2001 and March 2002 reported that 25% of mothers would present at the hospital seeking treatment for their child’s fever even for relatively low temperatures of between 37°C and 38°C (Matziou et al., 2008).

In an Australian context, a survey of 401 parents/carers revealed that 24.3% of the participants could not identify the correct degree that was considered as fever (Walsh et al., 2008). Only 19.5% participants could correctly identify a high fever, more than 50% would administer fever medicine without a physician’s advice, and 41.5% would seek medical advice for a normal temperature (Walsh et al., 2008).

For more understanding of fever and its management, the following sections will outline the common features of fever and the primary modalities of its management. These sections will consider fever pathophysiology, causes of fever in children, varying levels of fever, the mechanics and principles of measuring a child’s temperature, and will conclude with a consideration of the most effective
management of child fever using pharmacological and non-pharmacological approaches.

2.3. Fever

Fever is an English word that is derived from the Latin word *febris*, meaning febrile response (Partridge, 2013). Pyrexia is a synonym derived from the Greek word *pyretos* (Blatteis, 2010), which means fire. Defined as an elevation of the core body temperature that exceeds the normal body temperature associated with an increase in the hypothalamic set point core temperature (Tc) (Blatteis, 2010; Bleeker-Rovers, van der Meer, & Beeching, 2009; Prinzhorn, 2004), fever is essentially an increase in the body temperature to a level that is considered to be above normal (Oshikoya & Senbanjo, 2008; Zomorrodi & Attia, 2008). Normal body temperature is about 37°C or 98.6°F, and one or more degrees above these values is considered to be fever (Brusaferro, Regattin, & Viale, 2008; Marcy et al., 2004). Many researchers define fever as a temperature higher than the average core body temperature. This is classified as a rectal temperature above 100.4°F (38°C), oral temperature higher than 100°F (37.8°C), axillary temperature higher than 98.96°F (37.2°C), and an ear (tympanic) temperature higher than 100.4°F (38°C) (Prinzhorn, 2004; Steere et al., 2003; Zomorrodi & Attia, 2008).

Body temperature is at its lowest point in the morning, reaching its peak temperature in the evening (El-Radhi & Barry, 2006; Zomorrodi & Attia, 2008). This rhythm is linked to sleep-wake cycles and normally fluctuates by 0.5°C in adults (Sarrell, Wielunsky, & Cohen, 2006; Zomorrodi & Attia, 2008). Body temperature also varies between infants, young children, older children and adults due to variables such as metabolic rates, body size, immune system and ratio of surface area to weight (body
surface area) (Marcy et al., 2004; Sarrell et al., 2006). Other factors that affect body temperature include level of physical activity, meal time schedule and environmental conditions such as air, water and weather (Marcy et al., 2004). High body temperature can be recognised clinically through certain signs and symptoms, such as skin warmth, and can be confirmed by using the fever measurement tool of the thermometer (Marcy et al., 2004). In the absence of a thermometer, a tactile examination (physical technique) is an alternative way to determine the presence or absence of fever (Wammanda & Onazi, 2009).

Within itself, fever is not a serious issue unless it is significantly and persistently high; for example, over 41.7°C or 107°F when measured rectally (Zomorrodi & Attia, 2008). This is because a high temperature can cause serious complications such as seizures, stroke, dehydration, cardiac problems and death (Walsh et al., 2008; Zomorrodi & Attia, 2008).

High fever is differentiated from hyperthermia in many ways. While elevated body temperature in hyperthermia is associated with external environmental factors such as heat stroke (Marcy et al., 2004; Zomorrodi & Attia, 2008), fever involves an internal mechanism that is essentially a defensive reaction to the admission into the body of pathogenic agents (Blatteis, 2010). This rise in temperature in the case of fever is associated with an increase in the hypothalamic set point, and is a response from the hypothalamus to control the body temperature (Ogoina, 2011; Thompson, 2005). However, in the case of hyperthermia, the hypothalamic set point does not change; hence the hypothalamus will not respond to an elevation in the body temperature (Bleeker-Rovers et al., 2009; Marcy et al., 2004).
2.3.1. *Causes of fever in children*

Fever is usually initiated by infection (Marcy et al., 2004), and infections are the main cause of death in children under the age of five years (NICE, 2007). However, fever may occur during non-infectious diseases such as cardiovascular, diabetes and prolonged respiratory problem (Marcy et al., 2004). A study conducted by Oshikoya and Senbanjo (2008) concluded that the most common causes of fever among children are infection and other factors not related to infection, including (but not limited to) teething, exposure to sunlight, eating contaminated food, dirty unsanitary environment, excessive crying, hyperactivity, the common cold, change in weather, exposure to cold, and lack of sleep.

Fever indicates a normal physiological reaction that usually results from the presence of external infectious substances in the body called pyrogens (Baraff, 2003; El-Radhi, 2008; Wilkins, 2008). These include bacterial, viral, fungal and parasitic pyrogens (Blatteis, 2003; Bleeker-Rovers et al., 2009), with bacterial and viral pyrogens being the most common cause of fever in children (Mahajan & Stanley, 2008; Massin, Montesanti, & LePage, 2006; Nademi, Clark, Richards, Walshaw, & Cant, 2001). While the majority of fevers in children are caused by viral pyrogens, such as viral Meningitis, Measles, and Mumps, bacterial pyrogens are the most dangerous (El-Radhi, 2008; Nademi et al., 2001). This is because as their presence of bacterial pyrogens in the blood leads to an increase in White Blood Cells (WBC) two- to three-fold compared to the effects of the presence of viral pyrogens (Nademi et al., 2001).

The common bacterial causes of fever in children are: occult bacteraemia (OB), meningitis, pneumonia and urinary tract infections (UTIs) (Baraff, 2003, 2008;
Mahajan & Stanley, 2008). Some other causes are upper and lower respiratory tract infections, acute otitis media, and gastroenteritis (Baraff, 2003, 2008; Purssell, 2002). However, OB is considered to be the most dangerous cause of fever, and underlies a large number of cases of fever in young children (Mahajan & Stanley, 2008; Steere et al., 2003).

However, OB, or the presence of bacteria in the blood without an apparent source which is caused by a bacteria called *Streptococcus pneumonia*, is considered to be the most dangerous cause of fever in young children (Mahajan & Stanley, 2008; Steere et al., 2003). This is because it underlies (covers) a large number of cases of fever without any symptoms.

**Fever propensity varies with age**

Every child has a unique body temperature that varies (only minimally) from that of other children. However, different age groups have different evaluation in terms of fever. The literature delimited for the review for this study has classified children into three groups, namely: zero to three months (Chiappini et al., 2009; NICE, 2007), three to six months (Chiappini et al., 2009; NICE, 2007) and six months to five years or older (Chiappini et al., 2009; Walsh et al., 2008). The majority of literature on fever and its management has mainly been on children within the five years or younger cohort, because fever is more prevalent in young children and neonates (Nijman, Oostenbrink, Dons, Bouwhuis, & Moll, 2010; Wammanda & Onazi, 2009). The reason for this is that neonates and young children have different implications in terms of fever due to metabolic rates, body size, immune system and ratio of surface area to weight (body surface area) (Marcy et al., 2004; Sarrell, Wielunsky, & Cohen, 2006). Indeed, a febrile child of less than three months who presents with a fever
requires urgent investigation and immediate hospital admission (Baraff, 2008; Chiappini et al., 2009; NSW Department of Health, 2010). Neonates with fever present a unique group with potential underlying conditions that are discrete from and different to children aged between three months and five years. Accordingly, the proposed study will focus exclusively on children greater than three months and up to five years of age.

2.3.2. What is normal, moderate and high fever?

Normal body temperature is considered to be 37°C or 98.6°F, with a variation of 0.5°C degrees according to time of day. Ranging from 36.5°C to 37.5°C, a normal body temperature will generally remain under 37.5°C (NSW Department of Health, 2010; Walsh et al., 2008). One or more degrees above 37°C is classified as fever for all age groups. However, there is general consensus that children in the following categories should be recognised as being at high risk of serious illness: children younger than three months of age with a temperature of 38°C or higher, and children aged three to six months with a temperature of 39°C or higher (NICE, 2007, 2013; NSW Department of Health, 2010). For children seven months and older, moderate fever is up to 40°C, high fever is over 40°C, and 41.6°C is considered unsafe and potentially harmful (El-Radhi, 2008; Walsh & Edwards, 2006).

2.3.3. Measuring body temperature

Measuring body temperature is an important evaluative procedure for health professionals. An accurate assessment of a child’s body temperature is critical to appropriately diagnose and treat (Barton, Gaffney, Chase, Rayens, & Piyabanditkul, 2003; El-Radhi & Barry, 2006; Nimah, Bshesh, Callahan, & Jacobs, 2006). Many different methods are available to measure body temperature. However, the practical,
safe, easy and commonly used methods at home and within hospitals are oral (OT), axillary (AT), rectal (RT) and by ear, or tympanic thermometry (TT) (Chiappini et al., 2009; El-Radhi & Barry, 2006).

a) Rectal temperature measurement (RT)

Historically, the RT method was the most common and accurate way of measuring body temperature in young children (Barton et al., 2003). Many studies demonstrate that this has a good agreement with core body temperature (95% limits of agreement 0.15°C to 0.65°C) (Craig, Lancaster, Taylor, Williamson, & Smyth, 2002; El-Radhi & Barry, 2006). However, many potential problems with the RT method have been raised that limits its use. To have an accurate RT reading, for example, the rectal thermometer needs to be placed two to four centimeters past the anal sphincter, which is painful, and can cause discomfort to children, risk cross infection, and expose the child to bodily contaminated fluids. Moreover, the procedure is time consuming (Chiappini et al., 2009; El-Radhi & Barry, 2006; Martin & Kline, 2004). For the purposes of this study, the use of this method will be excluded.

b) Axillary temperature measurement (under arm)

Axillary (AT) temperature measurement is undertaken by placing a thermometer under the child’s arm. This method is easy, safe, well-tolerated, and the most common way of measuring body temperature in infants and young children (Barton et al., 2003; Chiappini et al., 2009; Nimah et al., 2006). The main concern in using the AT method is that it does not deliver a precise reading (Craig et al., 2002; Martin & Kline, 2004), since the axilla is not situated near any major blood vessels (Martin & Kline, 2004). Although AT is not 100% accurate, it is still the easiest and safest method for parents/carers and healthcare providers to use. Convenience renders it the
method most highly recommended by researchers (Chiappini et al., 2009; Chiappini, Venturini et al., 2012). This method will be one of the recommended fever measurement tools in this study.

c) Oral temperature measurement (OT)

Oral temperature measurement is suitable for children five years of age and over. It is more accurate than AT (Chiappini et al., 2009; El-Radhi & Barry, 2006), and only 0.4°C less than the core body temperature (El-Radhi & Barry, 2006). However, OT readings can be impacted upon by the ingestion of cold and hot drinks/food, or by inhaling hot air (Chiappini et al., 2009; El-Radhi & Barry, 2006; Martin & Kline, 2004). While electronic and mercury thermometers can be used orally, the use of the latter has been discontinued due to the risk of mercury toxicity in the case of breakages (Chiappini et al., 2009; Martin & Kline, 2004). The use of a glass thermometer will not be recommended for use in this study.

d) Ear method or tympanic temperature measurement (TT)

Measuring body temperature using an infrared thermometer (TT) at the external ear canal has been a commonly used method over the past 15 years, with its use becoming more prevalent worldwide since 1988 when it was first produced and tested (Craig et al., 2002). While it is the easiest, fastest, cleanest, most convenient and non-invasive approach for temperature measurement (Barton et al., 2003; Chiappini et al., 2009; Martin & Kline, 2004; Nimah et al., 2006), TT does pose some limitations. Many factors can compromise the accuracy of a TT measurement, such as the presence of hair in the aural canal, exposure of the ear canal to ambient air movement (Martin & Kline, 2004), or the presence of earwax (Chiappini et al., 2009; Martin & Kline, 2004). This method is not suitable for infants under two
months of age (Barton et al., 2003), because the curved shape of the auditory canal makes it difficult for the thermometer to reach the tympanic membrane (Barton et al., 2003; Chiappini et al., 2009; Martin & Kline, 2004; Nimah et al., 2006).

To summarise, both AT (using an electronic thermometer) and TT (using the infrared thermometer) are recommended for children older than two months. Although the infrared thermometer is more expensive (AUD 67.95) than the electronic one (AUD 10.95) (Omron, 2013), the use of both thermometers will be recommended in this study.

2.3.4. **Reasons for presenting to the ED with a child with fever**

Parents/carers with a febrile child often present inappropriately to the ED and/or other healthcare facilities. These inappropriate presentations result from an unnecessarily high level of concern on the part of the parents/carers due to their poor grasp of health information. These parents/carers may believe, for example, that fever is a disease rather than an indicator of a disease (Arpa, 2010; Matziou et al., 2008; McIntyre, 2011; Poirier, Collins, & McGuire, 2010). According to the literature, the main reasons for inappropriate presentations at EDs and other healthcare facilities are: lack of knowledge and poor HL, parent/carer concerns and beliefs, a bad experience with previous fever episodes, and confused or incorrect health practitioner instructions (Clinch & Dale, 2007; Dawood et al., 2010; Poirier et al., 2010; Walsh et al., 2008).

Essentially, parents/carers’ unnecessarily elevated concerns and their correspondingly inappropriate behaviour in relation to their child’s fever management reflect their level of anxiety and fear (Clinch & Dale, 2007). These unrealistic concerns and overstated misconceptions about their febrile child are
known as ‘fever phobia’ (McIntyre, 2011, p. 2; Poirier et al., 2010, p. 2; Zomorrodi & Attia, 2008, p. 1). Often, parents’/carers’ fear of fever stems from the complications that are often associated with fever. Moreover, parents/carers reported that they presented their child to the ED because they believed that fever could cause seizures, brain damage and death (Nijman et al., 2010; Poirier et al., 2010; Walsh et al., 2008).

A survey of 230 cases in 2009 at the Children’s Hospital of The King’s Daughters, Norfolk, Virginia, USA found that parents/carers believed that fever could cause seizure (38%), death (18%), brain damage (15%) and other problems such as blindness (1.9%), infection (3%) or shock (2.2%) (Poirier et al., 2010). It was found that parents’/carers’ fears and misconceptions about fever’s side effects could lead to incorrect actions towards their child’s health. As a result of these misconceptions, Poirier observed, caregivers may aggressively administer fever medication or seek healthcare assistance (Poirier et al., 2010).

Poor education and LHL skills are other reasons cited for inappropriate presentation at ED with a febrile child (Herman et al., 2009). On the other hand, parents/carers with a higher level of overall education and higher Functional Health Literacy (FHL) levels have the capacity to differentiate between varying levels of fever. This factor seems to be the most important reason that is linked to the parents’/carers’ concerns, and correspondingly the correct child fever management (Dawood et al., 2010; Poirier et al., 2010; Walsh et al., 2008; Zomorrodi & Attia, 2008). Conversely, parents/carers with limited education may not have the ability to differentiate between mild, moderate and high fever (Poirier et al., 2010; Walsh et al., 2008). In their survey, Poirier et al. (2010) found that 55% of the sample incorrectly classified a temperature of less than 37.8°C as a fever, while 63.9% of the sample would
incorrectly administer fever medication before the temperature reached 37.8°C. These results demonstrated that there is a significant correlation between level of education and the temperature at which a caregiver would call a pediatrician or take a child to the ED (p=0.006 and 0.037, respectively). Likewise, Matziou et al. (2008) found that parents/carers with higher levels of education (university degree) demonstrated better knowledge about fever and its correct management than parents/carers with low levels of education (secondary school or less) (Matziou et al., 2008). Having a solid knowledge of fever, and knowing how to manage it and how to differentiate between its levels of severity, will improve a parent/carer’s ability to deal with a febrile child. Accordingly, this enables the parent/carer to utilise health facilities appropriately and only when necessary.

In addition, negative experiences with previous fever episodes can prompt parents/carers to seek healthcare assistance for lower temperatures in children (McIntyre, 2011; Poirier et al., 2010; Walsh et al., 2008). Parents/carers, who have had a bad experience with a febrile child, especially episodes involving convulsions, may act hastily, before the current fever reaches a treatable level (McIntyre, 2011). On the other hand, previous experience could be an advantage in terms of improving parents’/carers’ knowledge and practice for future fever episodes. It was found, for example, that parents/carers with previous experience of fever and its management generally demonstrated better assessment and more appropriate behaviours in terms of treatment of a febrile child (Matziou et al., 2008).

Healthcare professionals’ management may influence parents’/carers’ concerns and anxiety regarding their child’s fever. Receiving conflicting information from healthcare professionals can increase concerns and generate uncertainty amongst parents/carers in relation to best practice in the event of fever (Clinch & Dale, 2007;
McIntyre, 2011; Walsh et al., 2008). Additionally, an inability to diagnose fever and lack of evidence base knowledge from healthcare professionals creates an environment in which parents/carers are likely to deliver inappropriate practices and administer incorrect treatment (Clinch & Dale, 2007; McIntyre, 2011). Research has shown that 36% of nurses are not aware of the beneficial effects of fever as it is a sign of a defence mechanism (Clinch & Dale, 2007).

The above literature highlights the various reasons why parents/carers might elect to attend an ED when their febrile child could be best managed at home. Moreover, parents/carers who are ill-informed are also more likely to engage in inappropriate and potentially harmful interventions to reduce their child’s fever; for example, inappropriate antipyretic dose administration (overdosing and underdosing), excessive sponging and cooling of the body, checking the child’s temperature every hour, and waking the child for antipyretic administration (Clinch & Dale, 2007; Walsh et al., 2008).

A number of factors have been identified that increase parents’/carers’ concerns about fever, and these factors can in turn lead to inappropriate presentations at a healthcare facility. One of this study’s objectives, therefore, will be to implement education programs that will reduce parents’/carers’ concerns. It is hoped that this will positively influence parents’/carers’ behaviour at home, and correspondingly reduce the inappropriate use of emergency or primary care services.

2.3.5. Child fever management

Maintaining a sense of confidence is an important consideration in terms of the management of child fever: parents/carers who are empowered and well-informed will demonstrate an agency and competence that enables them to respond to a febrile
child in the most appropriate and effective manner (Arpa, 2010; Walsh et al., 2008; Zomorrodi & Attia, 2008). There are two common methods of managing a febrile child: physically (non-pharmacological) or by using antipyretic medications (pharmacological). The physical technique may include fanning, sponging, administering fluids, and cooling the body and head (El-Radhi & Barry, 2006; Sakai, Niijima, & Marui, 2009). The pharmacological approach, on the other hand, entails the administration of antipyretics; this is the most common and preferred treatment (Arpa, 2010). Some methods of managing fever are recommended, while others are discouraged. The following sections will explore various treatments.

\textit{a) Pharmacological management}

The most common and preferred method for fever reduction is the use of antipyretics. The popularity of this approach has increased worldwide steadily over the last two decades, from 67% in 1980 to 95% in 2002 (El-Radhi, 2008; Walsh et al., 2007). Antipyretic use is recommended only when fever is associated with other signs of discomfort such as severe crying, irritability, lethargy, loss of appetite and sleep disturbance (Chiappini et al., 2009; Hay et al., 2008; Watts, Robertson, & Thomas, 2003). Several different antipyretics are available to reduce child fever, with the most common being Panadol (Paracetamol) and Nurofen (Ibuprofen) (Arpa, 2010; Erlewyn-Lajeunesse et al., 2006; McIntyre, 2011; Nabulsi et al., 2006; Purssell, 2011; Sarrell et al., 2006). While Paracetamol has been used to treat fever and mild to moderate pain since 1886 (Jefferies, Saxena, & Young, 2012), Ibuprofen is a relatively new fever medicine (first use was 1961), that has increased in popularity especially for administration in a clinical setting (Hay et al., 2008). Ibuprofen is now in common use to treat fever and pain in children (Arpa, 2010; Chiappini, Venturini et al., 2012).
In terms of safety, both Paracetamol and Ibuprofen as antipyretic medications have been found to be effective in reducing fever. Results from a number of studies have shown that both Paracetamol and Ibuprofen, when used in appropriate dosages, have well-established efficacy and safety profiles (Nabulsi et al., 2006; Perrott, Piira, Goodenough, & Champion, 2004; Southey, Soares-Weiser, & Kleijnen, 2009). A systematic review of 24 RCTs involving 84,192 participants that focused on the measurement of side effects from using Ibuprofen and Paracetamol (including gastrointestinal symptoms, asthma and renal problems) concluded that there was no clinically significant difference between both drugs, or between both drugs and a placebo (Southey et al., 2009).

Although both Paracetamol and Ibuprofen are safe and used extensively to manage fever and pain in children younger than five years (Chiappini et al., 2009), Ibuprofen appears to be a more efficacious paediatric antipyretic than Paracetamol in children older than six months (Chiappini et al., 2009; Hay et al., 2008; Zomorrodi & Attia, 2008). Both medications are equally effective medication for child pain management (Perrott et al., 2004).

A meta-analysis of 17 trials found Ibuprofen to be more effective than Paracetamol, demonstrating that a single dose of Ibuprofen (4–10 mg/kg) has a similar effect to 7–15 mg/kg of Paracetamol for pain relief. In terms of safety, Ibuprofen was found to be similar to analgesics or other antipyretics at varying time points after administration (two, four and six hours).

Overall, Ibuprofen (5–10 mg/kg) was found to be more effective than Paracetamol (10–15 mg/kg) as an antipyretic (Perrott et al., 2004) with results of a systematic review of 12 trials (n=1509 participants) favoring Ibuprofen over Paracetamol.
This study revealed that there is insufficient evidence supporting the use of Paracetamol as an antipyretic medication (Meremikwu & Oyo-Ita, 2003). It must be noted, however, that the trials in the review were very small and the trial data were incomplete. Similar results have been recorded elsewhere, however, supporting the use of Ibuprofen over Paracetamol (Arpa, 2010). An RCT of 123 children investigating the effect of the antipyretics on reducing a child’s temperature found that there was no statistically significant difference between the effect of Ibuprofen and Paracetamol on child fever management (Erlewyn-Lajeunesse et al., 2006).

Previous research findings support the use of Ibuprofen over Paracetamol to manage fever in children (Arpa, 2010; Hay et al., 2008). However, when multiple dosages are required, Paracetamol is the recommended antipyretic drug for children six months and younger, because Ibuprofen can cause stomach upset as it is a non-steroidal anti-inflammatory drug (NSAID) that inhibits the production of prostaglandins, which are important in keeping the stomach mucosa intact (Dalal & Zhukovsky, 2006).

Although both Ibuprofen and Paracetamol are proven to be safe and efficient, a combination of both drugs – known as alternative Acetaminophen and Ibuprofen – has been manufactured and used universally (first use was 2000) (Arpa, 2010; Erlewyn-Lajeunesse et al., 2006; Nabulsi et al., 2006; Purssell, 2011; Sarrell et al., 2006; Southey et al., 2009). However, the evidence for the efficacy of the alternative Acetaminophen and Ibuprofen is conflicting. For instance, Sarrell et al. (2006) advocated for its use, while Erlewyn-Lajeunesse et al. (2006) and Hay et al. (2008) were cautious in their endorsement. Meanwhile, other researchers (Chiappini et al., 2009; Nabulsi et al., 2006) reject it outright.
The findings of Sarrell et al. (2006) are based on a randomised double-blind study with a sample of 464 children aged between six to 36 months. The results of this study showed that using of the alternative Acetaminophen and Ibuprofen is more efficient in lowering the mean temperature and faster in reducing the body temperature than the use of Paracetamol or Ibuprofen in isolation. Similarly, Erlewyn-Lajeunesse et al. (2006) found that administering of the alternative Acetaminophen and Ibuprofen was superior to Paracetamol use alone and has same effect of Ibuprofen administration. Consistent with both Sarrell et al. (2006) and Erlewyn-Lajeunesse et al. (2006) studies, Paul et al. (2010) found that the combined treatment of Paracetamol and Ibuprofen had a significantly better effect (P<0.001) than Ibuprofen alone at hours four to six post-administration (hour 4, P<0.005; hours 5 and 6, P<0.001) (Paul et al., 2010).

Conversely, Nabulsi et al. (2006) presented similar findings to Sarrell et al. (2006) and Erlewyn-Lajeunesse et al. (2006) regarding the use of the combination approach. Nabulsi et al. (2006) contend that the use of the combination of the two drugs should not be endorsed until its safety and efficacy is tested in large clinical trials. Others believe that the administration of Acetaminophen and Ibuprofen needs to be undertaken with caution, due to side effects that include renal failure and hyperthermia (Erlewyn-Lajeunesse et al., 2006; Paul et al., 2010).

In brief, the majority of literature supports Paracetamol as the appropriate antipyretic for use in young children aged six months and under. Secondly, both Paracetamol and Ibuprofen are recommended and safe antipyretic to be used for older children aged six months and older (NICE, 2013; NSW Department of Health, 2010). The combination of these two drugs (alternative Acetaminophen and Ibuprofen) was not recommended (Chiappini, Venturini et al., 2012; NICE, 2013; NSW Department of
Health, 2010). Accordingly, the current study will emphasise the use of both drugs to manage a febrile child. Paracetamol will be recommended for all age groups, with Ibuprofen recommended for children six months and older. A combination of both drugs as an antipyretic will be avoided as this is not supported by contemporary guidelines.

**Dose and mechanisms of action for antipyretic**

Both Paracetamol and Ibuprofen inhibit the biosynthesis of prostaglandins, which in turn inhibits the thermoregulatory set point in the anterior hypothalamus (Bleeker-Rovers et al., 2009; Zomorrodi & Attia, 2008) (see fever pathophysiology page 18 and 19). Both drugs are absorbed into the gastrointestinal tract. Paracetamol reaches peak plasma concentrations within 30 minutes, while Ibuprofen takes one hour to be absorbed (Sarrell et al., 2006). To bring down a child’s temperature Paracetamol takes about 30 minutes, while Ibuprofen takes one hour. The maximal temperature reduction peaks for Paracetamol is within two hours and three hours for the Ibuprofen (Sarrell et al., 2006). Due to the effectiveness of Paracetamol and Ibuprofen, 50% of paediatricians in the USA recommended the use of both medications in managing child fever (Arpa, 2010; Nabulsi et al., 2006; Zomorrodi & Attia, 2008).

Ideal doses are: 5–10 mg/kg every eight hours for Ibuprofen and 12–15 mg/kg every six hours for Paracetamol (Arpa, 2010; Chiappini et al., 2009; Chiappini, Venturini et al., 2012; Sarrell et al., 2006). The maximum daily dose of Paracetamol is 60 mg/kg for children younger than three months of age; and 80 mg/kg for children older than three months (maximum, 3 g/d). More than 150 mg/kg in a single dose of Paracetamol is considered a toxic (Chiappini et al., 2009; Chiappini, Venturini et al.,
2012), for Ibuprofen the maximum safe single dose is 30 mg/kg up to 1.2 g/day, and the toxic dose being over 100 mg/kg a day (Chiappini et al., 2009; Chiappini, Venturini et al., 2012).

\textit{b) Non-pharmacological approach}

Non-pharmacological interventions are an alternative way of reducing body temperature. The most recommended of these is the physical cooling method by fluid administration, which is considered the safest cooling method with no side effects (El-Radhi, 2008; JBI EBNM, 2004; NICE, 2007). Other cooling methods demonstrate side effects that may restrict its use, such as a cold bath that can cause shivering which can actually increase the temperature rather than reduce it (Chiappini et al., 2009).

Sponging reduces body temperature in three stages – namely conduction, convection and evaporation (Meremikwu & Oyo-Ita, 2003; Zomorrodi & Attia, 2008). In the first stage, the heat from the patient’s warm body is exchanged to water. Convection is when the heat moves from warm to cool air, and finally the body loses heat as water evaporates (Meremikwu & Oyo-Ita, 2003; Zomorrodi & Attia, 2008).

Suggestions about using physical methods vary; some methods are recommended, others are recommended with caution and concerns (Meremikwu & Oyo-Ita, 2003), while other experts argue that the use of a non-pharmacological model is only appropriate after antipyretic administration (Zomorrodi & Attia, 2008). Some researchers contend that physical methods such as encouraging fluid intake, removing excess clothing or extra wrappings and ensuring air circulation will improve the body’s physiological response to fever and should be employed (Watts et al., 2003). Furthermore, physically cooling the body is recommended in children
with very high body temperature (hyperthermia) where a quick drop in temperature is needed (Chiappini et al., 2009; El-Radhi, 2008; Zomorrodi & Attia, 2008). Sponging is often required in instances of high environmental temperature and humidity (Watts et al., 2003; Zomorrodi & Attia, 2008), where the thermoregulatory centre is not involved in controlling the body temperature as it is in the case of hyperthermia (Zomorrodi & Attia, 2008).

In summary, it appears that certain physical methods can be effective in managing fever. These include encouraging fluid intake, removing excess clothing and sponging during hot weather. For children with high fever (hyperthermia), the physical method is useful because it lowers the temperature quickly. However, these methods need to be employed with caution, since they can induce shivering and discomfort, and may ultimately raise the body temperature again.

2.3.6. Educational intervention to minimise concern and improve practice

Fever education programs are the best way to increase parental confidence, reduce concerns for future fever episodes, and support the appropriate use of healthcare services (Baker et al., 2009; Cohee et al., 2010; Dawood et al., 2010; Herman et al., 2009). Numerous studies have reported the implementation of fever education programs (Baker et al., 2009; Cohee et al., 2010; Considine & Brennan, 2006; Herman et al., 2009; Hsu, Chen, & Huang, 2012). These programs appear to be effective in improving parents’/carers’ fever knowledge (Baker et al., 2009), fever management practice (Cohee et al., 2010), and in minimising inappropriate health service use (Herman et al., 2009). Indeed, implementing a fever education program resulted in a 29% to 54% improvement in parents’/carers’ fever knowledge (Baker et al., 2009), 13% to 46% improvement in correct fever management practices (Herman
et al., 2009), and 13% to 30% reduction in the inappropriate use of health services for children with fever (Herman et al., 2009).

Different approaches, intervention strategies and programs were presented in the literature and have been used in various contexts to deliver a health message to educate parents/carers about fever and its management. Instruments used to facilitate education sessions include but are not limited to video presentations, group education and brochures. In a prospective randomised cohort study, Baker et al. (2009) used an 11-minute video about home management of fever. The content of this education program included details regarding methods for temperature measurement, when to contact a physician for treatment of a febrile child, clarification of some misconceptions about fever, and methods to manage a febrile child. The educational intervention in the Baker trial demonstrated a significant improvement in parents’/carers’ fever knowledge (54%) and attitudes (28%) towards a febrile child. Another experimental Vietnamese study (2012) using pre- post-test design found that the use of a brochure and a CD-Rom video as a fever education tool resulted in significant improvement in scores in fever information, attitudes, self-efficacy and skills (Hsu et al., 2012).

Group education or verbal instruction is another helpful educational tool to improve parents’/carers’ knowledge about fever. Pediatrician-reinforced educational sessions on child fever management demonstrated significant improvement in parents’/carers’ knowledge, practices and attitudes (Sarrell & Kahan, 2003). The Sarrell and Kahan (2003) study reported that 75% of parents/carers correctly defined the lower limit of high fever as 38.5°C after attending a reinforced education session, compared to 46% before the session. Similarly, 61% correctly measured the fever after the session versus 46% before, and 43% of the parents/carers correctly assessed when to visit the
pediatrician after the session versus 23% before. In order to reduce the overuse of ED by patients with mild illness such as fever, Herman et al. (2009) used a health aid book entitled *What to do When Your Child Gets Sick*. Participants who used the book demonstrated a significant reduction in ED visits for a low-grade fever.

Fever management education programs are an effective tool to improve participants’ attitudes towards a febrile child, and increase their fever knowledge, management skills and self-efficacy. A systematic review to determine what educational interventions are effective in influencing parents/carers to provide care for their febrile child (Young, Watts, and Wilson, 2010) concluded that there was a diverse range of educational tools available to inform parents/carers about fever and its management. Written, visual, interactive and verbal material in a structured or repeated session was shown to be effective, significantly improving knowledge of fever management in children (Herman et al., 2009; Young et al., 2010).

Education programs have a positive impact on the anxiety and stress levels of parents/carers, and their ability to manage a febrile child prior to seeking health advice. A quasi-experimental study involving 87 parents/carers demonstrated a 30% reduction in their fever-related anxiety after implementing a fever education program (O’Neill-Murphy et al., 2001). Features of this education program included the correct use of thermometer, the correct use of antipyretics and what fever grade should be considered as high fever. In this study, the researchers found that all of these actions would lead to reduced pressures on healthcare facilities and EDs.

It is generally agreed that fever education is an ongoing process rather than a discrete and one-off occurrence. Generally, researchers concluded that although parents/carers did not modify their behaviours in terms of the inappropriate use of
health services, their knowledge about fever nonetheless improved significantly (Baker et al., 2009; Sakai et al., 2009). Accordingly, a major focus in this thesis will be the development of a health literacy modified fever education program for parents/carers. This aspect of the intervention will be explained in detail in Chapter Five.

2.3.7. Fever management guidelines

Numerous studies have produced evidence-based guidelines for fever management in children. Appendix 1 summarises important findings from the following sources: the National Institute for Health and Clinical Excellence (NICE, 2007) and its update (NICE, 2013), a Summary of the Italian Pediatric Society Guidelines (Chiappini et al., 2009) and its update (Chiappini, Venturini et al., 2012), clinical practice guidelines for the acute management of fever (NSW Department of Health, 2010), and further recommendations for the correct use of physical fever management at home as proposed by the Joanna Briggs Institute for Evidence Based Nursing and Midwifery (JBI EBNM, 2001, 2004). A comprehensive review of contemporary guidelines relating to fever management has been used to shape the education program in this study. Chapter Five presents this material in detail.

2.4. Summary

To conclude, fever in children and its associated worries are universal concerns. It is important to understand; however, that fever is a host defense mechanism rather than a disease. Nevertheless, sustained high fever in children can cause serious problems. Parents/carers need therefore to differentiate between varying levels of fever and hyperthermia. Although different practices and beliefs exist in regard to fever and its management, essentially fever can be managed in two ways – using antipyretics or a
physical intervention. The recommended antipyretics for fever in children are Ibuprofen and Paracetamol, while the recommended physical methods to cool the body temperature in children are encouraging fluid intake, removing excess clothing, and sponging in hot weather. Infrared thermometry is the recommended method of measuring a child’s body temperature. Much like other illnesses, the best way to enrich a person’s knowledge about fever, and correspondingly to minimise their fears, is by providing information. Fever education programs result in improved parents’/carers’ knowledge about fever and minimise their anxiety, which in turn leads to the correct utilisation of healthcare facilities. Educational interventions are varied, but simple programs are recommended because they can accommodate a spectrum of levels of literacy and HL. This will be addressed in Chapter Three, which will define key issues relating to literacy and HL and how these issues have informed the methodology of this study.
Chapter Three

3. Literature Review — Health Literacy (HL)

3.1. Introduction

Reading and writing skills are essential tools for people in their daily activities. Being able to read and write means being able to understand and use information, and to act accordingly. Written communication skills are an integral component of navigating cultural interaction, such as writing a letter or completing a job application. Knowledge can be gained, goals can be achieved, and an individual’s health can be promoted as a result of increased levels of literacy (Graff, 2010).

Within healthcare settings, basic reading and writing skills are required to understand health instructions, to communicate and interact with healthcare professionals and to complete certain clinical documentation, such as insurance forms or consent forms.

The ability to apply reading and writing skills in order to communicate and interact in society is known as literacy (Opoku-Amankwa, 2010). This chapter will focus on literacy and HL, and will highlight other health issues linked to literacy and LHL. The incidence of FHL within Australian and international populations will be presented and examined. This chapter will also discuss different tools and approaches used to test an individual’s HL level, as well as strategies to improve health consumers’ HL skills.

To provide the background for this chapter, a literature review was undertaken using the following search terms: literacy, low literacy, limited literacy, functional literacy, health, health literacy, mothers, parents – and a combination of these words. The databases searched were Scopus, Science Direct, PubMed, PsycINFO and
Educational Resources Information Centre between 1999 and 2013, resulting in 2,077 articles. Only full text articles in English and articles found to be directly relevant to the topic were included in the review. Earlier published articles were included for the purposes of directing attention to a literacy tools source. A total of 84 articles comprised the final selection of available literature.

3.2. Literacy

Literacy is a broad term and has been defined as the ability to read, write and speak at a certain level of proficiency that enables social communication and interaction (Bartlett, 2008; Kalman, 2008; Krajcik & Sutherland, 2010; Melott, 2010). In addition, scholars such as Kickbusch and Maag (2008) have defined literacy on the basis of not only being able to read and write, but also to demonstrate proficiency with numerical skills.

Due to technological advances and rapid changes in a number of sectors such as education, a contemporary definition of literacy may cover more than reading, writing and numerical skills. Some experts have argued that other aspects of life could be considered under the broader matrix of ‘literacy’ – for example, issues relating to home, community, technology and health (Kickbusch & Maag, 2008; LeVine & Rowe, 2009; Melott, 2010). The Australian Bureau of Statistics (2006) has identified five different domains in relation to literacy, including prose literacy (ability to understand information), document literacy (ability to use information), numeracy (ability to use mathematics), problem solving (skills required to solve problems) and HL.
3.3. **Health literacy (HL)**

Although literacy is a relatively new concept in a health context, the term ‘health literacy’ has been used in medical literature for at least 40 years by authors such as Nutbeam (2006), Ozdemir, Alper, Uncu and Bilgel (2010) and Sorensen et al. (2012). Throughout the relevant literature, there are various definitions of HL, although all are related to the same essential concept, which centres on how health consumers understand and act upon health information. Essentially, health literacy can be defined as ‘the degree to which individuals can obtain, process and understand the basic health information and services they need to make appropriate health decisions’ (Collins et al., 2012; p. 1). More specifically, HL is ‘the knowledge and skills required to understand and use information relating to health issues such as drugs and alcohol, disease prevention and treatment, safety and accident prevention, first aid, emergencies, and staying healthy’ (Australian Bureau of Statistics, 2008, p. 4).

In the last 30 years the concept of HL has gained global prominence (Nutbeam, 2006; Sorensen et al., 2012). The importance of HL stems from the fact that levels of HL have a direct link to individual health outcomes (Berkman et al., 2011; Collins et al., 2012; Taggart et al., 2012), with FHL individuals generally found to demonstrate better health outcomes than those with a LHL level (Taggart et al., 2012). Those with FHL possess adequate knowledge about their illness; can implement better self-management, present with lower medication complications, lower rates of hospitalisation, and exhibit better access to healthcare facilities (Berkman et al., 2011; Nutbeam, 2008; Taggart et al., 2012).
In today’s world of advanced technology, literacy and HL have been linked to the ability to use a computer and navigate the internet (Lam & Lam, 2012). It is argued that since most health instructions are available through the internet, patients are expected to possess the skills to access and utilise online information (Gracie, Moon, & Basham, 2012; Lam & Lam, 2012). Just as navigating healthcare facilities requires basic reading and writing skills, so too does virtual navigation require basic computer and internet capabilities. Compared with other groups, internet users are more likely to have adequate literacy levels (Australian Bureau of Statistics, 2006), presumably due to the fact that people must be able to read in order to access the internet.

It is important to differentiate between limited literacy and illiteracy, as these are two separate categories. Limited literacy is defined as the inability to read, write and use numbers efficiently (Garcia et al., 2010; Pignone, DeWalt, Sheridan, Berkman, & Lohr, 2005). Conversely, to be functionally illiterate is to lack the reading and writing skills needed to function in society (Garcia et al., 2010; Mitty & Flores, 2008). Thus, the person with limited literacy may still possess the basics of reading and writing, in comparison with the illiterate person who lacks all fundamentals of reading and writing. Other definitions of illiteracy are centred on the ability to read at a certain level. For example, the National Adult Literacy Survey (NALS) defines people who are unable to read at the fifth grade level or less as being functionally illiterate (Scudder, 2006).

3.4. Consequences of limited health literacy (LHL)

Research in this area has demonstrated a number of negative outcomes that can result from the existence of LHL skills. On an individual or family level, those with
LHL will demonstrate a lower knowledge level about their health status (Sorensen et al., 2012; Taggart et al., 2012). They may have difficulty in accessing a health facility because they cannot follow and read the emergency signs. In addition, they may struggle to articulate their complaint, or to understand the instructions delivered by the health professionals with whom they consult. Individually and cumulatively, such factors will negatively impact on their overall health status (Hester & Stevens-Ratchford, 2009; LeVine & Rowe, 2009). Additionally, those with LHL skills are more likely to engage in unhealthy behaviours (Taggart et al., 2012). For example, adolescents with LHL are more likely to consume higher levels of alcohol and to smoke. Women with LHL are more likely to have depressive symptoms, less likely to breastfeed their children and less likely to have private health insurance (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004). People with LHL are also less likely to be involved in social and academic activities. Moreover, patients with LHL are commonly excluded from clinical trials because they cannot easily comprehend the general and health information that is usually associated with these interventions (Garcia et al., 2010).

A population demonstrating LHL skills can adversely impact on community health services which include inappropriate, costly use of hospital services and potentially increased hospitalisations (Lee, Arozullah, & Cho, 2004; Weiss et al., 2005). Significantly, the ED may be the most misused department by people with LHL, as this cohort often presents for mild illnesses that could be successfully and effectively treated in primary healthcare centres (Herman et al., 2009; Lee et al., 2004). This inappropriate attendance can render the ED overcrowded, leading to a decrease in staff productivity and a corresponding increase in frustration levels across staff and patients. Indeed, from 58% to 82% of pediatric ED visits are for non-urgent
conditions (Berry et al., 2008), and 82% of people triaged as non-urgent consider their situation as urgent. In other words, an improvement in literacy and HL skills may lead to an increased ability to distinguish between what is urgent and what is non-urgent. This in turn would reduce the inappropriate use of EDs and therefore result in a decrease in waiting time and overcrowding, and an increase in the healthcare team’s productivity.

3.5. **Factors that influence individual literacy and HL**

An individual’s HL level is determined by a range of factors, across a number of sociodemographic, psychosocial and cultural dimensions. Determinants include income and professional status, level of education, English language proficiency, age, gender, race and cultural background (Adams, Stocks et al., 2009; Sorensen et al., 2012).

Low income is often correlated with low levels of literacy, compared to those with an average or high income, who generally exhibit higher literacy levels. Similarly, individuals who are employed usually report higher levels of literacy compared to the unemployed (Berkman et al., 2011; DeWalt et al., 2011). Additionally, there is a direct correlation between English language proficiency and an individual’s HL (Adams, Appleton et al., 2009; Australian Bureau of Statistics, 2006). The same relationship exists between educational level and HL. Health literacy also decreases with age; people aged 65 years and over generally demonstrate lower HL in comparison with other age groups (Adams, Appleton et al., 2009; Australian Bureau of Statistics, 2006; Mitty & Flores, 2008).

Other determinants of an individual’s HL include country of birth, primary language spoken at home, medical conditions, health insurance status and marital status.
Country of birth and use of English as a second language have been shown to have a direct relationship to limited literacy levels in multicultural countries where English is the first language such as United States and England (Adams, Appleton et al., 2009; Berkman et al., 2011; DeWalt et al., 2011).

Statistically, people with LHL are more likely to have no medical insurance and a higher morbidity and mortality rate (Baur, 2011; DeWalt et al., 2011). Literacy levels may also be affected by cultural, religious and political issues, particularly for those born overseas (Adams, Appleton et al., 2009; DeWalt et al., 2011).

3.6. Health literacy and its prevalence in Australia and globally

Health literacy is only now emerging as a field of study; however the term health literacy was first introduced in the 1970s, particularly in countries where a significant proportion of the population were born overseas, or came from culturally and linguistically diverse backgrounds (Sorensen et al., 2012). Multinational surveys, such as the National Assessment of Adult Literacy (NAAL) (Betz, Ruccione, Meeske, Smith, & Chang, 2008), have yielded unexpected findings with one third of Americans classified as having LHL skills (Rudd, Kirsch, & Yamamoto, 2004), and approximately 20% of the British population classified as generally illiterate (Chachamovich, Fleck, & Power, 2009; UNESCO, 2006). In Canada, 65% of the population lack basic HL skills (Barber et al., 2009).

The situation in Australia is comparable, with census data indicating that 60% of the population lack basic HL skills (Australian Bureau of Statistics, 2006). According to an international report, Australian adolescents’ skills in reading, writing and arithmetic in 2010 are significantly worse than they were a decade earlier (Dillon, 2010). These factors partially determine the overall HL level of the
Australian population. Only 6% of Australians demonstrate a high HL, up to 60% of Australian adults aged between 15 and 74 years were assessed as having inadequate literacy and HL skills, and 40% were assessed as having literacy skills that were adequate (Australian Bureau of Statistics, 2006).

Considering the prevalence of LHL in Australia and overseas, a number of initiatives and interventions have been established by governments and health sectors to improve standards. Several methodologies have been employed and instruments developed to educate people with LHL, with tremendous effort invested to improve the population’s overall health knowledge (Pignone et al., 2005). Since healthcare professionals play a major role in patient education, they need to be able to assess and determine a patient’s level of HL, and to ascertain whether the patient is able to understand the presented instructions (Coleman, 2011). Over the previous decade numerous strategies have been developed to assist healthcare professionals in distinguishing between LHL and FHL levels (Berkman et al., 2011). Most commonly, HL measurement tools are employed. While some of these tools have been systematically developed and codified, many others remain informal (Yin et al., 2007). The following section considers the methods that are most commonly employed to measure HL.

### 3.7. Tools to measure HL

There are a variety of tools – encompassing both formal and informal approaches – available to measure a patient’s level of HL. For example, health literacy can be measured informally by empirically observing a patient. Healthcare professionals can observe the patient’s behaviours, or how they respond to health instructions and questions. For example, a patient’s ability to fill out forms correctly, and errors such
as misspelling or misinterpretation, are all indicators of poor literacy and presumably correspondingly poor HL (Yin et al., 2007). As a direct and expedient mode of assessment, the informal method is generally preferred by healthcare professionals because it fits into their busy schedules (Bass III, Wilson, & Griffith, 2003). Many experts, however, feel it to be an inadequate tool of measurement, since patients often exhibit shyness or embarrassment in a healthcare setting and these impediments can impact on behaviour (Bass III et al., 2003; Scudder, 2006). In contrast, formal methods are more organised and codified, are specifically devised for research and clinical purposes, and are considered more appropriate for testing individual and group levels of HL. Formal measurement tools are created using the protocols of clinical research, including rigorous and systematic testing, large sample sizes and thorough confirmation of the validity and reliability of the instruments (Adams, Appleton et al., 2009).

Various tools have been used to measure HL among populations and within clinical settings. Computerised tools, language-specific tools and disease-specific tools have been commonly employed. Instruments such as the Adult Literacy and Life Skills Survey (ALLS) in Australia (Australian Bureau of Statistics, 2006), the Health Activities Literacy Scale (HALS) in America (Rudd et al., 2009), and the International Adult Literacy and Skills Survey (ALL) in Canada (Barber et al., 2009), have all been applied to assess populations. Other instruments include the Health Literacy Screening Questions (Chew, Bradley, & Boyko, 2004), The Functional Health Literacy in Adults (TOFHLA) and the short format of TOFHLA (STOFHLA) (Baker, Williams, Parker, Gazmararian, & Nurss, 1999), Rapid Estimate of Adult Literacy in Medicine (REALM) (Arozullah et al., 2007; Bass III et al., 2003; Davis et al., 1991; Davis et al., 1993; Davis et al., 2006), The Medical
Achievement Reading Test (MART) (Hanson-Divers, 1997), the Newest Vital Sign (NVS) (Weiss et al., 2005), the Single Screening Question (Wallace et al., 2006), the Slosson Oral Reading Test (SORT) (Davis, Michielutte, Askov, Williams, & Weiss, 1998; Powell, Moore, & Callaway, 1981), and the Wide Range Achievement Test (WRAT) (Wilkinson, 1993).

In both a general and a medical context, the five main tools used to measure the level of literacy and HL are: the Wide Range Achievement Test (WRAT-3), the Slosson Oral Reading Test-Revised (SORT-R), the Rapid Estimate of Adult Literacy in Medicine (REALM), a Single Screening Question approach, and the Newest Vital Sign (NVS). Developed in 2005, the NVS is the most recent of the five. As these are the most commonly used and expeditious HL tools cited in the relevant literature, an elucidation of each is offered below.

3.7.1. *Wide Range Achievement Test (WRAT)*

First introduced in 1946 by Jastak and Bijou, the Wide Range Achievement Test (WRAT) was revised by Jastak and Wilkinson in 1984 with its nomenclature updated to WRAT-R (Felton, Naylor, & Wood, 1990; Wilkinson, 1993). Further modified in 1993 and renamed the WRAT version 3 (or WRAT-3), (Wilkinson, 1993), this tool was designed to measure the basic skills of reading, spelling and mathematics for an overall assessment of general literacy skills. The main WRAT was tested in seven U.S. states, in diverse cultural groups including Caucasians, African-American people and Latin Americans. It is the oldest and the second most common HL tool used for both patients and their caregivers aged between five years and 74 years (Davis et al., 1998; Johnstone & Wilhelm, 1996). The test contains two sections, a letter test and a word test. The letter section of the test requires the patient
to pronounce 15 letters, while the word reading section requires the patient to
pronounce 42 words. The words in this test are arranged in ascending order of
difficulty. The test takes approximately three to five minutes to administer and score.

The WRAT-3 can be marked by using the raw scores, which range from 1 to 57, and
can be converted; to grade equivalent reading levels (Bass III et al., 2003; Davis et
al., 1998; Davis et al., 2006). The main limitation of the WRAT-3 is that it contains
some difficult terms such as *assuage*, *terpsichorean* and *epithalamion*. WRAT-3 is
nevertheless the second most commonly used word recognition test employed in
medical settings (Bass III et al., 2003; Davis et al., 2006). This test costs USD 95.00
to purchase (Davis et al., 1998).

Concurrent validity of WRAT-3 is supported through a strong correlation with the
California Test of Basic Skills and the Stanford achievement test, of 0.72 and 0.87
respectively. WRAT-3 has demonstrated high test-retest reliability with scores
ranging from 0.91 to 0.98 (Bass III et al., 2003; Davis et al., 1998) (see Table 1).

Five minutes can be a long time in which to complete a test in a healthcare setting,
however, and this duration may present an issue for some healthcare professionals.
Furthermore, the challenging vocabulary may engender frustration in patients,
resulting in non-compliance and non-completion of the test, possibly leading to a
bias in the study (Bass III et al., 2003). Accordingly, for the purpose of this study,
WRAT-3 has not been used as a measure of HL.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>WRAT-3</th>
<th>SORT</th>
<th>REALM-SF</th>
<th>Single Screening Question</th>
<th>NVS-E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Items</td>
<td>For the reading subtest. (15 letters 42 words)</td>
<td>200 words</td>
<td>7 medical words</td>
<td>One question</td>
<td>6 nutritional questions</td>
</tr>
<tr>
<td>Age group</td>
<td>Between 5 and 74 years</td>
<td>Kindergarten school level to 9th-grade level</td>
<td>Adolescence</td>
<td>18 to 89 years</td>
<td>18 years or older</td>
</tr>
<tr>
<td>Time required</td>
<td>3 to 5 minutes</td>
<td>5–10 minutes</td>
<td>&lt; 1 minute</td>
<td>Question could be asked rapidly</td>
<td>Up to 3 minutes</td>
</tr>
<tr>
<td>Scoring</td>
<td>Uses a row of scores from 1 to 57 converted to grade-equivalent reading levels</td>
<td>Uses a raw score, depends on words pronounced correctly, then converted to grades</td>
<td>Total correct: 0–3=inadequate HL level 4–6=marginal HL level 7=adequate HL level</td>
<td>Answer Sometimes or occasionally or never indicated LHL.</td>
<td>≥ 2=inadequate HL level 3=marginal HL level, ≤ 4=adequate HL level</td>
</tr>
<tr>
<td>Reliability</td>
<td>Strong test-retest reliability coefficient (r=0.91 to 0.98).</td>
<td>Test-retest reliability of 0.95</td>
<td>Strong test-retest reliability coefficient (r=0.97)</td>
<td>The question scores with AUROC curves, 0.80 (95% CI=0.67–0.93), with STOFHLA</td>
<td>Cronbach’s α=0.76 in English version</td>
</tr>
<tr>
<td>Validity</td>
<td>Moderate to strong correlation with the California Test of Basic Skills And Stanford achievement test, 0.72 and 0.87 respectively.</td>
<td>Good correlation to other reading tests such as Woodcock–Johnson Test of Achievement–Letter Word Recognition subtest 0.90 and higher.</td>
<td>Excellent agreement between REALM-SF and REALM (Numbers), Strong correlations with SORT-R (0.96, p&lt;0.001), PIAT-R (0.97, p&lt;0.001), and WRAT-R (0.88, p&lt;0.001).</td>
<td>Demonstrates high correlation and specificity with REALM</td>
<td>Demonstrates moderate correlation with TOFHLA. Criterion validity (r=0.59, p&lt;0.001 )</td>
</tr>
<tr>
<td>Cost (USD)</td>
<td>$95.00</td>
<td>$32.00</td>
<td>$10.00</td>
<td>Not available</td>
<td>Free</td>
</tr>
<tr>
<td>Advantages</td>
<td>Measures reading, spelling and mathematics.</td>
<td>Has a moderate number of items at lower reading levels to measure both literacy and HL</td>
<td>Time efficient, contains only health words</td>
<td>Short and quick make it very useful to be used in clinical setting</td>
<td>Available to measure, maths, reading and comprehension. Available in two languages.</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Comprehension not tested. Words not chosen from healthcare context, contains some difficult terms and issues.</td>
<td>Long time to undertake the test</td>
<td>Unable to distinguish between patients with ninth grade reading level and above.</td>
<td>The study was conducted in a single primary care clinic, and therefore the results cannot be generalised</td>
<td>Designed for literacy skills rather than HL skills.</td>
</tr>
</tbody>
</table>

*Wide Range Achievement Test -3 (WRAT-3), Slosson Oral Reading Test (SORT), Rapid Estimate of Adult Literacy in Medicine- short format (REALM-SF), Area Under the Receiver Operating Characteristic (AUROC), Short format of TOFHLA (STOFHLA), and Newest Vital Sign (NVS)*
3.7.2. *Slosson Oral Reading Test-Revised (SORT-R)*

First introduced by Slosson in 1963 (Powell et al., 1981), the Slosson Oral Reading Test (SORT) is a broadly used test that was re-standardised in 1990 by the same author and renamed SORT-R (Davis et al., 1998). SORT-R is used to evaluate a youth’s level of education, and is suitable for use with ages four years and above (Goodfellow, Trachimowicz, & Steele, 2008). Although not designed specifically for health purposes, SORT-R can nevertheless be used as a tool to evaluate a patient’s HL (Davis et al., 1998), and has a moderate number of items at lower reading levels (Goodfellow et al., 2008).

The main limitation of the SORT-R test, and particularly when administered in healthcare settings or in a clinical setting for research purposes, is its duration. At roughly 10 minutes to administer and score (Goodfellow et al., 2008) or possibly longer in a healthcare setting, the test represents a significant time investment. Additionally, people need to feel comfortable when undergoing a test. The SORT-R could prove challenging and intimidating for some people, because it requires them to pronounce 200 words within 10 minutes. For this reason, it may be difficult for health professionals to use the SORT-R as a HL measure. The validity of SORT-R, however, is due to its high correlation with the more complex reading assessments such as the Woodcock–Johnson Test of Achievement–Letter Word Recognition subtest and the Peabody Individual Achievement Test–Revised Reading Recognition subtest (Davis et al., 1998; Davis et al., 2006), with a test-retest reliability of 0.95 (Goodfellow et al., 2008) (see Table 1). This test is purchased at a cost of USD 32.00 (Davis et al., 1998).
3.7.3. **Rapid Estimate of Adult Literacy in Medicine (REALM)**

First introduced in 1991 by Davis and colleagues, the Rapid Estimate of Adult Literacy in Medicine (REALM) HL measurement tool includes 125 words that are arranged into four columns. It requires three to five minutes to administer and score (Davis et al., 1993; Yin et al., 2007). The REALM was restructured in 1993 to contain only 66 words, allowing it to be completed in less than two minutes. Initially tested in African-American people and Caucasian populations (Arozullah et al., 2007), it is today the most commonly used method of measuring HL in a healthcare context; it is time-efficient and highly customised, containing only health-related words. Other revisions of the tool have produced different versions such as the REALM-R (Bass III et al., 2003) and REALM-Teen (Davis et al., 2006).

The REALM test is usually carried out by asking the patients to pronounce the words in a loud voice, starting with the first word in the left-hand column. However, if patients find it difficult to read a word, they are asked to try again or say ‘skip’ and then move on to the next word. If patients are unable to continue, they are asked to look at the list of words and read as many as they can from the remaining words. The level of HL is determined by the number of words pronounced correctly (Bass III et al., 2003; Davis et al., 1993; Davis et al., 1998; Davis et al., 2006; Yin et al., 2007). The 66 items are transformed into four different reading levels: third grade or less (0–18), fourth to sixth grade (19–44), seventh to eighth grade (45–60), and ninth grade and above (61–66). Another evaluative option for the test is to divide patients into three literacy levels based on correct pronunciation of the words; (0–44) words is inadequate HL, (45–60) is marginal HL, and adequate HL (61 and more) (Davis et al., 1993; Yin et al., 2007).
Another two short forms of the test were introduced REALM short form (REALM-SF) by Arozullah et al. (2007), and REALM revised (REALM-R) by Bass III et al. (2003). The REALM-SF consists of seven words only, whereas the REALM-R form comprises of eight words. Both tests take less than a minute to administer and score, and both demonstrate a sound correlation \((r=0.94\) and \(r=0.72\) respectively) with the main REALM form and with WRAT-R. For the purposes of this study, the REALM-SF is the preferred measure of HL; it is the most recent form of the REALM, and it demonstrates fewer limitations in comparison to the REALM-R. Interestingly, a recent study by Kaphingst, Ali, Taylor and Kass (2010) successfully reevaluated and validated the REALM by telephone, leading the researchers to conclude that the tool was viable for remote use via telephone contact. The average call time was two minutes (range 2–3 minutes), with the average time to complete the REALM being one minute (range 1–2 minutes) (Kaphingst et al., 2010).

The contents of REALM were extracted from educational materials and forms that were used in Louisiana State University Hospital Clinic (Davis et al., 1993). Both the REALM and the revised versions show high correlations with previous commonly used tools, such as SORT-R \((r=0.96, p<0.0001)\), the Peabody Individual Achievement Test-Revised (PIAT-R) \((r=0.97, p<0.0001)\), as well as WRAT-R \((r=0.88, p<0.0001)\) (Davis et al., 1993; Davis et al., 1998; Davis et al., 2006; Yin et al., 2007). In addition, the REALM showed good face validity as evaluated by healthcare professionals (Davis et al., 1993; Yin et al., 2007). Finally, the REALM demonstrates high test-retest reliability \((r=0.99, p<0.001)\) (Davis et al., 1993; Davis et al., 1998; Davis et al., 2006).
The REALM has become the most common method used in the healthcare context because it is time efficient (less than two minutes to test and score) and contains only health-related words. Many studies have recommended and utilised this measure (Chisolm & Buchanan, 2007; Davis et al., 2006; Trifiletti et al., 2006; Yin et al., 2007). The test has the further advantage of being printed in a large font in widely spaced columns on purple paper, conferring an inviting appearance that may appease any anxiety or apprehensiveness felt by the patient in anticipation of undertaking the test (Davis et al., 1993).

The REALM test does, however, pose potential disadvantages, including the fact that it is only available in the English language, and it lacks a mathematical section (Mitty & Flores, 2008; Parker, Baker, Williams, & Nurss, 1995). Despite these possible setbacks, the fact that REALM contains only health-related words (compared to other instruments) renders it one of the most suitable measurement tools for use in a health setting.

3.7.4. Single Screening Question

The single screening question is produced to identify patients with inadequate or marginal HL, and is expedient because it can be applied in a busy clinical setting (Wallace, Rogers, Roskos, Holiday, & Weiss, 2006). This question has been adopted and reevaluated from three initial HL screening questions that were developed by Chew et al. (2004). These questions are ‘How often do you have someone to help you read hospital materials?’ (Question 1) ‘How confident are you filling out medical forms by yourself?’ (Question 2) and, ‘How often do you have problems learning about your medical condition because of difficulty understanding written information?’ (Question 3). Each question has five possible responses, and use a
five-point Likert scale: always, often, sometimes, occasionally, and never (Chew et al., 2004; Wallace et al., 2006). Question 2 has been identified as the best question to detect LHL and marginal HL skills (Betz et al., 2008; Wallace et al., 2006). Patient responses ranging from sometimes, occasionally and never will indicate the LHL level.

The overall performances of the three questions in testing patients’ HL were evaluated by the Area Under the Receiver Operating Characteristic (AUROC), which is a procedure to measure a scale of accuracy range between 0.5 and 1.0, where a value of 0.5 indicates that the scale is performing at a random level, and 1.0 indicates perfect discrimination (Chew et al., 2004). The AUROC’s results for the three questions were Question 1; 0.87 (95% CI=0.78–0.96), Question 2; 0.80 (95% CI=0.67–0.93), and Question 3; 0.76 (95% CI=0.62–0.90). In addition, the detection of HL has strong correlations with STOFHLA and REALM (Betz et al., 2008; Wallace et al., 2006) (see Table 1). The content of the questions is designed to reveal the patient’s ability to navigate the healthcare system, complete medical forms, follow medication instructions, interact with providers, and read appointment slips. Although the authors supported the single question approach (Question 2), the sample size testing the validity of the tool was small and demographically specific, including only Caucasian, male patients in a surgery setting. Due to this specificity, the findings cannot be generalised to diverse populations (Chew et al., 2004).

3.7.5. Newest Vital Sign (NVS)

First introduced in 2005 by Weiss and coworkers, the Newest Vital Sign (or NVS) was developed as a quick and accurate screening tool for use with patients
demonstrating limited literacy skills. This test is available in two languages – English (NVS-E) and Spanish (NVS-S) (Weiss et al., 2005).

In this test, patients are required to answer six questions based on the information provided on a nutrition label. Questions are then scored either correct or incorrect. The scores range from zero to six: four or more correct answers = adequate literacy, three correct answers = marginal literacy, and two or less correct answers = inadequate literacy (Adams, Appleton et al., 2009; Weiss et al., 2005). This tool is designed to measure literacy levels rather than HL skills, and takes approximately three minutes to administer and score.

Newest Vital Sign was tested in the south-west of the USA, a region with high numbers of English and Spanish speakers (Weiss et al., 2005). It has also been used in a survey of 2,824 Australians in 2009 (Adams, Appleton et al., 2009). The NVS is favoured by researchers to achieve literacy and HL measurement because it encompasses maths, reading and comprehension skills as well as abstract reasoning (Yin et al., 2007). The NVS furthermore demonstrates a strong correlation with the TOFHLA (Weiss et al., 2005). The internal consistency (Cronbach’s \( \alpha = 0.76 \)) and criterion validity of the English version of the NVS was satisfactory (\( r=0.59 \)) (Weiss et al., 2005; Yin et al., 2007) (see Table 1). An internationally recognised tool designed to suit people aged 18 years and over, the NVS can be accessed at no cost at:

3.8. Strategies to improve individuals’ literacy and HL skills

The relationship between patients’ HL levels and health outcomes has been established. It is vital to improve people’s literacy and HL (Collins et al., 2012) in order to increase the knowledge of health consumers, and encourage their interactions in the community (Nutbeam, 2009b). Possessing adequate HL skills affords health consumers the confidence to make informed and unequivocal decisions regarding their treatment options (Adams, Appleton et al., 2009; Collins et al., 2012), resulting in better health outcomes. Raising health awareness is also an important contributing factor to the efficient self-management of chronic illnesses (Collins et al., 2012).

Health literacy can be improved with education (Nutbeam, 2009b; Taggart et al., 2012; Yin et al., 2009). Education programs have resulted in a range of positive outcomes in patients’ reading levels, self-efficacy (Robinson et al., 2008), understanding of health conditions (Ferguson & Pawlak, 2011), improved quality of life, and overall satisfaction with their healthcare (Otal et al., 2012).

Across the entire HL spectrum, health consumers prefer simple education programs (Ferguson, 2012; Garcia et al., 2010). Strategies to make educational interventions more accessible for people with varying levels of HL have been established. The use of plain language is the cornerstone of developing any material for people who might have LHL status (Ferguson & Pawlak, 2011; Garcia et al., 2010; Otal et al., 2012; Yin, Forbis, & Dreyer, 2007). Additional initiatives have been formulated and implemented, including considering the structure and design of information (Greene, Peters, Mertz, & Hibbard, 2008; Peters, Dieckmann, Dixon, H, & Mertz, 2007), using numbers to indicate better health outcomes for the selected treatment option.
(Peters et al., 2007), using media presentations (Kang, Fields, Kiyak, Beck, & Firestone, 2009), and limiting the information and simplifying the readability of the information (Greene et al., 2008; Kang et al., 2009). All of these approaches have been used to improve health outcomes for patients with LHL skills.

Numerous studies have reported the implementation of HL intervention programs (Cohee et al., 2010; Herman et al., 2009; Robinson et al., 2008; Rudd et al., 2009; Wallace et al., 2009). Overall, these programs appear to be effective in disease prevention, reducing disease-related distress, self-reported behaviours, and patient satisfaction (Berkman et al., 2011; Rudd et al., 2009; Taggart et al., 2012). Other benefits include improvements in HL skills and a positive reform to various health behaviours, such as smoking, nutrition, alcohol consumption, physical activity and weight (Rudd et al., 2009; Taggart et al., 2012). Most studies that implement education programs in the healthcare context aim to introduce their interventions in a simple way using a variety of strategies tailored for the audience.

Kripalani et al. (2007), for example, developed a straightforward medication card designed for use with LHL patients. The medication card was developed in three stages: background research, using plain language and pictures, and then sourcing experts to review the developed material (see Table 2). The authors found that participants with LHL were most likely to refer to the simply designed bill card, while all participants found the card very useful. Kripalani et al. (2007) stated that picture-based instructions promote better understanding of prescription medications, and participants at all levels of literacy preferred the simple card.

Consistent with the steps used in the Kripalani et al. (2007) study, Rudd et al. (2009) developed a LHL education program for arthritis patients (entitled Notebook). The
Notebook was developed in three different stages using plain language, adding pictorials and assessing the reading ability of the written material using the Simple Measure of Gobbledygook (SMOG) as a reading ability test and calculator (see Table 2). In this study, Rudd et al. (2009) implemented the Notebook in a RCT with 127 arthritis patients. The authors concluded that although the impact of the education program on the study outcomes (reduced literacy barriers and enhanced health outcomes) was not significant, the study nevertheless offered a useful framework for HL interventions that could be applied using a larger sample.

Wallace et al. (2009) developed a low literacy diabetes education guide by using plain language, conversational tone, limited information and pictures. The program was implemented in a pilot study on 250 diabetes type II patients. The low HL education program resulted in a statistically significant \( (p \leq 0.001) \) improvement in the study outcomes, these are: increased patient’s confidence, lower their stress levels, improved self-reported behaviours and health knowledge. Another form of a low HL intervention was a health aid book presented in five different languages (English, Spanish, Chinese, Vietnamese and Korean) (Herman et al., 2009). Designed as an easy-to-read and easy-to-understand book for individuals with LHL, it was written for a third to fifth grade reading level. Eighty nine percent of the participants in the Herman study found the book very easy to use, 95% found it very useful, and 94% subsequently reported higher levels of confidence in terms of caring for their children (Herman et al., 2009) (see Table 2). Additionally, this simple health aid book resulted in fewer participants stating that they would present with their children to ED for complaints such as low-grade fever or vomiting. However, this study did not have a control group.
To enhance correct medication administration, Yin et al. (2011) conducted an RCT using a text-plus-pictogram leaflet as an educational intervention (Yin et al., 2011). Adopted from a previous study, the diagram was further refined using a simple graphic diagram to illustrate the dose (see Table 2). Results of the trial showed that parents/carers with LHL who received the intervention had significantly lower dosing errors than participants in the control group who used a standard text-only intervention (50.4% vs 66.4%; p=0.02).

Finally, supporting the idea that people at all levels prefer simple health instructions, results from a pilot study showed that all parents/carers reported satisfaction with the plain language material, irrespective of their HL level (Otal et al., 2012). This 2012 pilot study used two pages of information sheets on fever, designed in a simple way using plain language that discussed managing a child’s fever. This educational material was written to match sixth grade reading ability (see Table 2). The authors concluded that the result of this study supported the need for clear, effective and simple communication instructions for patients and families (Otal et al., 2012).

Another useful strategy to improve a patient’s HL skills is to encourage their interaction with and participation in various healthcare activities (Garcia et al., 2010; Nielsen-Bohlman, Panzer, & Kindig, 2004). Accordingly, a patient's participation in such activities will improve their health skills, knowledge and their general health condition. Public media can also promote HL skills (Nielsen-Bohlman et al., 2004). Podcasting of well-developed health and education programmes using television and other public media can be used as an effective means of increasing HL skills.
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<td>Background research, pictures, simple language, and then used experts to</td>
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<td>Arthritis Notebook</td>
<td>Plain language, adding pictorials and assessing the reading ability</td>
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<td>Multiple language Health Aid</td>
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<td>Otal et al., (2012)</td>
<td>Pilot</td>
<td>Two-page fever information</td>
<td>Plain language that matches sixth grade reading ability</td>
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3.9. **Summary**

Literacy and HL levels are key determinants of a person’s overall health and wellbeing. A person with poor literacy and HL skills potentially has a lower quality of life and poorer health outcomes than someone with functional literacy levels. A range of socioeconomic factors will directly impact on an individual’s HL skills. The ability of healthcare professionals to assess patients’ HL levels can assist them to deliver health information in a form that is accessible to all patients. There are various tools available to measure a health consumer’s HL, with the most time-efficient methods being the preferred choice for busy clinical settings. This review has demonstrated that the REALM-SF is the most appropriate instrument for use in this study, given this study’s contextualisation in a busy ED environment (Alqudah, Johnson, Cowin, & George, 2014a). Easy to administer, the REALM-SF will rapidly and accurately assess the patients/carers’ HL.

Educational interventions that take into consideration HL issues have been demonstrated to deliver improved health outcomes for patients. The following chapter will detail the research problem, and further elucidate the study’s aim, hypotheses and research questions. Finally, it will provide a rationale for the chosen research design.
Chapter Four

4. Study Methodology and Hypotheses

4.1. Introduction

Previous chapters have reviewed the literature that underpins and informs this study. An association has been found between a parent/carer’s level of HL and the correct management of their child’s fever (Herman et al., 2009; Otal et al., 2012). This chapter will now outline the problem statement, aims of the study, research questions, research hypotheses, study phases and rationale for the research design.

4.2. Problem statement

As previously stated, fever is a common childhood complaint that leads to a significant number of children presenting to the ED. Approximately 20% of pediatric cases reporting to ED are related to fever (Baker et al., 2009; Van Ierland et al., 2012; Wammanda & Onazi, 2009), and of all child fever presentations to ED, 73% are considered inappropriate (Van Ierland et al., 2012). A febrile child will often induce stress and worry in parents/carers (McIntyre, 2011; Pereira et al., 2013), which can lead to inappropriate actions, such as the use of antipyretic medication or physical measures to cool the child (Clinch & Dale, 2007; Cohee et al., 2010). These interventions can worsen the child’s condition, and may indirectly contribute to unnecessary utilisation of healthcare services, and in particular the ED.

Parents’/carers’ fears, concerns and inappropriate management of a febrile child may be attributed to their inability to understand the nature of fever (Van Ierland et al., 2012), potentially compounded by their low level of HL (Herman et al., 2009;
Nielsen-Bohlman et al., 2004). For example, parents/carers may misinterpret low fever as high fever, or moderate fever as a very high fever (Walsh et al., 2008). A non-urgent childhood condition can therefore erroneously be interpreted as an urgent condition (Herman et al., 2009).

This thesis proposes that improved knowledge and practice related to fever measurement and management, using educational approaches that accommodate varying levels of HL or literacy, will assist parents/carers to correctly evaluate the severity of the child’s complaint, and accordingly to access health services more appropriately, and only when required. Education programs are the best tool to improve health consumers’ knowledge, practice, beliefs and attitudes (Baker et al., 2009; Cohee et al., 2010; Dawood et al., 2010). Fever education programs are the most effective means of increasing parent/carer confidence, reducing their concerns for any future fever episode and supporting the appropriate use of healthcare services (Baker et al., 2009; Cohee et al., 2010; Dawood et al., 2010; Otal et al., 2012).

Several studies have reported the implementation of fever education programs (Clinch & Dale, 2007; Dawood et al., 2010; Herman et al., 2009; Otal et al., 2012; Walsh et al., 2008). Overall, these programs can be seen as effective in improving parents’/carers’ knowledge, practice and beliefs (Baker et al., 2009; Cohee et al., 2010; Walsh et al., 2008), and therefore in minimising inappropriate health service use relating to fever (Herman et al., 2009). Although these fever education programs have been found to improve parents’/carers’ knowledge of managing fever, no fever education program was identified that specifically considered parents/carers with LHL or varying levels of HL.
In order to make educational interventions more accessible to the general community and within hospitals and other health settings, education programs need to be designed in a simple way to suit people with varying levels of HL (Ferguson & Pawlak, 2011; Garcia et al., 2010). People at all levels of literacy and HL prefer simply written health instructions (Ferguson & Pawlak, 2011; Garcia et al., 2010).

A number of studies have been designed in a simple way and reported outcomes of the implementation of HL intervention programs (Robinson et al., 2008; Rudd et al., 2009; Wallace et al., 2009). These programs appear to be effective in improving patients’ self-efficacy, disease-related distress, self-reported behaviours and health knowledge (Berkman et al., 2011; Taggart et al., 2012). Other benefits were improvement in HL and reform of poor health behaviours such as smoking, inadequate nutritional intake, over-consumption of alcohol, physical inactivity and weight problems (Rudd et al., 2009; Taggart et al., 2012).

A relationship exists between lower levels of education and lower levels of literacy and therefore potentially lower levels of HL (Sorensen et al., 2012; Taggart et al., 2012). There is also a demonstrated association between lower socioeconomic status and poor literacy, and therefore poor HL. Similarly, being born overseas or speaking a language other than English at home (Australian Bureau of Statistics, 2006; Wallace et al., 2009) may influence a patient’s literacy and HL status. All of these variables will be considered in this study.

The population in the Sydney South West region is diverse and includes people who were either born overseas (39%) or have English as a second language (28%). A high proportion of the population is situated within lower socioeconomic sectors, with lower levels of education (Campbelltown City Council, 2011). Given its
diversity, the population of the region is likely to encompass a broad spectrum of HL (Campbelltown City Council, 2011; Sydney South West Area Health Service, 2008).

Linking this information with the inappropriate presentation of children with fever at ED, this study is anticipating a high proportion of children presenting to Campbelltown Hospital ED with mild to moderate fever who could have been managed at home or by attendance at primary healthcare centres. This study seeks to develop and test a HL modified education program relating to fever management for children. This education program will be designed to accommodate the variation in literacy and HL existing across the spectrum of parents/carers attending the ED at Campbelltown Hospital.

4.3. **Aim of the study**

The overall aim of this thesis is to explore fever management presentations within local EDs, and to develop, implement and evaluate the effectiveness of a health literacy modified fever education program for parents/carers with a varying levels (limited and functional) of HL attending Campbelltown Hospital ED. It is envisaged that informed parents/carers would reduce their inappropriate use of emergency services for children with fever.

4.4. **Research questions and hypotheses**

4.4.1. **Research questions relating to ED presentations for child fever:**

a) What are the sociodemographic characteristics (age and gender) of children presenting with fever to the ED?

b) What modes of arrival (how parents/carers bring their children to the ED) are used to attend the ED?
c) What are the diagnoses (initial and on exiting the ED) of children presenting with fever?

d) What is the frequency of ED presentations for children with fever, and how does the frequency vary by month?

e) What is the seasonal variation of ED presentations for children with fever?

f) What was the disposition (health condition) of the child after visiting the ED (that is, how the child exited the ED after assessment and/or treatment)?

4.4.2. **Research questions relating to the factorial randomised controlled trial**

g) What is the level of HL of parents/carers presenting to the ED with a febrile child?

h) What is the difference in parent/carers’ level of knowledge and anticipated fever management practices for parents/carers with LHL and FHL?

4.4.3. **Hypotheses**

Parents/carers with limited or functional health literacy who receive a health literacy modified fever education program (brochure and DVD) will demonstrate:

a) Increased fever knowledge (as measured by the Fever Knowledge Scale, see page 112).
b) Increased ability to manage fever at home using physical and pharmacological approaches of fever management (as measured by the Fever Management Practices Scale, see page 112);

c) Reduced ED/primary care presentations,

Compared with parents/carers with limited or functional health literacy receiving an existing Fever Fact Sheet (measured by items related to number of visits to ED, see Table 7.

4.5. Research design and methodology

To achieve the aim of the study, three phases were proposed: Phase 1, Phase 2 and Phase 3 (the main study). See Figure 1.

Phase 1: The development of a health literacy modified fever education program represents the first phase. This phase involved the development of a simple fever education program which formed the intervention.

Phase 2: A descriptive study exploring child fever presentations to the Campbelltown Hospital ED has been conducted. This phase describes the nature of the ED presentations for children with fever using secondary data analysis. Information from this phase was used to inform the sampling procedure and data collection processes for Phase 3.

Phase 3: A factorial randomised controlled trial (F-RCT) using the health literacy modified fever education program for the intervention group was undertaken. An F-RCT was used to evaluate the impact of a health literacy modified fever education
program on participants’ fever knowledge, anticipated fever management practices, and their ED/primary care presentations over a three-month period.

**Figure 1 Methodology of the study**

**Rationale for an F-RCT**

An F-RCT design will appropriately address the research questions and hypotheses posed by this study. A factorial design is an experimental design used to measure the effectiveness of manipulating two or more independent variables on the dependant variables (Bartley, 2010). This design provides researchers with the opportunity for a separate analysis of the main effects of the independent variables and their interaction (Polit & Beck, 2010). In the main study, there are two independent variables (intervention/control and LHL/FHL) groups and several dependent
variables (fever knowledge, anticipated fever management practices and ED/primary care presentations).

The F-RCT design has been used in various settings, for example in studies involving elderly people to evaluate the impact of interventions on nursing home use and healthcare costs (using four different interventions) (Phibbs et al., 2006), and in therapeutic studies to assess the effectiveness of two different nicotine replacement therapies (Ferguson et al., 2012). Similarly, an F-RCT design has been used in a study of hypertensive patients testing the impact of the intervention on patients’ decisions in regard to drug therapy used for reducing blood pressure (Montgomery, Fahey, & Peters, 2003). A study of osteoarthritis patients evaluating the clinical efficacy of patient-administered assessment tools also used four different interventions (Ravaud et al., 2004).

Features of an RCT have been detailed in international guidelines known as the Consolidated Standards of Reporting Trials (CONSORT) (Altman, Moher, & Schulz, 2012; CONSORT Group, 2010). The RCT is characterised by an intervention being applied to a subject (manipulation) referred to as the intervention group, being compared to a control group, with the measurement of a defined outcome or outcomes (Polit & Beck, 2010; Polit & Gillespie, 2009). A well-executed RCT is considered the gold standard in evaluating healthcare interventions, and provides a strong level of evidence (CONSORT Group, 2010) for effectiveness.

An important feature of an RCT is that it has the ability to minimise or avoid research bias (Moher et al., 2010) such as selection bias, measurement bias and analysis bias. Strategies to minimise or avoid bias in an RCT include randomisation, blinding and treatment of missing data. Participants in an RCT are selected randomly
where each participant has the same opportunity of being selected (NHMRC, 2013; Polit & Beck, 2010). Randomisation is the safest way to ensure that the sample is representative, and that each subject has the same opportunity to be involved in any intervention in the study. By using this method, the researcher can be certain that the different results between groups are due solely to the intervention, and not to selection bias (Bartley, 2010; Hopkins, 2000).

In order to minimise measurement bias or inaccurate outcomes – that is, error from intervention and distribution between groups – this design requires participants and researchers involved in the study to be unaware of the assigned intervention (blinding) (Moher et al., 2010; Schulz, Altman, & Moher, 2010). Blinding is a useful tool to ensure that there are no variances in the way that each group is assessed or managed that could affect the intervention (Boutron et al., 2006; Polit & Beck, 2010). In the current study, all participants and investigators (encompass the nurses who will administer the test) will be unaware of the assigned intervention. This will be achieved by providing educational material and a DVD to both groups.

The analysis bias in an RCT can be minimised using the ‘intention to treat’ analysis approach, which means using all subjects in the analysis after randomisation (Polit & Gillespie, 2009).

Adding to the characteristics of the general RCT, a special feature for an F-RCT design is providing researchers with the opportunity to investigate whether the interaction or association between variables can predict changes in the outcomes (Moher et al., 2010). The interaction between variables means that the change in one independent variable can predict changes in a dependent variable (outcome) (Tabachnick & Fidell, 2011). Using an F-RCT design in this study will allow the
researcher to investigate whether participants’ HL will interact with the intervention in any way. Features of the F-RCT have been considered in line with the CONSORT statement guidelines.

4.6. Summary

This chapter has outlined the problem statement linking limited fever knowledge to potentially incorrect management of fever in children and inappropriate presentations within the ED. The importance of health literacy in relation to the use of health services has been stated. Further, the aim, hypotheses, research questions and rationale for choosing the research design for this study have been highlighted. The intervention in this study is a health literacy modified fever education program designed in a simple way to suit parents/carers with varying levels of HL. This study will be undertaken in three different phases: Phase 1, the development of the health literacy modified fever education program; Phase 2, the examination of fever presentations of children to the ED of Campbelltown Hospital; and Phase 3, an F-RCT to test the effectiveness of the program.

The next chapter will explore Phase 1 of this study and present the steps used to develop a health literacy modified fever education program for parents/carers.
Chapter Five

5. Phase 1 Development of a health literacy modified fever education program for parents/carers

5.1. Introduction

This chapter discusses the development of the health literacy modified fever education program. The education program formed the intervention for the main study (F-RCT) of this thesis. The chapter begins with a brief review of fever education programs, followed by a review of HL educational strategies. Finally, the chapter outlines the approaches used to develop this health literacy modified fever education program.

5.2. Impact of fever education programs

Fever education programs are the recommended way to increase parents’/carers’ confidence, reduce their concerns for any future fever episode and to support the appropriate use of healthcare services (Baker et al., 2009; Cohee et al., 2010; Dawood et al., 2010; Herman et al., 2009; Walsh et al., 2008). A substantial number of studies have reported the implementation of fever education programs (Baker et al., 2009; Cohee et al., 2010; Considine, 2006; Herman et al., 2009).

These programs were effective in improving parents’/carers’ knowledge (Baker et al., 2009) and practice (Cohee et al., 2010), and in minimising inappropriate health service use (Herman et al., 2009). As mentioned in earlier chapters, fever education sessions improved parents’/carers’ knowledge and increased their confidence and their ability to manage febrile illness appropriately (Baker et al., 2009; O'Neill-Murphy et al., 2001; Sarrell et al., 2006).
Although previously designed fever education interventions showed an improvement in parents’/carers’ fever knowledge and fever management practice and a reduction in health service presentations, no education program or material was found relating to fever management for parents/carers with limited or varying levels of HL. Accordingly, this study uses systematic steps to develop a health literacy modified fever education program for parents/carers with a febrile child presenting to the ED.

In order to make educational interventions more accessible to the general community and within hospitals and other health settings, healthcare professionals need to consider the parents’/carers’ level of literacy, HL and their ability to understand given instructions (Ferguson & Pawlak, 2011; Garcia et al., 2010). Literacy has been defined as the ability to read, write and speak at a certain level of proficiency (Bartlett, 2008). Health literacy is related to general literacy and is defined as the ‘degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions’ (Baker et al., 2009, p. 878).

Although patients across the entire HL spectrum prefer simple education programs (Ferguson & Pawlak, 2011; Garcia et al., 2010), research has found that prepared education instructions are typically written at a higher level than most individuals can understand. Obviously, then, this information can dramatically exceed what people with low literacy skills are able to comprehend (Ferguson & Pawlak, 2011; Svider et al., 2013).

Education programs have been previously developed for individuals with LHL in a variety of diverse health contexts relating to different problems and cohorts of patient or client groups. Examples of these programs include: low HL education
programs for children with asthma (Robinson et al., 2008), a stroke education intervention (Hoffmann & McKenna, 2006), testing epilepsy instructions (Elliott & Shneker, 2009), educating patients with cancer (Amalraj, Starkweather, Nguyen, & Naeim, 2009), injury prevention materials (Trifiletti et al., 2006), and the process of development of an illustrated medication schedule (Kripalani et al., 2007).

The following section outlines the key aspects of the education programs that have been modified for health literacy.

5.3. Developing health education programs

Developing an effective education program necessitates paying close attention to the presentation of health information or health instructions (Kripalani et al., 2007). Additional principles are required when designing educational material targeting people with LHL (Garcia et al., 2010; Scudder, 2006). The most common strategies found in the literature to improve the usability of health information are: using plain language, reinforcing written material with pictorials where possible, testing the readability of the contents, and validating the program contents (Ferguson, 2012; Rudd et al., 2009; Scudder, 2006).

Plain language is defined as ‘clear writing that tells the reader exactly what he/she needs to know without unnecessary words or expressions’ (Yin et al., 2007, p. 272). This includes the use of simple language, using the active voice, presenting main ideas first, avoiding the use of medical terminology, and avoiding abbreviations and statistics unless they are absolutely necessary (Yin et al., 2007). Reducing anatomy and physiology terminology and colour coding of tabular instructions is necessary when presenting health instructions (Elliott & Shneker, 2009; Ferguson, 2012). Font
sizes of 12 and larger are preferred in designing written material, with a font size of 14 favoured by older people (Ferguson & Pawlak, 2011; Scudder, 2006).

Researchers suggest replacing polysyllabic words (words that include three or more syllables) with words that have two syllables or less such as replacing immediately with right away, excessive with too much (Scudder, 2006), or substituting the word administer with give, or similarly using the term birth control rather than contraception. Following these rules will enhance the usability of any written material, thus benefiting all patients (Ferguson & Pawlak, 2011; Scudder, 2006).

Even for those with a more advanced level of literacy, simple health information is favoured. Research indicates that those with average literacy prefer simple medical language rather than complicated terminology (Elliott & Shneker, 2009; Otal et al., 2012). It is important to render educational material both visually appealing and textually accessible, by using less complicated fonts, appropriate spacing between words, and avoiding long sentences (Ferguson & Pawlak, 2011; Scudder, 2006).

Pictorials are another useful tool in developing and delivering education programs to people with LHL. Using pictorials such as pictures, graphics and pictograms increases the utilisation of educational material, especially when the images are reinforced with short captions (Kripalani et al., 2007; Rajda & George, 2009). For example, using pictures improved the medication administration regimen among older people and among patients. In this study, the researchers used pictures to demonstrate the frequency of medication administration, the number of dosage units prescribed daily, and the daily prescribed duration of therapy (Yin et al., 2007).

In an RCT conducted in United States African-American people a picture-based education program (Pill Card), found that 76.3% of the participants found the card
very helpful. The program also helped older people to remember which medicines to take, the name of the medication, indications for use, dosage, and time of administration (Kripalani et al., 2007).

Another step in increasing the utility of written materials is to test the readability of the contents. A range of tools is available to test the readability of written material. The most commonly used are the Fry (Svider et al., 2013), Simple Measure of Gobbledygook (SMOG) (Rajda & George, 2009; Svider et al., 2013), Flesch–Kincaid (Svider et al., 2013; Trifiletti et al., 2006) and the Suitability Assessment of Materials (SAM) (Trifiletti et al., 2006). Researchers used these tools to match written documents with fifth to sixth grade reading ability, since this level of proficiency is the most recommended reading ability grade for LHL groups (Ferguson, 2012; Ferguson & Pawlak, 2011; Yin et al., 2007). People with less than fifth grade reading ability are considered to be functionally illiterate (Scudder, 2006). Reading ability tools are available not to simplify the material, but rather to identify the readability level of the presented material. Accordingly, complex words can be replaced with simple ones to suit the majority of patients. Educational material can then be validated for its content. Information should be valid and the education program must provide contemporary and relevant knowledge that patients or carers require (Elliott & Shneker, 2009; Hoffmann & McKenna, 2006).

**Methods of developing the modified fever education program**

For this study, the education program has been developed using the following approach. These steps have been derived from similar educational interventions for patients with LHL (Kripalani et al., 2007; Rudd et al., 2009; Trifiletti et al., 2006). There were six steps in developing the program:
1. Defining the scope of information through an extensive literature review

2. Selecting the medium for presenting health information

3. Developing pictorial images to represent key points

4. Using plain and syntactically simple language

5. Assessing the readability level using established tools

6. Expert review of the material to establish content validity

**Step 1: Reviewing the literature to determine the scope of health information**

The databases Cochrane Library, Google Scholar, MEDLINE, OVID Science direct and Scopus were searched using the following keywords: child, education, fever, health literacy, emergency nursing. The literature review was undertaken in two stages, commencing with a review of the extensive research on HL and research relating to education programs for people with LHL (Amalraj et al., 2009; Elliott & Shneker, 2009; Ferguson, 2012; Ferguson & Pawlak, 2011; Hoffmann & McKenna, 2006; Rajda & George, 2009; Robinson et al., 2008; Svider et al., 2013; Trifiletti et al., 2006). Secondly, literature relating to fever, child fever research and best practice was examined and a considerable number of studies producing evidence-based guidelines for fever management in children were identified. The content of the education was extracted from international guidelines, evidence-based practice information sheets and systematic reviews. For example, in developing the education program, the researcher used information from the National Institute for Health and Clinical Excellence (NICE, 2007) and its update (NICE, 2013), a Summary of the
Italian Pediatric Society Guidelines (Chiappini et al., 2009; Chiappini, Venturini et al., 2012), and the evidence base for the acute management of fever (NSW Department of Health, 2010). Several components of these evidence-based guidelines on fever management have been incorporated into the education program.

The main health messages included in the program were summarised as follows:

a) General knowledge about fever, such as what is mild, moderate and high fever.

b) The correct way of measuring a child’s temperature. Underarm axillary method using an electronic thermometer is the recommended method for children five years and under.

c) Fever medicine (antipyretics), the correct dose and correct method of administration. For example, Ibuprofen and Paracetamol are the recommended medicines for treatment of fever in children.

d) What parents/carers should not do in the case of a febrile child, such as use of fans, cold water, icepacks or antipyretics.

e) The physical method of reducing body temperature: correct and incorrect practices.

f) Situations that require further assistance from health professionals, such as instances where the child’s temperature exceeds 41.1°C.

g) Emergency contact telephone numbers for the ambulance service and EDs of local hospitals.

**Step 2: Selecting the appropriate medium for the presentation of these messages**

Different approaches to education have been applied to varied cohorts in order to accommodate a spectrum of levels of literacy and HL. There are several modalities for the delivery of education programs, including verbal presentation in the form of group lectures, classes and discussions between patients (Garcia et al., 2010). Other
methods, such as using written material or multimedia products, may be preferred where patients wish to keep the material, share it with others and/or peruse it at their leisure in the comfort of their home (Garcia et al., 2010; Hoffmann & McKenna, 2006). Multimedia products include visual aids, audiotape instructions, videotapes and interactive computer programs (Ferguson & Pawlak, 2011). In this study, audiovisual materials were selected as educational tools for several reasons. They are easy to manage, parents/carers can retain their own copy of the DVD to view in their free time, and health information in this format is easy to share with friends and family members in a stress-free environment (Garcia et al., 2010).

Additionally, audiovisual tools are an appropriate format for people with LHL or poor English language skills, because even if the viewer is unable to understand the language, they can still observe the demonstrations and actions portrayed in the presentation (Garcia et al., 2010; Robinson & Mercer, 2007). Brochures are a helpful supplementary tool that allows parents/carers to recall and reinforce the audiovisual instructions (Elliott & Shneker, 2009). Written instructions within brochures allow for message consistency, reusability, portability and flexibility (Hoffmann & McKenna, 2006).

Certain variables of audiovisual presentations require consideration. To optimise the effectiveness of the medium, audiotape instructions should be less than five minutes in length, with no more than two messages per presentation. Digital Video Disc (DVDs) and videotapes should not exceed eight minutes in duration. Short messages are more easily digested and are thus received more favourably (compared to formats of a greater duration). This positive response in turn promotes action, increases motivation, and facilitates self-empowerment (Ferguson, 2012; Ferguson & Pawlak,
It is further recommended to convey only one message per visual image, to place these images in context, and to avoid using visual aids for purely decorative or aesthetic purposes (Garcia et al., 2010). Key messages were identified and incorporated into a DVD and brochure. A transcript was developed for the DVD, which was filmed using actors, and produced by professional audiovisual staff from South Western Sydney Area Health Service. The DVD production was funded by the Centre for applied Nursing Research (CANR)-South Western Sydney Local Health District (SWSLHD). The content of both the DVD and the brochure was similar, and both tools were used. The DVD is eight minutes in duration, and the brochure is a coloured double-faced paper presentation (see Appendix 2).

**Step 3: Developing pictorial images to represent key points**

In the developed education program, symbols and pictures have been used where possible in order to visually portray and simplify the written messages. For example, in Figure 2, photographs were used to indicate the correct way to measure temperature using the appropriate thermometer, while Figure 3 illustrates fever symptoms that require urgent attention, such as a child having seizures.

*Figure 2 Measuring a child's temperature*
Messages in the DVD were combined with pictures – for example, a cross mark (×) was presented with the wrong practices or Things not to do (Figure 4), and a tick (√) was presented with the recommended practices listed on the What to do sign and prior to recommended practice.
**Step 4: Presenting information using plain and syntactically simple language**

Simple words and everyday common language were used in the program (both the brochure and the DVD transcript) (see Appendices 2 and 3). For example, the phrase *not correct* was used instead of *not reliable*, and the word *check* replaced *measure.* Medical terms have been substituted with simple words wherever possible. For example, the word *underarm* was used instead of *axillary,* and *fever medicine* instead of *antipyretic.* Abbreviations were also avoided, so *oral thermometer* was used rather than its acronym *OT.*

**Step 5: Assessing the readability level**

The readability of all materials – that is, both the DVD transcript and the brochure – in the education package were tested to support a fifth grade reading level, since individuals who fall below this level are classified as illiterate (Scudder, 2006). The SMOG readability test was selected as the most appropriate approach. As the most recommended readability tool, it is commonly cited in relevant literature, is easy to use, and has an online calculator (Rajda & George, 2009). In this method, the researcher selects 30 sentences from the document (10 from the beginning, 10 from the middle and 10 from the end) and then inserts them into the SMOG calculator. The SMOG calculator then obtains the reading ability of the document, based on the total number of words that contain three or more syllables (Hoffmann & McKenna, 2006; Svider et al., 2013). The SMOG calculator provides the following features: the text supplied, total words given, total number of polysyllabic words in the text, and the total number of sentences in the paragraph. The formula used in the SMOG to test readability is $3 + \text{Square Root of polysyllable count.}$ For example, in the
proposed education program, two sentences were included: ‘Give your child a lukewarm bath for 10–15 minutes every 3 hours. Do not give your child a cold bath.’ The output generated by the SMOG calculator for this paragraph is (total words 21), (total number of polysyllabic words 2) and (total number of sentences 2). Refer Figure 5. Using the SMOG formula, the result or the reading level required to read this sentence will be (3+Square Root of 2) = (3+1.4) = 4.4 (less than fifth grade reading level). The SMOG calculator with further instructions is available online at http://www.niace.org.uk/misc/SMOG-calculator/s mogcalc.php

How to use the SMOG Calculator

Text supplied: Give your child a lukewarm bath for 10-15 minutes every 3 hours. Do not give your child a cold bath.
The SMOG index: 13.8
Total words: 21
Total number of polysyllabic words: 2
Total number of sentences: 2

Figure 5 Output generated by SMOG

Step 6: Reviewing the prepared material

After preparing the written material and testing all the contents to match a fifth grade reading ability, the program was reviewed by 11 academic experts and professionals in ED (a general practitioner and professor of medical education, two nursing professors, two emergency nurses, ED director, and the research team). All feedback was reviewed, and minor modifications to the education package, such as grammatical mistakes were implemented.
5.4. **Summary**

Fever is a common childhood problem that engenders much concern for parents/carers. Educational interventions have been found to be effective in terms of modifying attitudes and behaviours. This chapter has outlined the essential steps in developing a fever education program for parents/carers with varying HL levels. The use of simple language has been seen to confer considerable benefits for all health consumers. Additionally, pictorials have been revealed as an important component in the design of simple instructions. For this study, the prepared materials consist of a DVD and brochure for distribution in the ED to participants of the study. The program (comprising the DVD and the brochure) has been published and it is now accessible through the area health service website at:

Chapter Six

6. Phase 2: Exploring Child Fever Presentations

6.1. Introduction

The previous chapter outlined the development of the intervention for Phase 3 (Chapter Seven) of this study. It is also important, however, to explore the nature of child fever presentations within Campbelltown Hospital (the study site) by accessing the existing database prior to conducting the clinical trial. The primary purpose of the current chapter is to describe the nature of ED presentations for children with fever, and in particular, to consider the frequency of presentations and to examine any seasonal variation throughout a 12-month period of ED presentations. These data and findings were used to inform the sampling strategy for the subsequent clinical trial.

6.2. Methods

This phase used secondary data analysis of existing ED data for children aged between three months and five years who presented with fever as a main or associated complaint. The study data were extracted from the pediatric ED census stored in the FirstNet database for the year 2011 (January to December inclusive). A total of 1,581 cases were retrieved.

FirstNet is a computer software system designed for entering and storing a patient’s visit to the ED. FirstNet has been adopted to be used in the triage area of EDs, and to facilitate patients’ treatments between EDs and other departments in Sydney and NSW hospitals. The program is currently being used in over 180 hospitals in NSW (NSW Department of Health, 2008).
The FirstNet database contains data items relating to various aspects of the patient’s visit to ED. These include: arrival time, arrival to discharge time, checkout time, gender, person accompanying the patient, patient’s date of birth, discharge code, discharge diagnosis, discharge disposition, discharge time, identification number, mode of arrival, time until seen by a doctor, time until seen by a nurse, seen by nurse until discharge time, presenting problem, triage category (priority of treatment), triage to treatment time, triage time, type of medical insurance, and visit number to ED.

This phase focused on eight of the above mentioned characteristics; namely, child’s age and gender, mode of arrival to ED, diagnoses including initial and discharge diagnosis, disposition (or how the child exited the ED after assessment and/or treatment), month and season of presentation. Data on child age and gender were included in order to determine the most prevalent age group and gender exposed to fever. Mode of arrival, disposition, and admission and discharge diagnoses were used as indicators of the urgency of the fever and of other illnesses with which the fever may be associated. Month of presentation was also an important factor, since it gave the researcher a clear idea of the best month in which to conduct the clinical trial, in terms of ensuring sufficient participants and sourcing them in a time-efficient manner.

6.2.1. Data preparation

After ethical approval for the main study was sought and obtained (from SWSLHD Ethics Committee, number HREC/11/LPOOL/265 and UWS Ethics Committee, number H9532), the Data and Quality Manager at Campbelltown Hospital was contacted to gain access to the data files from the FirstNet database in relation to the
presentations by children to ED for the 2011 calendar year. The data custodians for the FirstNet database for Campbelltown ED extracted presentations for children relating to fever and exported the de-identified data into a spreadsheet. Access to this data was permitted for the purposes of this study and the subsequent trial.

The data were then imported into a statistical program for analysis. Data for children younger than three months and older than five years were excluded from the study (rationale provided in Chapter Two). Recoding of the data was initially undertaken, with the children’s ages recoded into five categories: 1 (3–12 months), 2 (13–24 months), 3 (25–36 months), 4 (37–48 months), 5 (49–60 months). Patients presenting to the ED can receive the following outcomes: 1, treated with follow-up appointment; 2, admitted to a critical care ward; 3, admitted to a non-critical care ward; 4, triaged but not seen by doctor; 5, seen by doctor and did not wait for the treatment.

6.2.2. Data analysis

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 18 (SPSS, 2011). Descriptive analyses, involving means, median, standard deviation, frequencies and percentages were used to outline the characteristics of the child fever presentations during the 2011 calendar year. Chi-squared tests were performed to compare categorical variables such as the discharge diagnosis and mode of arrival and disposition. Graphical presentations of the data have been presented when time was a factor such as the seasonal variations of presentations.
6.3. **Results**

6.3.1. **Sociodemographic characteristics of children**

There were slightly fewer female children (44.7%) presenting with fever than males (55.3%). The most prominent age group for fever presentations were children aged between 13 months and 24 months (53%), followed by children aged between three to 12 months (23.2%). The number of presentations was greatly reduced for the older cohort (37 months and older). See Table 3.
### Table 3  
**Age of child presenting to ED (N=1581)**

<table>
<thead>
<tr>
<th>Age (Months)</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3–12</td>
<td>367</td>
<td>23.2</td>
</tr>
<tr>
<td>13–24</td>
<td>838</td>
<td>53.0</td>
</tr>
<tr>
<td>25–36</td>
<td>171</td>
<td>10.8</td>
</tr>
<tr>
<td>37–48</td>
<td>116</td>
<td>7.3</td>
</tr>
<tr>
<td>49–60</td>
<td>89</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1581</td>
<td>100</td>
</tr>
</tbody>
</table>

6.3.2. **Mode of arrival to ED**

The majority of cases arrived at the hospital via private vehicle (90%), with only 8.7% arriving by ambulance. A small percentage of cases were referred from the outpatient clinic during regular checkup appointments (0.7%). Very few children (0.6%) approached ED on foot and used other modes of arrival that were not specified in the database.

6.3.3. **Presenting problem and discharge diagnosis**

Childhood complaints are recorded by the triage nurse on FirstNet on two different occasions. These include the presenting problem (what do parents/carers think or nurses observe) and the discharge diagnosis (after the ED medical officer has assessed the child). The following problems were reported at initial presentation: convulsion or query convulsion (5.4%), fever (59%), fever and cough (11.6%), fever and rash (3.8%), fever and shortness of breath (SOB) (2%), fever and vomiting (4.9%), upper respiratory tract infections (URTI) combined with urinary tract infections (UTI) (1.1%), viral illness (0.9%), and other diagnoses not specified in the
FirstNet codes (8%). However, the initial presentations were revised after the medical officer assessment. See Table 4.

Table 4  Presenting problem and discharge diagnosis (N=1581)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Initial Presentation</th>
<th>Discharge Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Convulsion or query convulsion</td>
<td>86</td>
<td>5.4</td>
</tr>
<tr>
<td>Fever</td>
<td>933</td>
<td>59</td>
</tr>
<tr>
<td>Fever and cough</td>
<td>184</td>
<td>11.6</td>
</tr>
<tr>
<td>Fever and rash</td>
<td>61</td>
<td>3.8</td>
</tr>
<tr>
<td>Fever and SOB</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>Fever and vomiting</td>
<td>77</td>
<td>4.9</td>
</tr>
<tr>
<td>URTI and UTI</td>
<td>17</td>
<td>1.1</td>
</tr>
<tr>
<td>Viral illness</td>
<td>14</td>
<td>0.9</td>
</tr>
<tr>
<td>Others not specified</td>
<td>125</td>
<td>8</td>
</tr>
<tr>
<td>Missing</td>
<td>52</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>1581</td>
<td>100</td>
</tr>
</tbody>
</table>

6.3.4. Child age and discharge diagnosis

Table 5 next page presents the diagnosis of the child on discharge within the predominant age categories, with 76.2% (n=1205) of the presentations being within the younger group aged between three and 24 months, and 23.8% (376) of the total presentations for children aged between 25 months and five years.
Table 5  Age in months and diagnosis on discharge (N=1581)

<table>
<thead>
<tr>
<th>Discharge Diagnosis</th>
<th>Age in Months (M)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-24 (M)</td>
<td>25-60 (M)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>(%)</td>
</tr>
<tr>
<td>Convulsion or query convulsion</td>
<td>63</td>
<td>(4)</td>
</tr>
<tr>
<td>Fever</td>
<td>185</td>
<td>(11.7)</td>
</tr>
<tr>
<td>Fever and cough</td>
<td>15</td>
<td>(1)</td>
</tr>
<tr>
<td>Fever and rash</td>
<td>4</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Fever and SOB</td>
<td>4</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Fever and vomiting</td>
<td>16</td>
<td>(1)</td>
</tr>
<tr>
<td>URTI and UTI</td>
<td>178</td>
<td>(11.2)</td>
</tr>
<tr>
<td>Viral illness</td>
<td>185</td>
<td>(11.7)</td>
</tr>
<tr>
<td>Others not specified</td>
<td>216</td>
<td>(13.6)</td>
</tr>
<tr>
<td>Missing Data</td>
<td>339</td>
<td>(21.4)</td>
</tr>
<tr>
<td>Total</td>
<td>1205</td>
<td>(76.2)</td>
</tr>
</tbody>
</table>

6.3.5. Month and season of presentation

Child fever presentations were not equally distributed across the months of the year. The highest number of fever presentations occurred during August 2011, accounting for 11.5% of the total number of presentations (the number of August presentations is 3.2% higher than the mean). February demonstrated the lowest number of fever presentations (6%), which is 2.3% less than the monthly mean number of presentations.
Seasonally, the winter months (June, July and August) demonstrated the greatest proportion of the total presentations, accounting for 520 visits (33%), followed by the spring months (September, October and November) accounting for 397 visits (25%), followed by Autumn (March, April, and May) accounting for 349 visits (22%). Summer months (December, January and February) demonstrated the lowest number of child fever presentations, accounting for 315 visits (20%). See Figure 6.

![Figure 6 Monthly presentations for children with fever to the Campbelltown ED in calendar year 2011](image)

6.3.6. **Child disposition after treatment**

Child disposition – or how the child exited the ED after assessment and/or treatment – was also examined. The various options available included: registered with the triage nurse but refused to wait (9.2%), and seen or assessed by a medical officer but did not complete the treatment (2.72%). Some parents/carers did not wait to obtain
X-rays as requested by the medical officer. The majority of children (56.5%) completed the treatment and was discharged home, with a subsequent appointment scheduled with either a general practitioner or outpatient clinic for follow-up. A small number of sick and critically ill children (0.13%) were admitted to a critical care ward. Approximately one third of children (31.2%) were admitted to a non-critical care ward. See Table 6.

Table 6  Child disposition after treatment (N=1581)

<table>
<thead>
<tr>
<th>Child disposition</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refused to wait, not seen</td>
<td>145</td>
<td>9.20</td>
</tr>
<tr>
<td>Registered with triage nurses, but did not complete the treatment</td>
<td>43</td>
<td>2.72</td>
</tr>
<tr>
<td>Discharge home with follow-up</td>
<td>894</td>
<td>56.50</td>
</tr>
<tr>
<td>Admitted but not to the critical ward</td>
<td>493</td>
<td>31.20</td>
</tr>
<tr>
<td>Admitted to the critical ward</td>
<td>2</td>
<td>0.13</td>
</tr>
<tr>
<td>Missing data</td>
<td>4</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>1581</td>
<td>100</td>
</tr>
</tbody>
</table>

6.4. Discussion

Any elevation in child temperature to an abnormal level is considered as fever (Oshikoya & Senbanjo, 2008). A slight increase in a child’s body temperature does not mean that he/she is ill. Different factors affect and are linked to the fluctuations in the child’s body temperature, including the child’s gender, age, sleep-wake cycles, activity, meal time, environmental conditions, metabolic rates, body size, immune system and ratio of surface area to weight (body surface area) (Marcy et al., 2004; Sarrell, Wielunsky, & Cohen, 2006). Common conditions that can cause fever among children include infections and non-infectious factors such as changes
in weather, unclean environment, excessive crying, exposure to cold, exposure to sunlight, hyperactivity, insomnia and contaminated food (Oshikoya & Senbanjo, 2008).

The data pertaining to fever presentations to Campbelltown ED that was accessed for this study encompassed a range of stated variables. These variables were investigated in previous studies focusing on fever in children (Cohee et al., 2010; Crocetti et al., 2001; Nijman et al., 2010; Steere et al., 2003; Wammanda & Onazi, 2009).

Although a number of fever studies have been undertaken in Australia in recent years (NSW Department of Health, 2010; Walsh & Edwards, 2006; Walsh et al., 2008), to the best of this researcher’s knowledge, this is the first fever study in an Australian setting that focuses on the characteristics of febrile children presenting to an ED. Certain limitations and challenges have arisen during this study. Firstly, the coding of some data items in the FirstNet database proved confusing; some diagnoses, for example, were labeled as fever and respiratory problems without further clarification on whether the condition was cough and cold, URTI or another illness. There was also confusion with the code for the initial diagnosis (evaluation), with two possible meanings based on whether the condition was evaluated by the parents/carers or by the triage nurse. A crucial specification that was absent in FirstNet was whether or not the case was deemed to be urgent. Consequently, the researcher was unable to verify the exact number of urgent and non-urgent presentations. It is notable for future application, however, that researchers could generally determine the urgency of a child’s condition indirectly by investigating other variables, such as mode of arrival at ED (ambulance or car) and whether the child was subsequently admitted to the critical care ward. An additional data item
could be included in the ED FirstNet database that indicates the level of urgency of a child’s fever.

This data set contains missing data for some variables however; the data is gathered by the health team at Campbelltown Hospital Emergency Department according to the NSW Health guidelines for FirstNet data (collection protocols). It is important to note that this phase, and the data, is used only to inform phase 3 – the main study.

**Child’s gender and age**

The results for the gender category were mostly evenly distributed between boys and girls (55.3% girls, 44.7% boys), which does not precisely correlate with Australian population data. The gender ratio at birth for all Australians is approximately 48.78% females to 51.22% males (Australian Bureau of Statistics, 2011a). New South Wales, however, has a slightly higher proportion of females than males, with 50.85% versus 49.15% respectively (Australian Bureau of Statistics, 2011a). These results can assist in the interpretation and generalisability of the NSW study findings to other settings within Australia.

The majority of children presenting with fever were between three months and 36 months of age, with children aged three to 24 months being the most prevalent age category presenting with fever. This is consistent with findings across previous studies (Baker et al., 2009; Cohee et al., 2010; Crocetti et al., 2001; Van Ierland et al., 2012). In most fever studies, children younger than three months are excluded, since a febrile child under three months always requires urgent investigation and hospital admission (Baraff, 2008; Chiappini et al., 2009; NICE, 2013). In addition, neonates have different implications in terms of fever due to metabolic rates, body size, immune system and ratio of surface area to weight (body surface area) (Marcy
et al., 2004; Sarrell et al., 2006). Fever is usually caused by infection (Marcy et al., 2004), and infections are the main cause of death in children under the age of five years (NICE, 2007).

In the current study, children aged between four and five years demonstrated lower numbers of presentations than the other age groups. The sudden drop in fever presentation in this age group can be attributable to a number of factors, such as increased body size, immunisations, stabilisation of sleep-wake cycles, increased activity and decreased metabolic rates (Sarrell et al., 2006; Zomorrodi & Attia, 2008). These findings relating to gender and age of children presenting to ED will have implications in the intervention study (Phase 3). Age of the child will be considered in the data collection process, as well as in the inclusion and exclusion criteria, so that children younger than three months and older than five years will be excluded from the trial.

**Seasonal variation**

Fever presentations revealed a variation by month and by season. The highest frequency of child fever presentations were in the winter months of June, July and August (33%). These results may be expected, since viral illnesses typically increase dramatically in the winter months (Matziou et al., 2008). Accordingly, the clinical trial will be undertaken in the winter period in order to capture a higher number of children during the shortest possible period of data collection.

The summer months of December, January and February represented only 20% of the total number of children fever presentations. The decline in presentations in summer is partially attributable to school holidays (New South Wales Government,
2011), which reduces environments (the school setting for example) where children may transmit infections to one another or transmit infections from school to home.

**Presenting problem, discharge diagnosis and child disposition**

Infectious diseases are the main cause of fever in children and include: occult bacteraemia, meningitis, pneumonia and urinary tract infections (Baraff, 2003, 2008; Mahajan & Stanley, 2008). Other causes include upper and lower respiratory tract infections, acute otitis media and gastroenteritis (Baraff, 2003, 2008; Purssell, 2002).

Results showed a mismatch between the empirical evaluations of children’s complaints at the time of presentation (what parents/carers think or nurses observe) compared to discharge diagnosis (after medical officers’ evaluations). There was a significant proportion of incorrect parents’/carers’ evaluations of their child’s illness. The disparity between the parents’/carers’ initial evaluation and the discharge diagnosis underscores the fact that fever is not a disease within itself, but rather a sign and symptom of a disease (Crocetti et al., 2001; Matziou et al., 2008; Sarrell & Kahan, 2003). Misunderstandings about the nature of fever go some way towards an explanation of why there is inappropriate use of EDs and primary health centres by concerned parents/carers with a febrile child. These data suggest that information about the underlying cause of fever in children could be useful to parents/carers. Other authors have noted that parents/carers have difficulties when assessing the child’s illness and its severity (Baker et al., 2009; Herman et al., 2009), which is likely to contribute to an inappropriate presentation to ED and other healthcare facilities (Baker et al., 2009; Walsh et al., 2008).

Just over half of the total number of children presenting to the ED with fever were discharged home (56.5%), suggesting that the fever may not have been urgent
enough to warrant attendance at the ED at all. Only two children (0.13%) required urgent admission to a critical care ward. However, 31.2% of the children required admission to the general ward. Previous literature concluded that most of the child fever presentations to ED are non-urgent and could be managed at home or by attendance at primary care centres (Baker et al., 2009; Herman et al., 2009; Sarrell & Kahan, 2003). Indeed, non-urgent conditions account for up to 82% of pediatric emergency department visits (Berry et al., 2008; Herman et al., 2009). This is reflected in the findings of an Australian survey of 401 parents in 2005 where only 19.5% of parents were able to correctly identify fever, and 41.5% stated that they would seek medical advice for a normal temperature (Walsh et al., 2008).

An indicator that some presented cases to ED were not urgent or could have had simple complaints is the fact that 9.2% of the sample registered with the triage nurse refused to wait, and 2.72% seen or assessed by the medical officer did not complete the treatment. Furthermore, most of the presentations arrived at ED by private vehicle (90.6%), with only 8.8% transported by ambulance. These data support the contention that most of the child fever presentations to ED are non-urgent.

6.5. **Summary**

Fever remains a common symptom in young children (five years of age and younger). This is the first Australian study to use existing data to explore the characteristics of febrile children presenting to ED. Fever presentations by children and their parents/carers vary by month and season, with the winter months (July to August) being the most frequent, and summer months (December and January) being the least frequent. Additionally, results from this phase of the study support the idea that the majority of children with fever presentations at ED are non-urgent, and could
potentially be managed at home (68%). The availability of a health call centre such as Healthdirect may assist in reducing these inappropriate presentations. A public company with services wholly or jointly funded by federal, state and territory governments, Healthdirect Australia delivers a safe and efficient health service, with consumers accessing a direct helpline to source health information, after-hours general practitioner advice, maternity and birthing services, redirection to health services nationwide, and aged care services (Healthdirect, 2014).

The findings from this phase of the study, along with the knowledge gained from the literature review detailed in Chapters Two and Three, will inform Phase 3. Results in relation to the child’s age will be considered, with children under three months or older than five years of age being excluded from the trial. The findings thus far clearly illustrate that the most opportune time to investigate a large number of febrile children is during the winter months. Therefore, this study will target the winter season for data collection. Furthermore, it is evident that a number of illnesses can be associated with fever, such as skin rash, shortness of breath and vomiting. In turn, these illnesses will be considered for their value as an indicator that could identify children with a history of fever, who could potentially be included in the study at the time of recruitment.

Although this phase of the study has been conducted to inform the subsequent F-RCT, findings from this phase can also be applied more broadly; for example, to educate triage nurses and other health professionals on issues relating to child presentations to the ED for fever. The findings from this study can propose a template and provide a source of information for future research investigations in relation to fever in children.
Chapter Seven

7. Phase 3: Methods for the Factorial Randomised Controlled Trial

7.1. Introduction

This chapter describes the methods used to conduct an experiment to evaluate the impact of a health literacy modified fever education program on parents’/carers’ fever knowledge, anticipated fever management practices, and ED/primary care presentations. Details of the survey used and the origins of the questionnaires, information on the sample selection criteria, sample size estimation, the interventions, and the outcome measures are outlined. Further, a description of the recruitment and data collection procedures is provided. Finally, data management and analysis procedures are described.

7.2. Methods

7.2.1. Design

This phase was designed as an F-RCT using a 2×2 factorial design as detailed in Chapter Four. As noted previously, a factorial design measures the effectiveness of manipulating two or more independent variables on the dependant variables (fever knowledge, anticipated fever management practices and ED/primary care presentations) (Bartley, 2010).

In keeping with the CONSORT document (Schulz et al., 2010); specific aspects of the F-RCT design will be described:
7.2.2. **Participants**

One hundred and seventy-five parents/carers of febrile children aged between three months and five years and who met the study eligibility criteria were invited to participate in the study. The inclusion criteria contained: parents/carers who presented to the ED with a child with a history of fever before presentation to ED (recounted to the triage nurse) or with a temperature of higher than 37°C; parents/carers attending with a child aged three months to five years; and parents/carers who were able to read, write and understand English. The exclusion criteria contained parents/carers with a child located in the Resuscitation Area, and those who could not read and write English.

7.2.3. **Setting**

The study was undertaken in the ED at Campbelltown Hospital, between April 2012 and February 2013. With 28% of its population born overseas, and 40% using English as a second language, Campbelltown represents a rich and diverse multicultural community (Campbelltown City Council, 2011, Sydney South West Area Health Service, 2008).

In South Western Sydney Local Health District (SWSLHD), there are approximately 260,000 children (aged 0 to 14 years), comprising 20% of the area’s population. With an average of 159 –this included both pediatric and adult patient– presentations per day (NSW Ministry of Health, 2013). Campbelltown Hospital is the major ED for the Macarthur area, and is likely to be the site of the next NSW Health Children’s Hospital (NSW Ministry of Health, 2013). In addition, Campbelltown is known to
have a high proportion of health consumers with low literacy levels, with 50.2% of
the Campbelltown City population having no tertiary educational qualifications, and
20% originating from countries where English is not the first language
(Campbelltown City Council, 2011).

7.2.4. Intervention

In keeping with the 2x2 F-RCT design, this study has identified four subgroups:
Limited Health Literacy (LHL) control group, Functional Health Literacy (FHL)
control group, LHL intervention group, and FHL intervention group.

Group 1: LHL Control group: Participants in this group were parents/carers with
LHL (measured using the HL test [REALM-SF]) who were given a Fever Fact Sheet
and a DVD of the Fever Fact Sheet used at Campbelltown Hospital (produced by the
Children’s Hospital at Westmead, Sydney Children’s Hospital, Randwick &

Group 2: FHL Control group: Participants in this group were parents/carers with
FHL (measured using the HL test [REALM-SF]) who received the Fever Fact Sheet
and a DVD of the Fever Fact Sheet.

Group 3: LHL Intervention group: Participants in this group were parents/carers
with LHL (measured using the HL test [REALM-SF]) who received the health
literacy modified fever education program. The education program includes a DVD
and a brochure that has been designed in a simple way to be used by parents/carers
with varying levels of HL. Both the DVD and the brochure contained information
about pharmacological and non-pharmacological fever management practices, the
correct way to measure a child’s body temperature, and general knowledge about
fever (see Chapter Five, development of a health literacy modified fever education program).

**Group 4: FHL Intervention group**: Participants in this group were parents/carers with FHL (measured using the HL test [REALM-SF]) who received the health literacy modified fever education program in a DVD and brochure.

### 7.2.5. Outcomes

The following are the outcomes measured in the trial:

#### Primary outcomes

- **Fever knowledge**: This outcome was measured using the Fever Knowledge Scale (FKNS), details of which appear on page 112.

- **Anticipated fever management practices**: This outcome was measured using the Fever Management Practices Scale (FMPS), details of which appear on page 112.

#### Secondary outcomes

Emergency department/primary care presentations for a febrile child were the secondary outcome measured in this study. This outcome was measured using the difference between the total numbers of presentations to the ED/primary care facility in the past three months before intervention (pre-survey) and after intervention (post-survey), details of which appear in Table 7.

### 7.2.6. Sample size estimation

Sample size estimation was based on the outcome measures of fever knowledge and fever management practices. Sample Power 2 was used in SPSS version 13 to assist
with the sample size estimation (SPSS, 2004). It was expected that the intervention would be effective if there was a 35% improvement in fever knowledge in the intervention group; that is, from 30% to 65% (this is based on estimates from existing trials that demonstrated improvements ranging from 22% to 54%) (Baker et al., 2009; Robinson, Schwartz, Magwene, Krengel, & Tamburello, 1989; Sarrell & Kahan, 2003). To detect a difference of at least 35% between the groups with a two-sided test of proportions, \( \alpha \) of 0.05, and 90% power would require 40 participants in each group. Taking into account a 20% refusal rate and 30% loss to follow-up (based on existing trials, range 0–45%) (Baker et al., 2009; Herman et al., 2009), the sample required would be 80 participants in each group (or a total of 160).

This researcher anticipated that the intervention would be effective if there was a 25% change in parents’/carers’ anticipated fever management practices in the intervention group from 40% to 65% (based on estimates from existing trials, with improvements ranging from 13% to 46%) (Herman et al., 2009; Sarrell & Kahan, 2003). To detect a difference of at least 25% between the groups with a two-sided test of proportions, \( \alpha \) of 0.05, and 80% power, 81 participants were required in each group. Taking into account a 20% refusal rate and 30% loss to follow-up (based on existing trials in this area), 162 participants were required in each group. Based on these estimations, 324 participants were required for the F-RCT.

7.2.7. Randomisation procedures and group allocation

Participants were allocated to the control or intervention groups randomly using a computer-based random number generation program. The program was used to generate a randomisation sequence stratified according to the participants’ level of HL – that is, either LHL or FHL. Using this list, a series of serially-numbered sealed
opaque envelopes were prepared and placed into two boxes representing the LHL and FHL groups (referred to as the GOOD box and GREAT box respectively). Once the level of HL was determined using the REALM-SF, data collection staff then selected the envelope from the relevant boxes. The envelopes were labelled with the study identification numbers ranging from 1001 to 1160 for the LHL group, and 1161 to 1320 for the FHL group.

In order to identify the parents/carers’ group allocation, each child’s hospital file and survey was coded with the same study ID number present on the allocated envelopes.

**Group allocation and delivery of the intervention**

Prepared envelopes replicated the randomisation sequence as noted above.

Depending on the group allocation, the envelopes contained both the DVD and the brochure developed in this study (intervention group), or the Fever Fact Sheet used in Campbelltown Hospital, accompanied by a DVD version of the same Fever Fact Sheet (control group). The survey forms, information sheet and the consent form were placed in different boxes as they were handled separately from the interventional envelopes.

7.2.8. *Training of data collection staff*

The RNs received a three-hour training workshop, and were given manuals on the data collection process (see Appendix 9). This workshop focused on how to access the FirstNet database, the way in which to approach and invite parents/carers to participate in the study, and how to conduct the HL test using the REALM-SF, gain consent from a parent/carer and to manage the data collection process.
The RNs collected data three days per week (Mondays, Wednesdays and Fridays) from 6.00 pm to 11.00 pm. On the data collection days, the RNs could contact the researcher by phone during working hours and by email; 24 hours a day, 7 days a week (24/7). Furthermore, the researcher was available onsite for each day of the data collection process with the RNs for the first month, then once a week for the remainder of the data collection period.

7.2.9. **Blinding**

In order to minimise any potential bias, blinding or masking is required (Polit & Beck, 2010). Blinding is a process that ensures that study participants and investigators remain unaware of the allocations (Boutron et al., 2006; Polit & Beck, 2010). In the current study, the researcher prepared envelopes that followed the randomisation sequence before the recruitment process began.

On the day of recruitment the investigators began by accessing the FirstNet database to identify eligible participants from the data. The investigators proceeded to approach these nominated suitable participants, providing them with a copy of the Participant Information Sheet (see Appendix 10) and asked if they would be interested in participating in the study. Interested parents/carers and who agreed to participate, were asked to sign and return the consent form (see Appendix 11). Investigators then administered the HL test to the participant, in a quiet and private area. Participants were given the appropriate randomised envelope (containing the DVD and brochure for the intervention group, or the DVD and the Fever Fact Sheet for the control group). All envelopes were opaque (unable to identify the allocation), looked exactly the same and were sealed to ensure that data collectors were unaware
of the group allocation. This process effectively constituted the blinding of the participants.

7.3. Data collection

This study used HL as a measurement tool in the pre-survey. The pre- and post-surveys contained developed scales items relating to fever knowledge, fever management practice, ED/primary care presentations, and sociodemographic details relating to parents/carers and their children. Pre- and post-surveys were similar, although the HL test and the sociodemographic data were only collected on the pre-survey.

7.3.1. Survey development

The survey comprised three sections:

- Part 1: the HL measurement tool using the REALM-SF detailed in Chapter Three;
- Part 2: the FKNS with questions relating to fever knowledge, the FMPS with questions relating to anticipated fever management practices, and items relating to the number of ED/primary care presentations with a febrile child; and
- Part 3: the sociodemographic dimensions of the parents/carers and the children in their care (see Appendix 5).

Part 1: HL Test: REALM-SF

To test the HL status of participants, the REALM-SF was used. An extensive review of possible instruments to measure HL is presented in Chapter Three. The REALM-SF (see Appendix 5) has demonstrated good concurrent validity with the Wide
Range Achievement Test (WRAT) (0.88, P<0.0001), and has strong test–retest reliability ($r=0.97$) (Berkman et al., 2011). The REALM-SF is time efficient, as it takes less than a minute to administer and score, and contains only health words (Arozullah et al., 2007). This tool was initially tested in African-American people and Caucasian populations in selected regions of the United States (Arozullah et al., 2007), and has been found to be suitable for busy clinical settings such as the ED (Alqudah et al., 2014a).

This test requires the participant to read out seven medical terms. A total correct pronunciation of 0–3 terms indicates an inadequate level of HL, while a total correct pronunciation of 4–6 terms indicates marginal HL. A total correct pronunciation of all seven terms indicates an adequate HL.

The developers recommend that an initial explanation be presented to persons undertaking the REALM-SF (Arozullah et al., 2007, p. 1033), as follows:

*We are studying medical word reading in order to improve communication between healthcare providers and patients*

This approach has been found to be supportive of people with LHL, since it minimises any potential embarrassment experienced on the part of the participant. It has been found that people with limited literacy and LHL may attempt to conceal their level of literacy because there is a feeling of shame related to poor literacy skills (Jordan, 2010; Mitty & Flores, 2008; Nielsen-Bohlman et al., 2004). This statement was initially presented to the participants of this study.
Part 2: Fever questions

Questions relating to fever in children and its management constituted the primary component of the survey, and consisted of three sections. Section One included items that form the FKNS, Section Two included items that form the FMPS, and the items in Section Three related to the number of ED/primary care presentations (see Appendix 5). Items included in both scales (FKNS and FMPS) were selected and adopted with permission from published and validated questionnaires on parental knowledge and management of fever in children (Matziou et al., 2008; Sakai et al., 2009; Sarrell & Kahan, 2003; Walsh et al., 2008) (see Table 7, and Appendix 6). The validity of the adopted items was determined by the fact that it was developed, validated and applied by experts (Matziou et al., 2008; Sakai et al., 2009; Walsh et al., 2008), or else adopted from previous studies, such as in Sarrell and Kahan (2003).

Some items were removed from the initial version of the questionnaires in order to avoid repetition. The readability of adopted items was simplified to support a fifth grade reading level, so measure was changed to check, for instance, and antipyretics was substituted with fever medicines. Additional items were developed for the study, and these items related to methods and tools to measure a child’s body temperature (refer to item numbers Q6 [a–e] and Q7 [a–c]). The content and face validity of the instrument were confirmed by six academic experts: three nursing academics, one senior research fellow and two emergency nurses. The final developed instruments of fever questions consisted of 42 items in three sections, as follows:
Section A: Fever Knowledge Scale (FKNS)

Questions relating to fever knowledge consisted of 25 items. These items aimed to investigate parents’/carers’ knowledge about varying levels of fever, knowledge about the consequences of high fever, how to measure a child’s temperature using the correct tool of measurement, time bathing a child, and what temperature requires attendance to ED/primary care facility (see Table 7). These items were selected from an existing scale and have been tested in a similar population (Matziou et al., 2008; Sakai et al., 2009; Sarrell & Kahan, 2003; Walsh et al., 2008). The correct answers to the 25 items were added together to form the total score correct for fever knowledge.

Section B: Fever Management Practices Scale (FMPS)

This scale incorporates 15 items relating to pharmacological and non-pharmacological approaches to fever management which represent the anticipated fever management practices. Table 7 next page; summarises the contents of the items in the pre-survey and the original source for each item. The correct answers to the 15 items were added together to form the total score correct for the anticipated fever management practices.

Internal consistency of the instruments

Although items in the survey were adopted from valid sources, and reconfirmed by experts in the field, further statistical analysis using SPSS was undertaken to confirm reliability. Internal consistency (reliability) of FKNS and FMPS has been tested. Items were recoded into a dichotomous form (correct=1, incorrect=0) and therefore the Kuder–Richardson procedure was used within the Cronbach’s Alpha procedure of SPSS (the default procedure for dichotomous data). Initially, the 40 items in
FKNS (25 items) and FMPS (15 items) were included in the reliability testing. Items with a negative value or items with a coefficient of less than 0.010 were subsequently excluded from the test (Polit & Beck, 2010). See SPSS output Appendix 7.
<table>
<thead>
<tr>
<th>Scale</th>
<th>Number</th>
<th>Items</th>
<th>Part/Item No.</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS</td>
<td>25 items</td>
<td>Varying level of fever</td>
<td>Q2a, Q2b, Q2c, Q2e, Q3a, Q3b, Q3c, &amp; Q3e</td>
<td>(Sarrell &amp; Kahan, 2003; Walsh et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consequences of high fever</td>
<td>Q5 (a-f)</td>
<td>(Sakai et al., 2009; Walsh et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring a child’s temperature</td>
<td>Q6 (a-c) + Q7 (a-c)</td>
<td>Developed in the current study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time bathing a child</td>
<td>Q9</td>
<td>(Matziou et al., 2008; Walsh et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature you think required medicine</td>
<td>Q12</td>
<td>(Matziou et al., 2008; Walsh et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature you think required ED</td>
<td>Q16</td>
<td>(Sakai et al., 2009)</td>
</tr>
<tr>
<td>FMPS</td>
<td>15 items</td>
<td>Temperature you take the child to ED or GP</td>
<td>(Q2f -g) + (Q4a -b)</td>
<td>(Sarrell &amp; Kahan, 2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical methods to reduce fever</td>
<td>Q8 (a-f)</td>
<td>(Matziou et al., 2008; Sakai et al., 2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Giving medication without doctor’s advice or without checking the child’s temperature</td>
<td>Q10 &amp; Q11</td>
<td>(Matziou et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternating fever medicine and dose</td>
<td>Q13 &amp; Q14</td>
<td>(Sakai et al., 2009; Sarrell &amp; Kahan, 2003; Walsh et al., 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wait before consultations</td>
<td>Q15</td>
<td>(Sakai et al., 2009)</td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>2 items</td>
<td>Visits to ED and other healthcare facilities</td>
<td>Q19 &amp; 20</td>
<td>(Walsh et al., 2008)</td>
</tr>
</tbody>
</table>
Instrument Reliability

Kuder–Richardson Alpha indicated fair reliability of the remaining items in the FKNS (n=14, α=0.715), see Table 8. A reliability of 0.70 or higher is regarded as adequate reliability (Polit & Beck, 2008). In the FMPS, 15 items were included in the test, and only items with positive values were included in the analysis. However, the internal consistency for the remaining 10 items in the FMPS was low (α=0.429).

Table 8  Kuder–Richardson for FKNS and FMPS items (n=155)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach's Alpha</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS</td>
<td>0.715</td>
<td>14</td>
</tr>
<tr>
<td>FMPS</td>
<td>0.429</td>
<td>10</td>
</tr>
</tbody>
</table>

Accordingly, these scales were produced based on the items that have the highest value in the internal consistency testing. The FKNS consisted of 14 items: Q2b, Q2c, Q2e, Q3b, Q3c, Q3e, Q5a, Q5b, Q5c, Q5e, Q6b, Q6d, Q9 and Q16 (the total of which is referred to as the FKNS-14). In the FMPS, the 10 items included: Q2f, Q2g, Q4a, Q4b, Q8b, Q8d, Q8e, Q8f, Q10 and Q11 (henceforth referred to as the FMPS-10).

Part 3: Sociodemographics

Sociodemographic questions consisted of 14 items exploring parents’/carers’ sociodemographic characteristics (12 items), and two items about their febrile child. Sociodemographic items included in the study were: parents’/carers’ gender, age, his/her relationship to the child, number of children, age of each child, educational
level, employment status, occupation, language spoken at home, country of birth, and (if born overseas) the duration of residency in Australia. Sociodemographic questions have been adopted from the Australian Bureau of Statistics Census of Population and Housing survey (Australian Bureau of Statistics, 2006).

There were a total of 54 questions in the pre-survey, 25 within the FKNS, 15 within the FMPS and 14 items for the sociodemographics, see Appendix 5 Pre-questionnaire ’Managing your child’s fever’.

7.3.2. Data collection procedure

Knowledge gathered from the descriptive study in Phase 2 (detailed in Chapter Six) was used to guide the study to target the suitable month and season to conduct the experimental phase. The study was discussed in detail with the Medical Director and Nursing Unit Manager (NUM) of Campbelltown Hospital ED. The ED NUM nominated three expert registered nurses with extensive experience within the ED and who worked part-time, to assist in the data collection process. These individuals are henceforth referred to as RNs.

Education of medical and nursing staff within the ED

In order for ED staff to be aware of the study and to facilitate the data collection process, four presentation sessions were conducted prior to the commencement date. One presentation was delivered for the medical staff, and three presentations for ED nursing staff (see Appendix 8).
**Pre-survey**

Data collection commenced in April 2012 and concluded in August 2012. Data were collected following a systematic process. RNs were asked to follow a diagram on the data collection process, (see Figure 7). The RNs accessed the FirstNet database and identified eligible patients from the listing; for example, the parents/carers presenting with a febrile child, or if the child’s temperature (taken by the triage nurse) was recorded as over 37°C. Parents/carers were approached and RNs then described the study, gave the participants the Participant Information Sheet and later asked if they would be interested in participating in the study. See Appendix 10, Participants’

**Figure 7 An overview of the recruitment process**

```
Accessed the FirstNet database

Assess for eligibility and recruitment

Approach the nominated parent, seek agreement (following scenarios) page 251

Reject/refusal to participate

Accept to participate

Stop the recruitment process

1. Participant Information Sheet
2. Consent form
3. Distribution of questionnaires
4. Conduct the REALM-SF test (LHL or FHL)
5. Select the randomisation envelope (containing the intervention/control material) and give this to participants
6. Collect the questionnaires
7. Label the consent form and pre-survey with the unique study ID
```
**Pre-Information Sheet**

If parents/carers agreed to participate, they were asked to sign and return the consent form (see Appendix 11). The RNs then checked the participant name and signature on the consent form, and subsequently administered the HL test to the participant, locating him/her in a quiet and private area. After the HL score had been assessed, participants were given the appropriate randomisation envelope (containing DVD and brochure for the intervention group, or the DVD and the Fever Fact Sheet sheet for the control group). Once participants had completed the pre-survey, they were asked to view the contents as soon as possible, and prior to completing the second survey. RNs labelled the consent form and pre-survey with the unique study ID number that was found on the randomisation envelope. Appendix 9 contains the script for the RNs to follow during the data collection process, detailing a range of different scenarios (see Appendix 9).

**Post-survey**

Three months after recruitment, a post-survey – together with post-information sheet (see Appendices 12 and 13) and a reply paid envelope – was posted to the participant’s postal address, using the information provided in the pre-survey. The post-survey was identical to the pre-survey except for the literacy test and the sociodemographic questions. Three weeks after the follow-up survey, a reminder letter along with a copy of the follow-up survey and another reply paid envelope was sent to participants who had not responded (see Appendices 12 and 14). Lastly, participants who did not respond to the postal reminder and who had provided their email address in the pre-survey were emailed an online version of the post-survey.
This post-survey was developed within Survey Monkey (Surveymonkey, 2013) (see Appendix 15).

To monitor the process of sending the follow-up postal and online survey, a collection control register was set up using Microsoft Excel software, as recommended by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2006).

This F-RCT has been registered with the Australian and New Zealand Clinical Trials Registry and follows the Consolidated Standards of Reporting Trials (CONSORT) guidelines of 2010 (Schulz et al., 2010). The registration number is ACTRN12612001057875, and the date of registration is 4th October 2012.

7.4. Ethical considerations

Ethics approval to conduct this study was granted by the South Western Sydney Local Health District (SWSLHD) Ethics Committee (date of approval 5th December 2011, number HREC/11/LPOOL/265) and the University of Western Sydney (UWS) Ethics Committee (date of approval 11th April 2012, number H9532).

Participants in this study were informed of what the study involved, and advised that participation was voluntary, and that they had the right to withdraw at any time. Participants’ privacy was ensured by keeping all study information in a safe place, all study information kept by the research team in a locked cabinet at UWS. These aspects were outlined in the Participant Information Sheet (see Appendix 10), which was given to participants prior to their enrolment in the study.

The information sheet provided clear information and instructions, and detailed the participants’ right to participate or not. Furthermore, the information sheet
encouraged them to ask any questions, and to report any concerns to the relevant committee. The contents of the information sheet were designed to match a fifth grade reading level – that is, a level appropriate for individuals with LHL. If at any time participants were unable to understand the content of the information sheet, the RN was available to explain it verbally. Parents/carers in the study were provided with the contact details of the investigators and the relevant Human Research and Ethics Committees, should they wish to ask any questions or raise any concerns.

The next section will explore the data management processes including procedures used to handle missing data. Analysis procedures, underlying assumptions and data adjustments are explained. A rationale for using different approaches is also provided.

7.5. **Data management and analysis**

During the process of data collection, data were entered by the researcher into the statistical software databases (SPSS) version 18 (SPSS, 2011). The responses from the electronic version of the survey were transferred by the researcher to hardcopy surveys, and then entered into SPSS. In order to check the error rate, the researcher randomly selected 20 cases from the 46 cases with completed data sets. A supervisor also selected cases and checked the data. Using the possible 200 variables, an error rate of 1% of data entry was found for the 20 pre- and post-surveys.

All data were checked for any out of range scores within the variables by listing the maximum and minimum scores for each variable in the data set. All values out of range were double checked with the original hardcopy data and corrected accordingly.
7.5.1. Managing missing data

This is an F-RCT with pre- and post-data collections that are spaced three months apart. Accordingly, strategies to manage issues related to participants lost to follow-up were required (Gupta, 2011; Shieh, 2013). As a result, there were less than 1% of all possible variables and records with missing data in the follow-up sample, which is considered an acceptable level (Acuna & Rodriguez, 2004). There are several approaches to managing missing data. These include case deletion, single imputations and multiple imputations (Acuna & Rodriguez, 2004; Polit & Gillespie, 2009). Case deletion is a simple approach whereby all missing values are simply deleted from the analysis. However, this process proves deleterious for small sample size studies, and significantly decreases the import of the analysis (Acuna & Rodriguez, 2004; Polit & Gillespie, 2009). Single or multiple imputations are other approaches in treating missing data. Imputation is the process of replacing missing data (Polit & Gillespie, 2009; Shieh, 2013). Single imputation uses different strategies, including replacing the missing value with the mean or median score from the remaining sample, carrying the last observation or score forward into the final data points and worst-case/best-case imputation and regression imputation (Shieh, 2013). One of the advantages of single imputations is that they are easy to apply. However, results from analysis using single imputation to treat the missing data could easily be over or underestimated (Acuna & Rodriguez, 2004; Shieh, 2013).

The strategy to manage missing data in this study was to use the last observation carried forward procedure. This strategy is frequently used effectively in clinical trials (Polit & Gillespie, 2009; Streiner & Geddes, 2001), and has been used in other studies that feature the same design (Hyde, 2011; Ravaud et al., 2004). Advantages
of managing the missing data by applying this approach include: it minimises the number of participants excluded from the study, and it permits the analysis to look at trends over time, instead of just focusing on the endpoint. However, there are specific challenges in using this approach in relation to an educational intervention tool, and the outcome measures are likely to change substantially. For example, the replaced value could have improved, or become worse (Streiner & Geddes, 2001). In addition, the sample loss to follow-up in this study was so substantial that using neither the mean nor imputation procedures would have been appropriate.

In the current study, only parents/carers eligible for the study and who participated in the follow-up survey were included for the follow-up analysis.

7.5.2. Statistical procedures

Initially in the analysis, the alpha level of \( p \) equal to or less than 0.05 was determined as statistically significant (Buettner, Muller, & Buhrer-Shinner, 2011), and has been applied to either accept or reject study hypotheses (Buettner et al., 2011; Hopkins, 2000). The Statistical Package for the Social Sciences (SPSS) version 18 was used to perform the analyses (SPSS, 2011). The selection of the analysis procedures was based on the type of data available (nominal, ordinal, interval or ratio), the number of groups in the analysis, and whether the data fulfilled the assumptions of selected statistical procedures (such as normality) (Buettner et al., 2011; Polit & Beck, 2010). Each analysis assumption and reason for use is explained in detail.

Several descriptive and inferential procedures (parametric and non-parametric procedures) have been used to address the key research questions, and to test the hypotheses of this study. Descriptive analyses were conducted to examine the sociodemographic characteristics of the sample. For nominal data, percentages and
frequencies were used, and where comparisons between groups were required, Chi-square procedures were undertaken. For interval data such as the participant’s age or the scores for the FKNS, the mean and standard deviation were used.

Inferential statistics – such as a paired sample T-test or Wilcoxon signed-rank – have been applied to compare within group mean difference (MD) in relation to the study outcomes (Argyrous, 2011; Tabachnick & Fidell, 2011). For example, within control group and within intervention group difference in relation to the study outcomes pre- and post- test were undertaken. Comparisons of mean differences in relation to the study outcomes between groups use the independent sample T-test and Mann Whitney U test have been applied. Furthermore, planned contrasts using analysis of variance (ANOVA) has been used to test all potential comparisons for the groups in a single procedure (Thompson, 2013), in keeping with the F-RCT design.

Assumptions underpinning the use of parametric procedures (such as the T-test) include the following: the dependent variable is either interval or ratio data, the independent variable consists of two independent groups, homogeneity of variances (similar variances between the two groups) exists, and the dependent variables are normally distributed (Argyrous, 2011; Buettner et al., 2011; Polit & Beck, 2010). Homogeneity of variances are tested using the Levene's test when the independent T-test is executed within SPSS (SPSS, 2011).

The non-parametric approaches do not require the data to be normally distributed, and are referred to as distribution-free (Argyrous, 2011; Buettner et al., 2011; Polit & Beck, 2010). In addition, the Mann Whitney U and Wilcoxon signed-rank test assumes that the data are ordinal or interval (Argyrous, 2011), and that the groups consist of two levels (intervention versus control).
Normality test

Prior to testing the difference within groups, the outcome data were examined in order to determine their normality. Normality of outcome scores is a prerequisite for many statistical analysis procedures (Buettner et al., 2011; Polit & Beck, 2010). Data can be tested for their normality using SPSS in two formats; graphically (using histograms or plots) (Argyrous, 2011) and statistically (using the Kolmogorov–Smirnov or Shapiro–Wilks Test) (SPSS, 2011). A bell-shaped curve in a histogram format indicates a normal distribution of the data (Argyrous, 2011; Finch, 2005; Polit & Beck, 2010), or a significant value (p<0.05) on the normality test indicates a non-normal distribution of the data. If the results of the normality test demonstrated non-normal distributed data, then a transformation procedure was performed to attempt to return the data to a normal distribution (Montgomery, Peck, & Vining, 2012). If the data remained non-normal, then non-parametric statistics were used (Buettner et al., 2011).

Normality testing within SPSS for the pre-survey (n=150) and post-survey (n=46) data was conducted. The results of the Kolmogorov–Smirnov and Shapiro–Wilks Test revealed that data were not normally distributed at p<0.05 (see Appendix 16). Kolmogorov–Smirnov tests range between p<0.01 to p=0.02. Since the data were not normally distributed, transformation procedures were required (see Appendix 16).

Histograms (see Appendix 16) showed that all the differences in means for the outcome measures are positively skewed. The most appropriate transformation procedure for positively skewed data is Logarithmic 10 (Log 10) (Hair, Anderson, Tatham, & Black, 1992). Accordingly, data were transformed using Log 10 and then
another Kolmogorov–Smirnov and Shapiro–Wilks Test was applied (see Appendix 16).

The results of the subsequent Kolmogorov–Smirnov and Shapiro–Wilks Test after the transformation were similar to initial distributions. The normality for the data was violated, and distribution-free procedures were required. Accordingly, non-parametric analyses in SPSS (Mann Whitney U and Wilcoxon signed–rank test) were used. Parametric analyses were also carried out, to allow comparison between parametric and non-parametric results.

**Pearson Chi-square analysis**

Pearson Chi-square test was used to determine whether there was any statistically significant difference in the proportions between two or more independent groups with two or more dependent categorical variables (Argyrous, 2011; Polit & Beck, 2010). Comparisons were accompanied by a contingency table or a cross-tabulation technique (Polit & Beck, 2010). Comparison between groups (that is, between the control and intervention groups, LHL and FHL) for sociodemographic data such as country of birth, education level, employment status, gender, HL level, occupation and language spoken at home, used these procedures.
Within and between group analysis

In order to test the effectiveness of the study intervention on study outcomes, within group (pre- and post-test) and between group (intervention and control) analyses were undertaken.

Parametric tests (T-test and independent sample T-test)

In this study, a paired sample T-test was used to compare within groups mean difference before and after intervention – control/intervention groups, and LHL/FHL groups – in relation to the study outcomes (Argyrous, 2011; Buettner et al., 2011). In addition, the paired sample T-test was used to investigate any differences in means and standard deviations (SD) in the total scale scores for the FKNS, FMPS and ED/primary care presentations. On the other hand, the independent sample T-test was used to compare between group mean differences (pre-post) in relation to the study outcomes.

Non-parametric tests (Mann Whitney U and Wilcoxon signed–rank test)

The Mann Whitney U (utility) test and Wilcoxon signed-rank test have been used for non-normal data comparisons. The Mann Whitney U test is equivalent to the independent sample T-test, while the Wilcoxon signed-rank test is equivalent to the paired T-test in the parametric approaches (Argyrous, 2011; Tabachnick & Fidell, 2011). The Mann Whitney U test is used to compare between group mean differences (pre-post), while the Wilcoxon signed-rank test is used to compare within group (intervention versus control) mean differences.

The parametric analysis is preferable over the non-parametric analysis, since parametric tests have more ‘power’ than the non-parametric analysis to reject the
null hypothesis (Argyrous, 2011; Tabachnick & Fidell, 2011). In addition, parametric statistics can draw more conclusions because they use the actual data, while non-parametric procedures use rankings of the values in the data (Argyrous, 2011; Tabachnick & Fidell, 2011).

**Mean differences in ANOVA using planned contrasts**

Analysis of variance (ANOVA) is used to investigate the causal relation between independent variables (IDs) or groups on one dependent variable (DV) (Argyrous, 2011; Polit & Beck, 2010). Essentially, ANOVA tests the difference between means within groups and between groups, and it is utilised based on the General Linear Model (GLM) (Montgomery, Peck, & Vining, 2012; Polit & Beck, 2010). In this study, planned contrasts were used to investigate the relationship and difference between parents’/carers’ HL, and intervention and control as IDs, the study outcomes FKNS FMPS, and ED/primary care presentations as DV.

The researcher in this study devised the hypothesis based on previous knowledge that people with LHL could potentially demonstrate poor fever knowledge, and furthermore that the health literacy modified fever education program (participants in the intervention group) would demonstrate improved study outcomes — FKNS, FMPS and ED/primary care presentations. Accordingly, the planned contrasts procedure in ANOVA (Ruxton & Beauchamp, 2008; Thompson, 2013) was used. Using the planned contrasts allows for group differences to be examined without the need to conduct multiple T-tests avoiding type I error (Ruxton & Beauchamp, 2008; Thompson, 2013). Planned contrasts are orthogonal contrasts which are a linear combination of two or more factor levels, in which the coefficients of the contrast must add to zero. Groups included in the contrast need to be given an equal negative
and positive value, for example (1, -1) or (2, -2), while any group not included in the contrast is assigned a zero (Ruxton & Beauchamp, 2008).

Before analysing the data using ANOVA, a number of assumptions need to be considered. Some of these assumptions are relevant to the current study and have already been addressed. These are (a) all the dependent variables or linear combinations of the dependent variables approximately distribute normally; (b) independence of the observations, which means that each subject score is not affected by other subjects’ scores or outcomes; (c) the independent variables are continuous data (that changes over the course of the study); and (d) homogeneity of variances or similar variances between the two groups (Montgomery et al., 2012; Polit & Beck, 2010).

Four planned contrasts in ANOVA in relation to study outcomes were estimated:

Contrast (1) is parents/carers with LHL in the control group (Group A) versus parents/carers with LHL in the intervention group (Group B);

Contrast (2) is parents/carers with FHL in the control group (Group C) versus parents/carers with FHL in the intervention group (Group D);

Contrast (3) is parents/carers with LHL in the control group (Group A) versus parents/carers with FHL in the control group (Group C);

Contrast (4) is parents/carers with LHL in the intervention group (Group B) versus parents/carers with FHL in the intervention group (Group D).
Confounding factors

A confounding factor is a hidden variable that has a relation or association with both the dependent variable and the independent variable (Montgomery et al., 2012; Polit & Beck, 2010). A confounding variable in the current study for example, any sociodemographic variable was tested for its potential relation or effect on the study outcomes.

Initial examination of confounding factors was undertaken using correlation procedures.

Correlation

Correlation analyses examine the relation between two or more variables. The Pearson correlation ranges from 0.00 to 1.00, with values less than 0.29 indicating weak correlation, between 0.3 and 0.49 moderate correlation, above 0.5 indicating good correlation, and above 0.9 indicating strong/high correlation (Polit & Beck, 2010; Portney & Watkins, 2000). The Pearson correlation analysis in SPSS examined a relationship between participants’ sociodemographic dimensions (country of birth, education, employment, HL, number of children, and language spoken at home) and study outcomes (fever knowledge, anticipated fever practices management, and ED/primary care presentations). These relationships assisted in determining any confounding variables that might influence the relationship between the independent and outcome variables.

Adjustment for multiple comparisons

As a typical methodological practice, a significant number of analyses on the same set of data are often performed, thereby increasing the potential for error (Abdi,
In research there is a 0.05% possibility of incorrectly rejecting the null hypothesis each time a researcher performs an analysis procedure. Accordingly, increasing the number of tests performed correspondingly increases the chance of incorrectly rejecting the null hypothesis, or determining a statistically significant difference. These errors can lead to rejection of the null hypothesis when it is true; for example, thinking that there is a change when there is none (Type I error).

Different techniques are available to minimise or to prevent these errors. Two choices are available to solve this issue: when the equal variance is assumed, or when the equal variance is not assumed (SPSS, 2011). When the equal variance is assumed, the Bonferroni and Tukey’s B test is recommended, and when the equal variance is not assumed, the Dennett’s T3 test is preferred (Hilton & Armstrong, 2006). In this study, Bonferroni adjustments were used where appropriate, as this the most common adjustment procedure for multiple comparison used in the literature.
7.6. **Summary**

This chapter has outlined the methods used in this study that are aimed at measuring the effectiveness of a health literacy modified fever education program on participants’ fever knowledge, anticipated fever management practices, and ED/primary care presentations. Using the intervention and control groups provides the researcher with the opportunity to determine the effectiveness of the health literacy modified DVD and brochure, compared to the materials presented to the control group. Furthermore, this chapter has outlined the analysis procedure used in the study relating to this F-RCT. Most of the outlined procedures required data to meet assumptions; therefore, when data did not meet the assumptions, alternative approaches were used. The next chapter will present the results of the statistical procedures described.
Chapter Eight

8. Results of the Factorial Randomised Controlled Trial

8.1. Introduction

This chapter commences with a description of the overall sample characteristics, followed by a comparison of baseline characteristics between the control and intervention groups. Further analyses outlined in this chapter include: descriptive analyses of FKNS, FMPS and ED/primary care presentations for participants with LHL and FHL. Results of the pre/post-test comparisons for control and intervention groups, inferential statistics and analysis between the intervention and control groups are presented. Planned contrasts using ANOVA are demonstrated; and finally, potential confounding factors are considered.

8.2. Participants

One-hundred and seventy-five parents/carers were initially screened (through the FirstNet database) for eligibility to participate after initial triage within the ED. These individuals were approached with an invitation to participate. Of these parents/carers, 11 refused to participate, and six did not meet the inclusion criteria. A total of 158 met the eligibility criteria and agreed to participate (eligibility fraction 90.2%). The eligibility fraction describes the proportion of participants deemed eligible for the study from all potential available participants (Jones, Jones, McCowan, Montgomery, & Fahey, 2009). Three participants did not complete the pre-questionnaire, and were subsequently excluded from the study. One hundred and fifty-five parents/carers participated and completed the initial survey, representing an
enrolment fraction of 98.1%. The enrolment fraction describes the proportion of eligible people who enrol in the study (Jones et al., 2009).

Three months after the pre-survey, a follow-up survey was sent to participants who provided their contact details in the pre-survey (n=152) (three participants did not provide their contact address in the pre-survey). Of these 152 participants, 46 responded to the follow-up survey (29.6% retention rate). See Figure 8.
Figure 7 Flowchart of recruitment of participants

Assess for eligibility ED visit (N=175)

Excluded (n=20)
- Refused to participate (n=11)
- Did not meet inclusion criteria (n=6)
- Participants did not complete the questionnaires (n=3)

Participants randomised (N=155)

LHL (n=33)
- Intervention (n=16)
  - Lost follow-up (n=13)
  - Completed treatment (n=3)
  - Included in the analysis (n=3)
- Control (n=17)
  - Lost follow-up (n=10)
  - Completed treatment (n=7)
  - Included in the analysis (n=7)

FHL (n=122)
- Intervention (n=60)
  - Lost follow-up (n=43)
  - Completed treatment (n=17)
  - Included in the analysis (n=17)
- Control (n=62)
  - Lost follow-up (n=44)
  - Completed treatment (n=19)
  - Included in the analysis (n=19)
8.3. **Sociodemographic characteristics**

8.3.1. *Pre-survey participants (N=155)*

**Parents/carers**

The participants’ sociodemographic characteristics at baseline in both groups were very similar (see Table 9). Of the 155 participants, the mean age was 31 years (SD=6) and 31.5 years (SD=7.5) for the control and intervention group respectively. The majority of the participants were Australian born (70% in the control group and 72% in the intervention group). In both groups, parents/carers were mainly educated to high school level (56.3% in the control and 50.7% in the intervention). Approximately one third of participants in each group were unemployed. Participants were mainly female in both groups (control group 85%, intervention group 77.3%). Most of the participants in both groups spoke English at home. A further 21.3% (control) and 22.7% (intervention) spoke a language other than English at home. The majority of participants in both groups were identified as having FHL (77.5% in the control and 80% in the intervention), (see Table 9).

**Children**

There was almost parity with the age of the children between the two groups, with the mean age being 27.3 months (SD=16.8) for the control group and 27 months (SD=19) for the intervention group. Most of the children in both groups were male (53.8% control group; 60% intervention group). The average ED/primary care presentations in the past three months varied between the control and the intervention groups, with the mean number of presentations for children in the control group being 2.1 (SD=1.6), and 2.5 (SD=1.9) for the intervention group.
Table 9  Parents’/carers’ sociodemographic characteristics for pre-survey sample (N=155), post-survey sample (n=46) and lost to follow-up sample (n=109)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre-survey N=155</th>
<th></th>
<th>Post-survey n=46</th>
<th></th>
<th>Lost to follow-up n=109</th>
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<td></td>
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<td>Control</td>
<td>Intervention</td>
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<tr>
<td></td>
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<td>N %</td>
<td>N %</td>
<td>N %</td>
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<td>Age mean (SD), years</td>
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<td>Australia</td>
<td>56 (70)</td>
<td>54 (72)</td>
<td>17 (65.4)</td>
<td>16 (80)</td>
<td>39 (72.2)</td>
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<tr>
<td>Overseas</td>
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<td>4 (20)</td>
<td>12 (22.2)</td>
<td>16 (29.6)</td>
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<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (1.9)</td>
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<td>12 (46.2)</td>
<td>10 (50)</td>
<td>33 (61.1)</td>
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<td>47 (62.7)</td>
<td>17 (65.4)</td>
<td>14 (70)</td>
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<td>Male</td>
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<td>58 (77.3)</td>
<td>25 (96.2)</td>
<td>18 (90)</td>
<td>43 (79.6)</td>
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<td>19 (73.1)</td>
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</table>

Note: Numbers may not add up to the total number of participants in each group due to missing data.
<table>
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<tr>
<th>Groups</th>
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<th>Post-survey n=46</th>
<th>Lost to follow-up n=109</th>
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<tr>
<td>English</td>
<td>59</td>
<td>(73.8)</td>
<td>58</td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>(21.3)</td>
<td>15</td>
</tr>
<tr>
<td>Number of children (M, SD)</td>
<td>2.26 (1.4)</td>
<td>2.25 (1.5)</td>
<td>2.1 (1.09)</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manager</td>
<td>7</td>
<td>(8.8)</td>
<td>16</td>
</tr>
<tr>
<td>Occupational</td>
<td>13</td>
<td>(16.3)</td>
<td>11</td>
</tr>
<tr>
<td>Administrative</td>
<td>10</td>
<td>(12.5)</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>34</td>
<td>(42.5)</td>
<td>25</td>
</tr>
<tr>
<td>ED/primary care presentations (M, SD)</td>
<td>3</td>
<td>(2.28)</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Note: Numbers may not add up to the total number of participants in each group due to missing data.
Chi-squared and T-test analyses have been used to compare intervention and control groups (pre-survey sample, post-survey sample, and the lost to follow-up sample) on the above characteristics. Although it is not appropriate to report differences at baseline between control and intervention groups, it is nonetheless commonly done (Assmann, Pocock, Enos, & Kasten, 2000). For example, Assmann et al. note that ‘a chance significant baseline imbalance is unimportant if the factor is unrelated to the outcome, unless it signals errors in randomisation’ (Assmann et al., 2000, p. 5).

For completeness of data reporting, comparisons have been undertaken between baseline characteristics for pre- and post-survey participants for the smaller sample (n=46) and p values ranging from 0.13 to 0.94. There were no statistical differences found between parents/carers of the two groups.

8.3.2. Post-survey participants (n=46)

Parents’/carers’ sociodemographic characteristics

The sociodemographic variables for participants who completed the follow-up survey were almost the same as those found in the baseline group. The only difference observed was that the proportion of employed participants in the follow-up survey for the control group was marginally higher than that found in the baseline survey (58.8% and 62.7% respectively). This difference was not deemed to be statistically significant p > 0.05, (see Table 9).

In pre- and post-survey participants, there were more managers in the intervention group than the control group, pre-survey (control 8.8% versus 21.3% intervention), post-survey (control 0% versus 30% intervention). The patterns identified in the pre-
and follow-up participants were consistent with the loss to follow-up sample
(n=109), (see Table 9).

**Children’s sociodemographic characteristics**

The characteristics of the children in the follow-up survey were similar between the control and the intervention groups. However, there was a lower proportion of female children in the control group than the intervention group (34.6% versus 50% respectively) See Table 10 for the post-survey sample (n=46). This difference in proportion between the groups was not statistically significant p > 0.05.

No significant difference was found between the control and the intervention group in terms of sociodemographics in the pre-survey, post-survey or for those who were lost to follow-up. The only statistically significant difference found between the two groups, however, was in the number of ED/primary care presentations for participants who were lost in the follow-up (p=0.05) (pre-survey data only were available).
Table 10  Children’s sociodemographic characteristics for pre-survey sample (N=155), post-survey sample (n=46) and lost to follow-up sample (n=109):

<table>
<thead>
<tr>
<th></th>
<th>Pre-survey N=155</th>
<th>Post-survey n=46</th>
<th>Lost in the follow-up n=109</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control N (%)</td>
<td>Intervention N (%)</td>
<td>Control N (%)</td>
</tr>
<tr>
<td>Age, mean (SD), months</td>
<td>27.3 (16.8)</td>
<td>27 (19)</td>
<td>29.1 (15.7)</td>
</tr>
<tr>
<td>Gender of the child</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male, no. (%)</td>
<td>43 (53.8)</td>
<td>45 (60)</td>
<td>17 (65.4)</td>
</tr>
<tr>
<td>Female, no. (%)</td>
<td>37(46.3)</td>
<td>30 (40)</td>
<td>9 (34.6)</td>
</tr>
<tr>
<td>ED/primary care presentations (M, SD)</td>
<td>2.1 (1.6)</td>
<td>2.5 (1.9)</td>
<td>2.5 (1.7)</td>
</tr>
</tbody>
</table>

Note: Numbers may not add up to the total number of participants in each group due to missing data
8.4. **Fever knowledge, anticipated fever management practice and ED/primary care presentations**

The research question relating to fever knowledge and anticipated fever management practices examined was:

What is the difference in parent/carers’ level of knowledge and anticipated fever management practices for parents/carers with LHL and FHL?

8.4.1. **Pre-survey parents/carers (N=155)**

Descriptive analyses were undertaken for 40 items which included total scores for the correct answers in the FKNS and FMPS. These were compared by the level of HL for the parents/carers.

Table 11 next shows the number and the percentage of correct questions answered before the intervention (pre-survey) between the HL groups (FHL and LHL) in relation to FKNS. Responses with less than 65% correct were underlined, and where there was a difference in answers between HL groups of more than 10%, these were also highlighted using **bold** and *italic* fonts. Items with higher correct answers in the LHL group were **bolded**, and items with higher correct answers in the FHL group were *italicised*. This standard was applied in Tables 11, 12, 14 and 15.
Table 11  Parents’/carers’ correct answers related to FKNS pre-survey (N=155)

<table>
<thead>
<tr>
<th>Items</th>
<th>LHL (n=33)</th>
<th>FHL (n=122)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child’s age (Months=M, Year=Y)</strong></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Normal temperature (3–6 M)</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>2. Temperature that is considered fever (3–6 M)</td>
<td>27</td>
<td><strong>81.8</strong></td>
</tr>
<tr>
<td>3. Temperature that is considered high fever (3–6 M)</td>
<td>26</td>
<td>78.8</td>
</tr>
<tr>
<td>4. Temperature that can cause harm (3–6 M)</td>
<td>25</td>
<td>75.8</td>
</tr>
<tr>
<td>5. Normal temperature (7M–5Y)</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>6. Temperature that is considered fever (7M–5Y)</td>
<td>22</td>
<td>66.7</td>
</tr>
<tr>
<td>7. Temperature that is considered high fever (7M–5Y)</td>
<td>24</td>
<td>72.7</td>
</tr>
<tr>
<td>8. Temperature that can cause harm (7M–5Y)</td>
<td>7</td>
<td><strong>21.2</strong></td>
</tr>
<tr>
<td>9. Fever that can cause dehydration</td>
<td>28</td>
<td>84.8</td>
</tr>
<tr>
<td>10. Fever that can cause brain damage</td>
<td>11</td>
<td>33.3</td>
</tr>
<tr>
<td>11. Fever that can cause pneumonia</td>
<td>6</td>
<td><strong>18.2</strong></td>
</tr>
<tr>
<td>12. Fever that can cause nothing</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>13. Fever that can cause loss of consciousness</td>
<td>13</td>
<td>39.4</td>
</tr>
<tr>
<td>14. Fever that can cause fit</td>
<td>12</td>
<td><strong>36.4</strong></td>
</tr>
<tr>
<td>15. Method of measurement (touch)</td>
<td>22</td>
<td>66.7</td>
</tr>
<tr>
<td>16. Method of measurement (mouth)</td>
<td>27</td>
<td>81.8</td>
</tr>
<tr>
<td>17. Method of measurement (axillary)</td>
<td>27</td>
<td>81.8</td>
</tr>
<tr>
<td>18. Method of measurement (rectal)</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>19. Method of measurement (ear)</td>
<td>16</td>
<td>48.5</td>
</tr>
<tr>
<td>20. Type of thermometer (mercury)</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>21. Type of thermometer (electronic)</td>
<td>29</td>
<td>87.9</td>
</tr>
<tr>
<td>22. Type of thermometer (infrared)</td>
<td>10</td>
<td><strong>30.3</strong></td>
</tr>
<tr>
<td>23. Time to spend bathing your child</td>
<td>9</td>
<td><strong>27.3</strong></td>
</tr>
<tr>
<td>24. Correct fever medicine</td>
<td>2</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>25. Temperature required ED</td>
<td>20</td>
<td>60.6</td>
</tr>
</tbody>
</table>

*Note: Responses with less than 65% correct (underlined), higher correct answers in the LHL group (bolded), higher correct answers in the FHL group (italicised).*

Table 11 includes 25 items related to the FKNS. Comparing correct answers between groups based on their HL level, both groups feature approximately the same proportion of correct answers for most of the items. However, the LHL group demonstrates a higher number of correct answers than the FHL one (14 versus 11). A
disparity has been noted in a number of the items; for example, the LHL group had a higher score in question numbers 2, 23 and 24. On the other hand, participants in the FHL group had higher scores in question numbers 14 and 22. A total scale score for each comparison has been presented after each table accordingly.

Another table for the FMPS has been produced to show the number and the percentage of correct questions answered before the intervention between the HL groups in relation to FMPS, (see Table 12 below).

**Table 12 Parents'/carers’ correct answers related to FMPS pre-survey (N=155)**

<table>
<thead>
<tr>
<th>Practice item</th>
<th>LHL (n=33)</th>
<th>FHL (n=122)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Months=M, Year=Y)</em></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Fever required hospitalisation (3–6M)</td>
<td>13</td>
<td>39.4</td>
</tr>
<tr>
<td>2. Fever required general practitioner (3–6M)</td>
<td>9</td>
<td>27.3</td>
</tr>
<tr>
<td>3. Fever required hospitalisation (7M–5Y)</td>
<td>2</td>
<td>6.1</td>
</tr>
<tr>
<td>4. Fever required general practitioner (7M–5Y)</td>
<td>6</td>
<td>18.2</td>
</tr>
<tr>
<td>5. Fever management by giving fluid</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>6. Fever management by tepid sponging</td>
<td>12</td>
<td>36.4</td>
</tr>
<tr>
<td>7. Fever management by dressing with clothing</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>8. Fever management by lukewarm bath</td>
<td>13</td>
<td>39.4</td>
</tr>
<tr>
<td>9. Fever management by cold bath</td>
<td>26</td>
<td>78.8</td>
</tr>
<tr>
<td>10. Fever management by removing excess clothing</td>
<td>25</td>
<td>75.8</td>
</tr>
<tr>
<td>11. Use fever medicine without physician’s advice</td>
<td>14</td>
<td><strong>42.4</strong></td>
</tr>
<tr>
<td>12. Use fever medicine without check</td>
<td>24</td>
<td>72.7</td>
</tr>
<tr>
<td>13. Manage fever by administering Nurofen</td>
<td>9</td>
<td><strong>33</strong></td>
</tr>
<tr>
<td>14. Manage fever by administering Panadol</td>
<td>7</td>
<td>21.2</td>
</tr>
<tr>
<td>15. Waiting time before seeking help</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note: Responses with less than 65% correct (underlined), higher correct answers in the LHL group (bolded), higher correct answers in the FHL group (italicised).*
Table 12, above, includes 15 items related to the FMPS. Both groups have approximately the same number of correct answers. Questions number 2, 3, 4, 11 and 13 have a higher score for the LHL group than the FHL group.

Functional health literacy has a higher score in questions 6 and 8. Overall, the LHL group demonstrated a higher number of correct answers than the FHL group (8 versus 7). In order to test whether or not the difference in the answers between HL groups in relation to total FKNS score and total FMPS score in the pre-survey (N=155) is significant, an independent sample T-test was conducted, (see Table 13 below).

**Table 13 Total scale score by the level of HL pre-survey (N=155)**

<table>
<thead>
<tr>
<th>Scale</th>
<th>LHL (n=33)</th>
<th>FHL (n=122)</th>
<th>95% CI</th>
<th>MD</th>
<th>P level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>lower</td>
<td>upper</td>
<td></td>
</tr>
<tr>
<td>FKNS</td>
<td>15.7 (2.2)</td>
<td>15.7 (2.5)</td>
<td>-0.93</td>
<td>0.98</td>
<td>0.95</td>
</tr>
<tr>
<td>FMPS</td>
<td>6.8 (1.4)</td>
<td>6.5 (1.6)</td>
<td>-.035</td>
<td>0.91</td>
<td>0.27</td>
</tr>
</tbody>
</table>

*Note: Mean difference (MD) between groups, independent sample T-test.*

The independent sample T-test indicates that there is no significant difference between HL groups in relation to the total FKNS and FMPS scores (p > 0.05) in the pre-survey (N=155). However, participants in the LHL group had a mean score 0.02 higher than the FHL group in the FKNS score, and 0.27 higher in the FMPS score.

8.4.2. **Post-survey parents/carers sample (n=46)**

This section provides a description of items between HL groups in the post-survey. The same comparison in individual items from the previous section was utilised after implementing the intervention, for those participants in the pre- and post-survey (n=46), (see Tables 14 and 15).
<table>
<thead>
<tr>
<th>Items</th>
<th>LHL (n=10)</th>
<th></th>
<th>FHL (n=36)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Normal temperature (3–6M)</td>
<td>10</td>
<td>100</td>
<td>35</td>
<td>97.2</td>
</tr>
<tr>
<td>2. Temperature that is considered fever (3–6M)</td>
<td>9</td>
<td>90</td>
<td>20</td>
<td><strong>55.6</strong></td>
</tr>
<tr>
<td>3. Temperature that is considered high fever (3–6M)</td>
<td>7</td>
<td>70</td>
<td>25</td>
<td>69.4</td>
</tr>
<tr>
<td>4. Temperature that can cause harm (3–6M)</td>
<td>8</td>
<td>80</td>
<td>25</td>
<td>69.4</td>
</tr>
<tr>
<td>5. Normal temperature (7M–5Y)</td>
<td>10</td>
<td>100</td>
<td>34</td>
<td>94.4</td>
</tr>
<tr>
<td>6. Temperature that is considered fever (7M–5Y)</td>
<td>9</td>
<td>90</td>
<td>21</td>
<td><strong>58.3</strong></td>
</tr>
<tr>
<td>7. Temperature that is considered high fever (7M–5Y)</td>
<td>7</td>
<td>70</td>
<td>20</td>
<td><strong>55.6</strong></td>
</tr>
<tr>
<td>8. Temperature can cause harm (7M–5Y)</td>
<td>2</td>
<td>20</td>
<td>6</td>
<td>16.7</td>
</tr>
<tr>
<td>9. Fever can cause dehydration</td>
<td>8</td>
<td>80</td>
<td>30</td>
<td>83.3</td>
</tr>
<tr>
<td>10. Fever can cause brain damage</td>
<td>3</td>
<td>30</td>
<td>13</td>
<td>36.1</td>
</tr>
<tr>
<td>11. Fever can cause pneumonia</td>
<td>3</td>
<td>30</td>
<td>7</td>
<td>19.4</td>
</tr>
<tr>
<td>12. Fever can cause nothing</td>
<td>9</td>
<td>90</td>
<td>34</td>
<td>94.4</td>
</tr>
<tr>
<td>13. Fever can cause loss of consciousness</td>
<td>3</td>
<td>30</td>
<td>13</td>
<td>36.1</td>
</tr>
<tr>
<td>14. Fever can cause fit</td>
<td>2</td>
<td>20</td>
<td>25</td>
<td>69.4</td>
</tr>
<tr>
<td>15. Method of measurement (touch)</td>
<td>8</td>
<td>80</td>
<td>22</td>
<td>61.1</td>
</tr>
<tr>
<td>16. Method of measurement (mouth)</td>
<td>6</td>
<td><strong>60</strong></td>
<td>29</td>
<td>80.6</td>
</tr>
<tr>
<td>17. Method of measurement (axillary)</td>
<td>9</td>
<td>90</td>
<td>30</td>
<td>83.3</td>
</tr>
<tr>
<td>18. Method of measurement (rectal)</td>
<td>10</td>
<td>100</td>
<td>32</td>
<td>88.9</td>
</tr>
<tr>
<td>19. Method of measurement (by ear)</td>
<td>6</td>
<td><strong>60</strong></td>
<td>24</td>
<td>66.7</td>
</tr>
<tr>
<td>20. Type of thermometer (mercury)</td>
<td>8</td>
<td>80</td>
<td>35</td>
<td>97.2</td>
</tr>
<tr>
<td>21. Type of thermometer (electronic)</td>
<td>9</td>
<td><strong>90</strong></td>
<td>26</td>
<td><strong>72.2</strong></td>
</tr>
<tr>
<td>22. Type of thermometer (infrared)</td>
<td>5</td>
<td>50</td>
<td>20</td>
<td><strong>55.6</strong></td>
</tr>
<tr>
<td>23. Time to spend bathing your child</td>
<td>3</td>
<td><strong>30</strong></td>
<td>6</td>
<td><strong>16.7</strong></td>
</tr>
<tr>
<td>24. Correct fever medicine</td>
<td>1</td>
<td><strong>10</strong></td>
<td>1</td>
<td><strong>2.8</strong></td>
</tr>
<tr>
<td>25. Temperature required ED</td>
<td>7</td>
<td>70</td>
<td>27</td>
<td>75</td>
</tr>
</tbody>
</table>

*Note: Responses with less than 65% correct (underlined), higher correct answers in the LHL group (bolded), higher correct answers in the FHL group (italicised).*
Table 15 Parents’/carers’ correct answers related to FMPS post-survey (n=46)

<table>
<thead>
<tr>
<th>Item</th>
<th>LHL (n=10)</th>
<th>FHL (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Fever required hospitalisation (3–6M)</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>2. Fever required general practitioner (3–6M)</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>3. Fever required hospitalisation (7M–5Y)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Fever required General Practitioner (7M–5Y)</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>5. Fever management by administering fluid</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>6. Fever management by tepid sponging</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>7. Fever management by dressing with excess clothing</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>8. Fever management by lukewarm bath</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>9. Fever management by cold bath</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>10. Fever management by removing excess clothing</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>11. Use fever medicine without physician’s advice</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>12. Use fever medicine without check</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>13. Manage fever by administering Nurofen</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>14. Manage fever by administering Panadol</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>15. Waiting time before seeking help</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: Responses with less than 65% correct (underlined), higher correct answers in the LHL group (bolded), higher correct answers in the FHL group (italicised)*

As in the pre-survey, the same patterns have existed between participants in different literacy groups. The proportion of correct answers in the FKNS and FMPS items were approximately the same within both groups. However, LHL groups had a higher percentage of correct answers than the FHL group in the FKNS (15 versus 10), while the FHL group had a higher percentage of correct answers for more items in the FMPS (8 versus 6).
To test whether or not the difference in the answers between HL groups in relation to total FKNS score and total FMPS score in the post-survey (n=46) was significant, an independent sample T-test was conducted, (see Table 16 below).

Table 16 Total scale score by the level of HL post-survey (n=46)

<table>
<thead>
<tr>
<th>Scale difference</th>
<th>LHL (n=10)</th>
<th>FHL (n=36)</th>
<th>95% CI</th>
<th>MD</th>
<th>P level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>lower</td>
<td>upper</td>
<td></td>
</tr>
<tr>
<td>FKNS</td>
<td>2.2 (3.9)</td>
<td>0.33 (3.9)</td>
<td>-0.81</td>
<td>4.5</td>
<td>1.8</td>
</tr>
<tr>
<td>FMPS</td>
<td>1.6 (2.8)</td>
<td>0.47 (2.4)</td>
<td>-0.66</td>
<td>2.9</td>
<td>1.12</td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>1.7 (3.5)</td>
<td>1.3 (2.7)</td>
<td>-1.7</td>
<td>2.5</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Note: Mean difference (MD) between groups, independent sample T-test.

The independent sample T-test indicates that there was no significant difference between HL groups in relation to the total FKNS and FMPS scores (p > 0.05) in the post-survey (n=46). However, participants in the LHL group had a mean score of 1.8 higher than the FHL group in the FKNS score and 1.12 higher the FMPS score.

8.4.3. Comparison of participants’ correct answers to other studies

Previous child fever studies have used a number of items similar to those in the current study. Given the unusual nature of the results, a comparison was made between participants’ answers in the current study with participants’ answers from other studies, (see Tables 17 and 18).

Items that have correctly scored over 75% in the other studies were excluded from the comparison next table. These, however, are detailed in Appendix 17. These items were consistent across studies; total items included in the comparison are 16 and 12 for the FKNS and FMPS respectively (Tables 17 and 18).
Table 17 Comparisons between parents'/carers’ correct answers for FKNS in the pre- and post-survey with other studies.

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-survey</th>
<th>Post-survey</th>
<th>Other studies % of correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=155</td>
<td>n=46</td>
<td>1</td>
</tr>
<tr>
<td>1. Temperature that is considered fever (3–6M)</td>
<td>101</td>
<td>65.2</td>
<td>29</td>
</tr>
<tr>
<td>2. Temperature that can cause harm (3–6M)</td>
<td>119</td>
<td>76.8</td>
<td>33</td>
</tr>
<tr>
<td>3. Temperature that is considered fever (7M–5Y)</td>
<td>107</td>
<td>69</td>
<td>30</td>
</tr>
<tr>
<td>4. Temperature that is considered high fever (7M–5Y)</td>
<td>101</td>
<td>65.2</td>
<td>27</td>
</tr>
<tr>
<td>5. Temperature that can cause harm (7M–5Y)</td>
<td>35</td>
<td>22.6</td>
<td>9</td>
</tr>
<tr>
<td>6. Fever can cause dehydration</td>
<td>131</td>
<td>84.5</td>
<td>38</td>
</tr>
<tr>
<td>7. Fever can cause brain damage</td>
<td>53</td>
<td>34.2</td>
<td>16</td>
</tr>
<tr>
<td>8. Fever can cause pneumonia</td>
<td>26</td>
<td>16.8</td>
<td>10</td>
</tr>
<tr>
<td>9. Fever can cause loss of consciousness</td>
<td>65</td>
<td>41.9</td>
<td>16</td>
</tr>
<tr>
<td>10. Fever can cause fit</td>
<td>92</td>
<td>59.4</td>
<td>27</td>
</tr>
<tr>
<td>11. Method of measurement (touch)</td>
<td>98</td>
<td>63.2</td>
<td>30</td>
</tr>
<tr>
<td>12. Method of measurement by ear</td>
<td>82</td>
<td>52.9</td>
<td>30</td>
</tr>
<tr>
<td>13. Type of thermometer infrared</td>
<td>60</td>
<td>38.7</td>
<td>25</td>
</tr>
<tr>
<td>14. Time to spend bathing your child</td>
<td>28</td>
<td>18.1</td>
<td>9</td>
</tr>
<tr>
<td>15. Correct fever medicine</td>
<td>3</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>16. Temperature required ED</td>
<td>105</td>
<td>67.7</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 18 Comparison between parents’/carers’ correct answers for FMPS in the pre- and post-survey with other studies

<table>
<thead>
<tr>
<th>Items</th>
<th>Pre-survey N=155</th>
<th>Post-survey n=46</th>
<th>Other studies % of correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fever required hospitalisation (3–6M)</td>
<td>64</td>
<td>17</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2. Fever required general practitioner (3–6M)</td>
<td>19</td>
<td>10</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3. Fever required hospitalisation (7M–5Y)</td>
<td>5</td>
<td>1</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4. Fever required general practitioner (7M–5Y)</td>
<td>11</td>
<td>7</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5. Fever management by tepid sponging</td>
<td>77</td>
<td>21</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6. Fever management by lukewarm bath</td>
<td>78</td>
<td>25</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7. Fever management by removing excess clothing</td>
<td>127</td>
<td>39</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>8. Use fever medicine without physician’s advice</td>
<td>31</td>
<td>12</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>9. Use fever medicine without check</td>
<td>108</td>
<td>63</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>10. Manage fever by administering Nurofen</td>
<td>30</td>
<td>9</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11. Manage fever by administering Panadol</td>
<td>34</td>
<td>12</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>12. Waiting time before seeking help</td>
<td>7</td>
<td>2</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>


The above tables show that participants’ responses to similar items from other fever studies demonstrate approximately the same patterns in both directions; if it is poor in this study, it seems to be poor in the other studies and vice versa. For example, in the item that relates to *Fever can cause (brain damage)*, correct responses to this question were very poor across studies, ranging from 14.4% in the Walsh study to 35.9% in the Al-Eissa study. Similarly, the figures in the current study are 34.2% and 34.8% respectively. On the other hand, the correct response *To what temperature is considered fever (7M–5Y)* were acceptable across studies, from 69% in the current study to 62.4% in the Al-Eissa study.
8.5. **Differences between and within groups (control and intervention)**

8.5.1. **Differences for pre-survey outcomes (N=155)**

As previously noted, the assumption of normality was not supported for the FKNS or FMPS scores, nor the mean difference scores (Appendix 16). Therefore, the analysis presented includes both parametric and non-parametric analyses.

**Parametric**

An independent sample T-test was used to determine whether or not there was any difference in parents’/carers’ FKNS-14 score, FMPS-10 score and number of ED/primary care presentations between control and intervention groups at the pre-survey stage (N=155). The result of the independent sample T-test is demonstrated in Table 19 below.

**Table 19  Comparison between groups for the pre-survey data (N=155)**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Control n=80</th>
<th>Intervention n=75</th>
<th>95% CI</th>
<th>MD</th>
<th>P level</th>
<th>Adjusted P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>lower</td>
<td>upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FKNS-14</td>
<td>8.0 (2.3)</td>
<td>8.2 (2.3)</td>
<td>-1.02</td>
<td>0.46</td>
<td>-0.27</td>
<td>0.46</td>
</tr>
<tr>
<td>FMPS-10</td>
<td>5.2 (1.3)</td>
<td>5.1 (1.6)</td>
<td>-0.41</td>
<td>0.54</td>
<td>0.06</td>
<td>0.78</td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>3.1 (2.4)</td>
<td>3.4 (2.7)</td>
<td>-1.2</td>
<td>0.47</td>
<td>-0.36</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Note: P value has been adjusted using Bonferonni procedures. 1 refers to 0.99 recurring. Mean difference (MD) between groups, independent T-test. Total possible maximum score for the FKNS is 14, and for the FMPS is 10.
The results revealed approximately the same proportion of correct answers for the FKNS-14, FMPS-10 and almost the same number of ED/primary care presentations between both groups (control and intervention). The results showed no significant difference in the score between both groups, with little difference in the mean between the groups for the FKNS-14 score, FMPS-10 score and ED/primary care presentation (MD = -0.27, 0.6 and -0.36 respectively).

**Non-Parametric**

The same comparison in the previous section was used in non-parametric approaches using the Mann–Whitney U Test.

*Table 20  Difference in means between groups (N=155) Mann–Whitney U Test*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Intervention</th>
<th>N</th>
<th>Mean rank</th>
<th>U value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14 Control</td>
<td>80</td>
<td>76.28</td>
<td></td>
<td>0.46</td>
</tr>
<tr>
<td>Intervention</td>
<td>75</td>
<td>79.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMPS-10 Control</td>
<td>80</td>
<td>80.05</td>
<td></td>
<td>0.98</td>
</tr>
<tr>
<td>Intervention</td>
<td>75</td>
<td>75.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/primary care presentations Control</td>
<td>80</td>
<td>73.34</td>
<td></td>
<td>0.17</td>
</tr>
<tr>
<td>Intervention</td>
<td>75</td>
<td>82.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td><strong>155</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As in the parametric analysis, the results of the Mann–Whitney U test showed almost the same results between the control and intervention groups. The control group had an average rank of 76.28, while the intervention group had an average rank of 79.84
for the FKNS-14, and approximately the same for the FMPS-10 and the ED/primary care presentations. No significant difference was recorded (P>0.05), (see Table 20 above).

As explained in Chapter Seven, there was a three-month gap between the pre- and the post-survey. Analysis using the participants who had completed the follow-up survey (n=46) follows.

The following results relate to the testing of the study hypotheses. The major hypotheses to be tested were identified as: parents/carers with limited or functional health literacy who receive a health literacy modified fever education program (brochure and DVD) will demonstrate:

(i) Increased fever knowledge (as measured by the Fever Knowledge Scale)

(ii) Increased ability to manage fever at home using physical and pharmacological approaches of fever management (as measured by the Fever Management Practices Scale);

(iii) And reduced ED/primary care presentations;

compared with parents/carers with limited or functional health literacy receiving an existing Fever Fact Sheet.

8.5.2. Planned contrasts for primary and secondary outcome measures for the final sample (n=46).

In keeping with the F-RCT design, four sets of planned, orthogonal contrasts were written and have been used. Planned contrasts in one-way ANOVA were conducted
to examine whether there were statistically significant differences among participants within four possible groups in relation to the study outcomes. Participants were assigned groups as follows:

- Group (A) parents/carers with LHL within the control group
- Group (B) parents/carers with LHL within the intervention group
- Group (C) parents/carers with FHL within the control group
- Group (D) parents/carers with FHL within the intervention group

Groups involved in the contrast were assigned opposite values ($1$, $-1$). Groups not involved in the contrast were given zero value to allow the comparison (Ruxton & Beauchamp, 2008; Thompson, 2013), (see Table 21 below).

TABLE 21  CONTRAST COEFFICIENTS

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>-1</td>
</tr>
</tbody>
</table>

*Note:* A=Group A LHL Control; B=Group B LHL Intervention; C=Group C FHL control; D=Group D, FHL Intervention.

Table 21 demonstrates the four different contrasts tested:

- Contrast (1) = Group A (1) versus Group B (-1), excluding Group C and D (0).
- Contrast (2) = Group C (1) versus Group D (-1), excluding Group A and B (0).
- Contrast (3) = Group A (-1) versus Group C (1), excluding Group B and D (0).
- Contrast (4) = Group B (1) versus Group D (-1), excluding Group A and C (0).
The initial descriptive analysis for the four groups in relation to the study outcomes FKNS-14, FMPS-10 and the ED/primary care presentations appears in Table 22.

Table 22 Descriptive analysis of Groups (A, B, C, D) for the mean difference for the FKNS-14, FMPS-10, and ED/primary care presentations

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Group</th>
<th>N</th>
<th>MD</th>
<th>SD</th>
<th>Std. Error</th>
<th>95% CI for Mean Lower</th>
<th>95% CI for Mean Upper</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14</td>
<td>A</td>
<td>7</td>
<td>1.71</td>
<td>3.68</td>
<td>1.39</td>
<td>-1.69</td>
<td>5.12</td>
<td>-4.0</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>3</td>
<td>0.66</td>
<td>2.08</td>
<td>1.20</td>
<td>-4.50</td>
<td>5.83</td>
<td>-1.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19</td>
<td>0.78</td>
<td>2.20</td>
<td>0.50</td>
<td>-0.27</td>
<td>1.85</td>
<td>-4.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>17</td>
<td>0.11</td>
<td>3.10</td>
<td>0.75</td>
<td>-1.47</td>
<td>1.71</td>
<td>-6.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td>0.67</td>
<td>2.76</td>
<td>0.40</td>
<td>-0.14</td>
<td>1.49</td>
<td>-6.0</td>
<td>8.0</td>
</tr>
<tr>
<td>FMPS-10</td>
<td>A</td>
<td>7</td>
<td>1.28</td>
<td>1.79</td>
<td>0.68</td>
<td>-0.37</td>
<td>2.94</td>
<td>-2.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>3</td>
<td>0.00</td>
<td>3.00</td>
<td>1.73</td>
<td>-7.45</td>
<td>7.45</td>
<td>-3.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19</td>
<td>1.00</td>
<td>2.18</td>
<td>0.50</td>
<td>-0.05</td>
<td>2.05</td>
<td>-4.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>17</td>
<td>0.88</td>
<td>1.86</td>
<td>0.45</td>
<td>-0.07</td>
<td>1.84</td>
<td>-2.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td>0.93</td>
<td>2.01</td>
<td>0.29</td>
<td>0.33</td>
<td>1.53</td>
<td>-4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>A</td>
<td>7</td>
<td>1.85</td>
<td>2.79</td>
<td>1.05</td>
<td>-0.727</td>
<td>4.44</td>
<td>-1.0</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>3</td>
<td>1.33</td>
<td>5.77</td>
<td>3.33</td>
<td>-13.0</td>
<td>15.6</td>
<td>-2.0</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19</td>
<td>1.47</td>
<td>3.30</td>
<td>0.75</td>
<td>-0.119</td>
<td>3.06</td>
<td>-4.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>17</td>
<td>1.11</td>
<td>2.05</td>
<td>0.49</td>
<td>0.05</td>
<td>2.17</td>
<td>-2.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td>1.39</td>
<td>2.90</td>
<td>0.42</td>
<td>0.52</td>
<td>2.25</td>
<td>-4.0</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Note: A=Group A LHL Control; B=Group B LHL Intervention; C=Group C FHL control; D=Group D, FHL Intervention.

The above table shows the mean difference of each outcome measure and the standard deviations for each group (A, B, C and D) in relation to three outcomes. First is the difference in mean between groups in relation to improvement in FKNS-14 scale, which ranged from no improvement or negative response (-6 correct answers) in Group D to improvement by eight correct answers in Group A. The second outcome is the mean difference in the FMPS-10 score, which ranged from no improvement or negative effect (-4 correct answers) in Group C to improvement by six correct answers in the same group. For the third outcome, the mean difference in number of ED/primary care presentations ranged from increasing the average number of presentations to four (-4) in Group C or decreasing the mean number of
presentations to nine lower than before the intervention in the same group. To test whether the difference between or within groups improvement in relation to the outcome measures was statistically significant or not, planned contrasts were conducted.

The result of Levene’s test indicates that the equal variances assumption is met for the three outcomes (p=0.04, 0.9, and 0.6 for FKNS-14, FMPS-10, and ED/primary care presentations respectively). See Appendix 16, (table 16-1). Table 23 next presents results based on when equal variances is assumed.

Table 23 ANOVA for between and within groups on the mean differences for FKNS-14 scores, FMPS-10 scores and ED/primary care presentations

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. (2-tailed)</th>
<th>Adjusted P</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>13.0</td>
<td>3</td>
<td>4.36</td>
<td>0.55</td>
<td>0.64</td>
<td>1</td>
</tr>
<tr>
<td>Within Groups</td>
<td>331</td>
<td>42</td>
<td>7.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>344</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMPS-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>3.61</td>
<td>3</td>
<td>1.20</td>
<td>0.28</td>
<td>0.83</td>
<td>1</td>
</tr>
<tr>
<td>Within Groups</td>
<td>179</td>
<td>42</td>
<td>4.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>182</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>2.93</td>
<td>3</td>
<td>0.97</td>
<td>0.10</td>
<td>0.95</td>
<td>1</td>
</tr>
<tr>
<td>Within Groups</td>
<td>378</td>
<td>42</td>
<td>9.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: P value adjusted using Bonferroni correction at the 0.05 level of significance. 1 refers to 0.99 recurring.

Results of the one-way ANOVA revealed that there was no statistically significant differences between groups for the three outcomes measures (F (3, 42) = 0.5, p= 0.6) for the FKNS-14 scale, (F (3, 42) = 0.2, p= 0.8) for the FMPS-10, and (F (3, 42) = 0, 10, p= 0.9) for the ED/primary care presentations.
The planned contrasts presented next gives the statistics of each contrast (1, 2, 3, and 4), in relation to the outcome measure, (see Table 24).

Table 24  Planned contrasts for four groups

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Contrast</th>
<th>Value of Contrast</th>
<th>Std. Error</th>
<th>T</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Adjusted P</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14</td>
<td>1</td>
<td>1.04</td>
<td>1.93</td>
<td>0.54</td>
<td>42</td>
<td>0.59</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.67</td>
<td>0.93</td>
<td>0.71</td>
<td>42</td>
<td>0.47</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-0.92</td>
<td>1.24</td>
<td>-0.74</td>
<td>42</td>
<td>0.46</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.54</td>
<td>1.75</td>
<td>0.31</td>
<td>42</td>
<td>0.75</td>
<td>1</td>
</tr>
<tr>
<td>FMPS-10</td>
<td>1</td>
<td>1.28</td>
<td>1.42</td>
<td>0.90</td>
<td>42</td>
<td>0.37</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.11</td>
<td>0.68</td>
<td>0.17</td>
<td>42</td>
<td>0.86</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-0.28</td>
<td>0.91</td>
<td>-0.31</td>
<td>42</td>
<td>0.75</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>-0.88</td>
<td>1.29</td>
<td>-0.68</td>
<td>42</td>
<td>0.49</td>
<td>1</td>
</tr>
<tr>
<td>ED/primary care</td>
<td>1</td>
<td>0.52</td>
<td>2.07</td>
<td>0.25</td>
<td>42</td>
<td>0.80</td>
<td>1</td>
</tr>
<tr>
<td>presentations</td>
<td>2</td>
<td>0.35</td>
<td>1.00</td>
<td>0.35</td>
<td>42</td>
<td>0.72</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-0.38</td>
<td>1.32</td>
<td>-0.28</td>
<td>42</td>
<td>0.77</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.21</td>
<td>1.87</td>
<td>0.11</td>
<td>42</td>
<td>0.90</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: *P value adjusted using Bonferroni correction at the 0.05 level of significance. 1 refers to 0.99 recurring.

Note: A=Group A LHL Control, B=Group B LHL Intervention; C=Group C FHL control; D=Group D, FHL Intervention.

Contrast (1) = Group A (1) versus Group B (-1), excluding Group C and D (0).
Contrast (2) = Group C (1) versus Group D (-1), excluding Group A and B (0).
Contrast (3) = Group A (-1) versus Group C (1), excluding Group B and D (0).
Contrast (4) = Group B (1) versus Group D (-1), excluding Group A and C (0).

The planned contrasts analysis revealed that there is no statistically significant difference in any of the four contrasts in relation to the study outcomes.

Additionally, individual groups to all groups’ comparison in relation to outcome measures have also been analysed in ANOVA using the planned contrasts and also found no significant difference (see Appendix 18).

Given the small numbers of cases in the individual groups within the factorial design, further analyses were conducted with only two groups – an intervention and control group.
8.5.3. Group differences (n=46) Control and Intervention for Outcome Measures (FKNS, FMPS, ED/Primary care presentations).

As previously noted, data were not normally distributed; therefore, parametric and non-parametric procedures were used.

**Parametric**

To test the group differences within the intervention and control groups (pre-post using the parametric approach), the paired sample T-test was appropriate, as in Table 25 below.

**Table 25 Comparison group mean differences (pre-post) (n=46)**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Control n=26</th>
<th></th>
<th></th>
<th></th>
<th>Intervention n=20</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>M value</td>
<td>95% CI</td>
<td>Pre</td>
<td>Post</td>
<td>M value</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>M</td>
<td>Adj P</td>
<td>low</td>
<td>M</td>
<td>M</td>
<td>Adj P</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>SD</td>
<td></td>
<td>Up</td>
<td>SD</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>FKNS-14</td>
<td>7.38</td>
<td>8.4</td>
<td>0.05</td>
<td>1.03</td>
<td>-2.1</td>
<td>0.02</td>
<td>8.35</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>0.1</td>
<td></td>
<td></td>
<td>3.1</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>FMPS-10</td>
<td>4.3</td>
<td>5.3</td>
<td>0.013</td>
<td>1.07</td>
<td>-1.9</td>
<td>-0.24</td>
<td>4.45</td>
</tr>
<tr>
<td></td>
<td>1.5</td>
<td>2</td>
<td>0.04</td>
<td></td>
<td>1.9</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>3.7</td>
<td>2.1</td>
<td>0.016</td>
<td>-1.57</td>
<td>0.31</td>
<td>2.84</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>0.04</td>
<td></td>
<td></td>
<td>2.69</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* Paired Sample T-test, P value adjusted using Bonferroni correction at the 0.05 level of significance. 1 refers to 0.99 recurring. Total possible maximum score for the fever FKNS score is 14, and for the FMPS score is 10.
Results from the paired sample T-test showed that participants in both the control group and the intervention group improved in their scores on FKNS-14, FMPS-10 and ED/primary care presentations. However, participants in the control group (n=26) demonstrated a significant improvement in all outcome measures FKNS-14, FMPS-10 and ED/primary care presentations (p=0.05, 0.01 and 0.01) before Bonferroni adjustment of the p value. However, the significant improvement within the control group for the FKNS-14 measure was lost after the p value was adjusted; although it should be noted that both FMPS-10 and ED/primary care presentations improved, p=0.04 for both outcome measures, and these remained statistically significant. The improvement within the intervention group (n=20) was not statistically significant; p>0.05 for any outcome measures.

Although the results showed an improvement in the study outcomes for both groups, overall FKNS-14 scores and FMPS-10 scores remained poor. The mean difference in the number of correct answers after the intervention also remained poor (control is MD=1.03, intervention MD=0.2) for the FKNS-14, and for the FMPS-10 (control is MD=1.07, intervention MD=0.75). Note that Table 25 demonstrates that participants answered approximately half of the questions correctly in the pre- and the follow-up survey.

Non-Parametric

The group differences between pre- and post-survey intervention were analysed using the Wilcoxon signed-rank test (non-parametric procedure), (see Table 26).
The analysis of the Wilcoxon signed-rank test showed an overall statistically significant improvement for the three outcome measures: FKNS-14 score (p=0.05), FMPS-10 score (p=0.01) and reduction in ED/primary care presentations (p=0.02) for the control groups before adjustment. The improvement that was statistically significant remains only for the FMPS-10 (p=0.04) within control group after p value adjustment. On the other hand, the improvement was not statistically significant for the intervention groups (p=0.62, 0.12 and 0.08) respectively for the three outcomes measures.
8.5.4. Differences between groups (n=46)

**Parametric**

An independent sample T-test was used to identify whether there was any mean difference between participants in the control and intervention group, (see Table 27).

**Table 27 Difference in means between groups (n=46)**

<table>
<thead>
<tr>
<th>Scale difference</th>
<th>Control Group</th>
<th>Intervention Group</th>
<th>MD</th>
<th>95% CI</th>
<th>P value</th>
<th>Adjusted P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FKNS-14</td>
<td>1.03 (2.6)</td>
<td>0.2 (2.9)</td>
<td>0.83</td>
<td>-0.84</td>
<td>2.49</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>0.83 (2.9)</td>
<td>0.83 (2.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMPS-10</td>
<td>1.07 (2.05)</td>
<td>0.75 (1.99)</td>
<td>0.32</td>
<td>-0.88</td>
<td>1.5</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>0.32 (1.99)</td>
<td>0.32 (1.99)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/primary care</td>
<td>-1.5 (-3.1)</td>
<td>1.15 (2.66)</td>
<td>0.42</td>
<td>-1.29</td>
<td>2.14</td>
<td>0.67</td>
</tr>
<tr>
<td>presentations</td>
<td></td>
<td>0.42 (2.66)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: P value adjusted using Bonferroni correction at the 0.05 level of significance. 1 refers to 0.99 recurring.*

Both the control and intervention groups showed improvement in FKNS-14 (MD = 1.03, 0.2) and FMPS-10 (MD=1.07, 0.75), and a reduction in ED/primary care presentations (MD =-1.57 and -1.15 respectively). The difference between groups, however, is not statistically significant ( >0.05).

**Non-Parametric analysis**

The Mann–Whitney U Test was used to ascertain whether there any differences in mean ranks between control and intervention group, (see Table 28).
Table 28 Differences in means between groups (n=46) Mann–Whitney U Test

<table>
<thead>
<tr>
<th>Scale difference</th>
<th>Group</th>
<th>n=46</th>
<th>Mean Rank</th>
<th>P value</th>
<th>Adjusted P</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14</td>
<td>Control</td>
<td>26</td>
<td>24.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>20</td>
<td>22.30</td>
<td>0.58</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMPS-10</td>
<td>Control</td>
<td>26</td>
<td>24.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>20</td>
<td>21.78</td>
<td>0.43</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/primary care presentations</td>
<td>Control</td>
<td>26</td>
<td>24.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>20</td>
<td>22.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td></td>
<td>0.67</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: U value adjusted using Bonferroni correction at the 0.05 level of significance.

As in the independent T-tests, the Mann–Whitney U Tests showed no significant difference in mean rank (p > 0.05) between control and intervention groups. The mean rank of study outcomes (fever knowledge FKNS-14, anticipated fever management practices FMPS-10, and ED/primary care presentations) was similar.

To complete the analysis, potential confounding variables were examined.

8.6. Confounding factors

8.6.1. Correlation

Pearson correlation analysis was conducted to test whether there was a relationship between sociodemographic variables and the outcome variables (FKNS-14 score, FMPS-10 score, and number of ED/primary care presentations). Participants’ sociodemographic variables were coded into a dichotomous form. These were age (30 years and younger = 0, and older than 31 years = 1), country of birth coded to (0 = born outside Australia, 1 = Australian born), HL level (0 = limited, 1 = functional), intervention group (0 = control, 1 = intervention), language spoken at home (0 = not English, 1 = English), education (0 = high school or less, 1 = more than high school),
employment (0 = not working, 1 = working) and number of children (0 = two or less, 1 = more than two). All variables were either dichotomous or continuous in nature. Results reported here (see Table 29) are those values that have a significant correlation, either positive or negative.
Table 29  Correlation Coefficient Matrix of Variables that have a significant correlation with the study outcomes (n=46)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intervention group</td>
<td>Pearson Correlation 1</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Pearson Correlation 0.31</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Parents/carers’age</td>
<td>Pearson Correlation 0.12</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Pearson Correlation 0.14</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Parents/carers’country of birth</td>
<td>Pearson Correlation 0.16</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. HL status</td>
<td>Pearson Correlation 0.14</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Language spoken at home</td>
<td>Pearson Correlation 0.16</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6. Pre number of ED/primary care presentations</td>
<td>Pearson Correlation -0.12</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>7. Post number of ED/primary care presentations</td>
<td>Pearson Correlation -0.23</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8. Pre FKNS-14 score</td>
<td>Pearson Correlation 0.17</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9. Post FKNS-14 score</td>
<td>Pearson Correlation 0.02</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10. Pre FMPS-10 score</td>
<td>Pearson Correlation 0.04</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Post FMPS-10 score</td>
<td>Pearson Correlation 0.05</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Difference in FKNS-14 score</td>
<td>Pearson Correlation -0.15</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Difference in FMPS-10 score</td>
<td>Pearson Correlation -0.08</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Difference in number of ED/primary care presentations</td>
<td>Pearson Correlation -0.07</td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
c. Listwise deletion N=46
The above correlation matrix reveals that among parents’/carers’ demographics, there was a significant and strong positive relationship between parents’/carers’ country of birth and parents’/carers’ HL status ($r=0.52$, $p<0.001$), as well as between parents’/carers’ country of birth and language spoken at home ($r=0.83$, $p<0.001$). Likewise, the same pattern existed between parents’/carers’ HL status and language spoken at home ($r=0.60$, $p<0.001$). These findings would be expected, as persons born overseas are likely to use English as second language at home, and correspondingly, their HL status is likely to be lower than Australian-born parents/carers or those who use English as their first language at home.

Between the outcome measures, results of the correlation table showed a significant and positive relationship between pre FKNS-14 and post FKNS-14 ($p<0.001$), which would be expected. Similarly, the relationship between pre- and post- FKNS-14 was moderately related ($r=0.60$). Likewise in the FMPS-10 domain, results revealed a significant and positive relationship between pre- and post- FMPS-10 ($p=0.02$), which would also be expected. Again, the relationship between pre- and post- FMPS-10 was moderate ($r=0.32$). As expected, the post FKNS-14 score and post FMPS-10 score ($p<0.001$) were moderately related ($r=0.44$).

The mean difference in the FMPS-10 score was related to the mean difference in the FKNS-14 score ($r=0.19$, $p<0.001$). The mean difference in number of ED/primary care presentations and the mean difference in the FMPS-10 were positively correlated ($r=0.28$, $p=0.055$).

Between the sociodemographic variables and the outcome measures, the correlation revealed that the only significant correlation was between the difference in mean FMPS-10 scores and the language spoken at home ($r=-0.28$, $p=0.05$).
Given that there was no significant relationship between sociodemographic factors and the outcome variables, and there was no significant effect of the intervention, no further regression analyses were undertaken.

8.7. **Summary**

Results detailed in this chapter demonstrate that there were 155 participants in the pre-survey stage, and 46 participants in the follow-up survey. Characteristics of participants were similar in all study groups at both stages pre-survey and post-survey. However, the number of LHL participants was very small in both groups. Results revealed that participants with LHL demonstrated a higher number of correct answers than participants in the FHL group. Participants’ responses in most of the survey items were similar to previous studies in relation to fever and its management in children.

Health literacy groupings were considered as originally designed, although the number of participants in the follow-up survey was small, and orthogonal planned contrast demonstrated no significant differences. Participants in both the control group and the intervention group improved in their scores in all the outcome measures; however, the only statistically-significant improvement was in the anticipated fever management practices and ED/primary care presentations for the control group.

No statistically significant relationship was found between sociodemographic factors and the outcome variables; hence no further regression analyses were undertaken. The next chapter will examine these findings in relation to the existing literature.
Chapter Nine

9. Discussion and conclusion

9.1. Introduction

Fever in children is considered to be one of the most common causes for parents/carers to present to the ED and seek medical assistance for their child (Baker et al., 2009; El-Radhi, 2008; McIntyre, 2011; Pereira et al., 2013). Furthermore, parents’/carers’ distress and poor knowledge of fever can result in the inappropriate use of antipyretics and other physical methods to control the condition, leading to unnecessary presentations to the EDs and other primary care facilities (Chiappini, Parretti et al., 2012; McIntyre, 2011).

As in other children’s illnesses, educating parents/carers is the best way to help parents/carers manage their febrile child appropriately (Baker et al., 2009; Chiappini, Parretti et al., 2012). Despite the widespread introduction of fever education programs to improve parents’/carers’ fever management, and to effect a change in practices in relation to the management of a febrile child, this researcher searched the literature and found no fever education program that considered the issue of LHL in parents/carers. This study is therefore the first in Australia that has produced a health literacy modified fever education program that seeks to improve parents’/carers’ fever knowledge and anticipated fever management practices, and thereby seeks to reduce inappropriate ED/primary care presentations.

This chapter integrates the findings of this study with previous similar study findings. The strengths and weaknesses of the research in this study are emphasised, the implications for practice are defined, and suggestions for future research are outlined. Recommendations for education and practice are described.
As the focus of this study was on supporting parents/carers with LHL status, Campbelltown Hospital was selected as an appropriate site due to the high proportion of patients with low literacy levels – 50.2% of the Campbelltown City population have no qualifications above high school level, while 20% of residents were born overseas or have English as a second language (Campbelltown City Council, 2011).

In an effort to confirm the frequency of child fever presentations within the Campbelltown ED, an initial study was undertaken using existing ED data.

_Fever presentations in the ED_

Secondary analysis of FirstNet data at Campbelltown Hospital found that 1,581 children presented to the ED with fever during the 2011 calendar year (January to December inclusive). Findings from this analysis were useful to determine the target population for the trial as children aged between three months and five years, were the age group most prone to fever (NICE, 2007; Nijman et al., 2010). Winter months – June to August inclusive in Australia – were targeted for the data collection process as they were found to have the highest number of total presentations (33% of the sample). This analysis clarifies that child presentations to ED were deemed to be non-urgent (68%) and may have been managed at home or by attending a primary care facility. This preliminary study confirmed the importance of the trial and defined the data collection months.
Participants in the trial

This study examined parents/carers attending a busy metropolitan ED in Sydney. The characteristics of the sample (age, country of birth, employment status, gender, HL status, language spoken at home, number of children, occupation, and number of ED/primary care presentations) provided a broad representation of the diversity of families residing in the region covered by South Western Sydney Local Health District.

The sociodemographic aspects of this study’s participants were comparable to those in the data collected by the Australian Bureau of Statistics for the Campbelltown municipality (Campbelltown City Council, 2011) where the study was conducted. According to the Census of Population and Housing 2011 (Australian Bureau of Statistics, 2011b), for example, approximately 25.2% of people who live in the Campbelltown area use English as a second language at home (Australian Bureau of Statistics, 2011b), compared to 22.7% in this study. Similarly, 28% were born overseas compared to 29% in this study, and 41% of Campbelltown residents have completed Year 12 compared to 53.3% in this study.

Although the sample targeted parents/carers with LHL, in this study only a small number of participants demonstrated LHL (pre-survey 33 participants, follow-up survey 10 participants, 21%). The study was conducted in a high-risk area where the majority of the population was identified as having poor literacy levels (Campbelltown City Council, 2011). It was therefore surprising that only 21% of the sample demonstrated a LHL status, especially given that the Australian Bureau of Statistics reports up to 60% of Australians with a LHL status (Australian Bureau of Statistics, 2006).
The disparity between the number of LHL participants in this study and the ABS figures could be attributable to a variety of factors. First, previous studies have asserted that people with LHL may have limited access to primary care facilities and EDs (Berkman et al., 2011; Betz et al., 2008). In other words, well-educated people, or those with FHL, are more likely to use EDs and primary care facilities than LHL groups (Berkman et al., 2011). Consequently, the small number of participants with LHL in hospital-based research may not represent the distribution of individuals with LHL across the Australian population.

Second, study settings and HL tools can also affect research outcomes (Barber et al., 2009; Jordan, 2010; Matsuyama et al., 2011). Put simply, different tools deliver different results. The current study was conducted in different settings using different HL tools in comparison to ABS settings and HL tools. The ABS used The Adult Literacy and Life Skills Survey (ALLS) to measure participants' level of HL. The ALLS has a satisfactory reliability (alpha=0.81) (Murray, Clermont, & Binkley, 2005). The survey contains 191 items distributed in five different domains: health promotion (60 items), health protection (65 items), disease prevention (18 items), healthcare and disease management (16 items) and finally systems navigation (32 items). The ALLS requires participants to read, write, fill in gaps and match words in a no time limit context, normally conducted in residential areas/streets. To measure HL, the ALLS uses a scale with scores that range from 0 to 500 points across five levels of HL. Level 1 (0–225) represents the lowest level of proficiency and Level 5 the highest (376–500).

The REALM-SF used in this study is also a reliable tool, featuring only three categories based on the number of words pronounced correctly: a total correct of 0–3 indicates inadequate level of HL, a total correct of 4–6 indicates marginal HL and
total correct score of seven indicates an adequate HL level (Arozullah et al., 2007). Three levels present less of a range than the five levels within the ALLS. In this study, two discrete levels for the REALM-SF were used— LHL scores ≤five and FHL scores six or more. Only 9 participants (pre-survey) and 2 (post-survey) had a score of six which may have resulted in their inclusion in the FHL group. Seventy-three percent of participants had a score of seven or more (113/155) (pre-survey). Very few participants fell in the 4-6 marginal HL band ( 31/155;20%) and further research on the utility of two or three levels is recommended. For the purposes of this study a two level approach was required.

This low percentage of patients with LHL is consistent with other Australian studies. A cross-sectional survey was conducted on 2,824 South Australians in 2008 using a valid HL tool - the Newest Vital Sign (NVS) - identified 24% of participants with LHL (Adams, Appleton et al., 2009). Another study from Victoria used 310 randomly selected participants, finding that approximately 25% of Australians have a less than adequate HL status (Barber et al., 2009).

In addition, research has demonstrated the fact that using different HL tools can yield varied results in terms of distinguishing between people’s HL status. In Barber’s et al., (2009) study a number of literacy measurements tools were used – NVS, REALM and TOFHLA – and produced different findings in relation to participants’ HL status within the same sample. The results were 25.9% (80/308) for the NVS, 13.2% (51/310) for the REALM and 6.8% (21/309) for the TOFHLA with LHL. This is consistent with international studies. Research by Matsuyama et al. (2011) found that 86% of the participants had adequate level of HL using STOFHLA, while 62% within the same sample had a high level of HL using the REALM.
Another American study of 204 HIV infected patients found that only one third of the participants have limited literacy skills, while 11.3% have lower literacy levels and 20.1% have a marginal literacy status (Osborn, Davis, Bailey, & Wolf, 2010). Results from the Matsuyama et al. (2011) and Osborn et al. (2010) studies did not match the results from National Assessment of Adult Literacy in America (NAAL, 2003), the latter of which reported that 47% of Americans have LHL skills. Accordingly, study setting and sample and HL tools will affect the estimation of the sample or population level of health literacy.

**Other sample issues**

This study initially included 155 participants in the pre-survey with most parents/carers agreeing to participate in the study (98.1%); however, there was a substantial loss of participants at the follow-up survey (n=46; 29%). Although some data have been presented using the 155 participants, the key hypothesis of this study was analysed using the lesser sample of 46 participants. While the large loss to follow-up group was unexpected, it is nevertheless a common feature in studies of this kind (Bell, Kenward, Fairclough, & Horton, 2013; Rudd et al., 2009). In the current study, the loss of participants at follow-up was consistent across both the intervention and control groups (control group n=79 to n=26 and intervention group n=76 to n=20). Bias is therefore at a minimum as the loss to follow-up at the post-survey was similar in both groups (Bell et al., 2013). Accordingly, estimates of the effectiveness of the intervention are appropriate within some limitations.
9.2. **Measuring parents’/carers’ fever knowledge and anticipated fever management practices**

The instruments used to measure participants’ fever knowledge and anticipated fever management practices were adopted from published and validated questionnaires on parental knowledge and management of fever in children (Matziou et al., 2008; Sakai et al., 2009; Sarrell & Kahan, 2003; Walsh et al., 2008). The contents of the education program converted to a simple language, medical jargon avoided and complex word changed to simple. The use of simple words ensures that participants can understand the question regardless of their HL status, which will hopefully result in better responses. Although most studies have used items related to fever knowledge and management practice as unique items (Matziou et al., 2008; Sakai et al., 2009; Sarrell & Kahan, 2003; Walsh et al., 2008), this study sought to provide the most reliable measure of fever knowledge and practice using an internally consistent measure. However, the reliability for the initial items for both scales (FKNS=25 and FMPS=15) was modest to unsatisfactory respectively. Further research should focus on developing a reliable and valid instrument to measure fever knowledge and anticipated fever management practices.

In addition, the adopted instrument was not direct in distinguishing the difference between levels of fever; this could create some confusion for the participants. For example, there were five different questions about degree of fever, including what temperature is: *normal for your child, fever for your child, high fever for your child, very high fever for your child, and may cause harm to your child*. The study consisted of two different age groups, meaning that the questions were asked twice: once for a child aged between three and six months, and once for a child aged between seven months and five years. Differences exist in the level of fever for the
differing age groups; for example, a temperature of 39°C is considered a very high temperature for children aged three to six months, while the same temperature is considered a moderate fever for children between seven months and five years (NICE, 2007, 2013; NSW Department of Health, 2010).

Furthermore, the outcome measures from FKNS and FMPS are self-reported measures (Walsh et al., 2008). It was difficult to be certain of the results collected from the participants, and whether participants answered the questions the way that they felt the question should be answered, in which case their responses may well deviate from their home practice (Polit & Beck, 2010). In some studies, self-reported measurements have been shown to inaccurately present the findings (Galesic et al., 2009). This issue is more important when asking participants about potentially undesirable traits (Polit & Beck, 2010).

9.3. Fever knowledge and anticipated fever management practices

Overall, the scores or the number of correct answers were poor within both groups.

Despite the fact that participants in both groups showed improvement in the study outcomes, the overall performance on certain items for both groups in relation to the FKNS-14 score and FMPS-10 score was poor. Results demonstrated that participants answered approximately half of the questions correctly in the pre- and the follow-up survey for both scales FKNS-14 score and FMPS-10 score. The percentage of correct and incorrect responses to items was nonetheless similar to that demonstrated in other international studies that have used several of the same items (Al-Eissa et al., 2000; Crocetti et al., 2001; Matziou et al., 2008; Walsh et al., 2008). For example, participants’ responses to Recognition of harmful fever (for children aged seven months to five years) were commonly wrong (80% to 90% incorrect) (Al-
Similarly, for items relating to If fever can cause brain damage, between 15% and 35% answered correctly (Al-Eissa et al., 2000; Walsh et al., 2008). Participants’ responses to correct fever management by removing excess clothing (72–84%) were high, which corresponded with Matziou et al. (2008), (see Appendix 17). There were, however, some exceptions to this understanding, including responses to items related to fever medication administration, and whether fever in children can cause dehydration.

The very low number of correct answers did raise questions about whether the DVD or brochure was examined as requested. No estimate of the frequency of viewing was obtained in this study. Further research should include measures of the frequency of viewing and an investigation into how useful the information had been for participants.

Some authors suggest that even with full and correct knowledge of the issues relating to fever management, there will still be parents/carers who believe that presenting at the ED or surgery is the preferred course of action (Matziou et al., 2008; Clinch & Dale, 2007; Walsh et al., 2008). Preference for visits to ED and other primary care facilities will always exist irrespective of the educational intervention, and may reflect parental concern, distress and uncertainty about diagnosis. Further qualitative research should focus on why parents/carers believe that attending the ED is required even for children with relatively low fevers.

In addition, participants with LHL were more frequently correct in their answers for the FKNS, while the opposite was true of the participants with FHL for the FMPS, (see Tables 14 and 15). However, both literacy groups demonstrate approximately
the same number of correct answers. This was an unexpected finding. Several studies have concluded that individuals with LHL could have similar or even better knowledge than those with FHL. For example, results from the Wallace et al. study (2009) into the self-management of diabetes showed that the improvement in diabetes-related measures was similar among intervention groups with different literacy levels. Participants with LHL skills in Wallace’s study demonstrated greater improvement (after reviewing the literacy-appropriate patient education material) in some items than participants with a higher HL status. Another randomised controlled trial, which investigated the impact of HL education programs on patients with chronic diseases, found that there was no significant difference in the clinical outcome for patients with varying literacy levels (Eckman et al., 2012).

**Effectiveness of the health literacy modified fever education program**

An F-RCT design was used to accommodate two levels of HL and the intervention and control features of the study. Initial analysis was undertaken using planned contrasts. The planned contrasts revealed no statistically significant difference between the four groups in any of the outcome measures \( p > 0.05 \). The hypotheses for Phase 3 were not supported. The small numbers within the LHL grouping in the follow-up survey for the intervention (n=3) and control groups (n=7) was a limitation. Given the small numbers of participants within the factors, and the violation of the underlying assumptions of planned contrasts, the sample was categorised into only two groups – intervention and control groups. Analyses were conducted with the pooled sample (including LHL and FHL participants into one grouping) receiving a health literacy modified fever education program for children, compared to the control group receiving the Fever Fact Sheet. The mean difference
between the intervention and control groups was examined and no significant
difference was detected in any of the outcome measures.

In the control group, the total score improved from 7.38 to 8.4 for the FKNS-14, and
was statistically significant before Bonferroni adjustment of the p value.
Approximately the same level of improvement can be seen for the FMPS-10 score,
and a reduction in the number of ED/primary care presentations occurred and
remained statistically significant after Bonferroni adjustment of the p value. On the
other hand, in the intervention group, the same pattern was noticed in improvement
(although to a lesser extent) of total FKNS-14 score (MD=0.02), total FMPS-10
score (MD=0.75), and total reduction in ED/primary care presentations (MD=1.15).
The improvement within the intervention group was not significant, however, in the
three outcome measures (P>0.05). The improvement within the control group was
higher than the improvement within the intervention group; both groups received an
intervention. The Fever Fact Sheet (control group) was found to be a useful fever
education tool. An accredited educational brochure, the Fever Fact Sheet has been
used across health services since 2009, (see Appendix 4).

The estimated power based on the knowledge test was 5% for a sample of 46, which
is well below what would be expected. Sample sizes of 2,000 parents/carers at
follow-up are required in order to adequately test these hypotheses, and are beyond
the available funding for this study.

The health literacy modified fever education program and the Fever Fact Sheet
contain similar critical information. In addition, the educational level for the Fever
Fact Sheet was tested and found to match seventh grade reading ability or less.
Seventh grade reading ability materials have been found by some authors to be
acceptable material for people with LHL (Yin et al., 2007). Accordingly, as illustrated, both interventions were a useful fever education tool for participants with varying HL skills, although only the Fever Fact Sheet has demonstrated significant differences. The Fever Fact Sheet has no pictorial signs or coloured pictures that represent key aspects of LHL educational material (Ferguson, 2012). The Fever Fact Sheet was designed for the general population, so does not target LHL parents/carers. It is important to note that there was no control group that did not receive an educational intervention; this differs from other fever education studies (Herman et al., 2009; Sarrell & Kahan, 2003). This feature of this study was a requirement that was stipulated by the ethics committee – that is, that all parents/carers received some fever education. This ensures unbiased interventions among different groups although this could have an impact on the study results.

This study found no significant difference between the intervention and control groups on any outcome measures, which corresponds to further examples in the HL literature. For example, an RCT investigating the impact of HL education programs on patients with chronic diseases found that there was no significant difference in the clinical outcome between the intervention and the control group (1.41 vs 0.81, respectively; p=0.07) (Eckman et al., 2012). Another RCT on arthritis patients found that a simple education program did not have a significant effect on the intervention group (Rudd et al., 2009). The results revealed that approximately the same improvement occurred between the intervention group (participants who received a simple education program) and the control group (participants who received the standard education program). Rudd et al. (2009) concluded that these results are due to the fact that patients’ experience with arthritis – and their arthritis knowledge –
steadily increased over time, rendering educational intervention and informational materials less effective/necessary for a cohort of more experienced patients.

On the other hand, a numerous number of low HL education programs were very useful, and returned a marked improvement. These have resulted in a range of positive outcomes such as improvements in patients’ self-efficacy, disease-related distress, self-reported behaviours and knowledge (Berkman et al., 2011; Robinson et al., 2008; Taggart et al., 2012). Other benefits were improvement in HL skills and a positive modification of poor health behaviours, including smoking, inadequate nutrition, excessive alcohol consumption, physical inactivity and weight issues (Ferguson, 2012; Hahn, Choi, Griffith, Yost, & Baker, 2011; Taggart et al., 2012).

Most studies that implemented education programs in the healthcare context aimed to introduce their interventions in a simple manner and to allow health consumers to more effectively utilise the presented health instructions.

Although the outcomes of this study are unexpected, considerable effort has been taken to strictly adhere to the CONSORT guidelines and other protocols and aspects of good practice when conducting RCTs. These aspects were considered as follows: the Health Literacy Modified Fever Education Program was designed using established techniques, the site selection was based on sound data on fever presentations derived from an examination of existing ED presentation data, experienced and well-trained data collectors were used, and education of ED staff was undertaken to ensure awareness of the trial. Other studies have emphasised the importance of educating the relevant staff about the study as an initial important step towards facilitating and supporting the data collection process (Edwards et al., 2009; Matsuyama et al., 2011; Rudd et al., 2009). This study also adhered to essential protocols of RCTs such as blinding and randomisation.
The development of the health literacy modified fever education program was a cornerstone in this study. This approach to developing health literacy modified material is recommended for other studies of this nature. A systematic approach was used to make the program simple and easy to understand. There were six steps in developing the program: defining the scope of information through an extensive literature review, selecting the medium for presenting health information, developing pictorial images to represent key points, using plain and syntactically simple language, assessing the readability level using established tools, and finally reviewing the prepared material by experts to establish the content validity of the education program, (see Chapter Five). The information used in the program (brochure and DVD) was sourced from existing studies and guidelines (Chiappini et al., 2009; Chiappini, Venturini et al., 2012; NICE, 2007, 2013; NSW Department of Health, 2010).

The education program is an evidence-based fever education tool that can be used by healthcare professionals to improve practice. The instructions in the program have been adopted from international guidelines, evidence-based practice information sheets, and systematic reviews in relation to fever and fever management. For example, the researcher used information from the National Institute for Health and Clinical Excellence (NICE, 2007) and its update (NICE, 2013), and a Summary of the Italian Pediatric Society Guidelines (Chiappini et al., 2009) and its update (Chiappini, Venturini et al., 2012). The evidence base for the acute management of fever was the NSW Department of Health (2010). This program provides the most up-to-date evidence on fever management.

The design of this program was based on other effective HL education programs (Kripalani et al., 2007; Rudd et al., 2009; Trifiletti et al., 2006). These low HL
education programs were found to be effective. Trifiletti et al. (2006) developed injury prevention materials for people with LHL skills in the following steps: literature review, adopting information, testing the readability of the material using a readability test, and finally revision of the prepared material by experts. In a pain management study, Kripalani et al. (2007) developed a medication bill card in three stages: background research, using pictures and simple language, and then review of the material by experts. All the materials given to the participants in the study (information sheets, consent forms, pre- and post-questionnaires, and the education program) have been tested to support a fifth grade reading level or less using the SMOG test. The practice of testing for the level of literacy should be encouraged for the development of any health information given or demonstrated to patients.

The innovative program proposed by this study (Alqudah, Johnson, Cowin, & George, 2014b) is also being deposited in the SWSLHD repository for access by all Australian health professionals. The applicability to local ED populations has been noted at local and national conferences such as Nursing and Midwifery Research Future Forums through UWS, with potential sites for future studies using larger samples of parents/carers with LHL.

This health literacy modified fever education program can be shown on television monitors in the EDs within local health services, and could potentially be viewed in other primary care settings where children present with fever. The program represents an excellent educational instrument for use in community settings, child care facilities, community health centres, and/or children’s zones in libraries (Alqudah et al., 2014b). Furthermore, this education program involving the DVD and brochure is accessible online for parents/carers and can currently be viewed at: http://www.sswahs.nsw.gov.au/services/canr/links.html
Choosing the site for data collection and staff training

Since approximately 20% of children’s cases reported to EDs are related to a febrile illness (Baker et al., 2009; Steere et al., 2003; Wammanda & Onazi, 2009), selecting a busy ED as the site for this study was appropriate, as it allowed easy recruitment of parents/carers with children experiencing fever. Access to the ED was greatly facilitated by the area health service, the Nurse Unit Manager and the Medical Director. The permission to access the triage FirstNet data system to identify patients from the listing was a huge advantage, as it afforded RNs a clear idea about the eligibility of the child to be involved in the study (age and complaint) before approaching the parents/carers.

Besides using the ED study site and the in-service sessions, three experienced ED nurses were recruited to assist with the data collection process. The nurses were trained on how to approach the possible participants, how to access FirstNet and how to administer the HL test. This training was essential to improve a nurse’s ability to carry out the recruitment process and to categorise participants into LHL or FHL groups, (see Appendix 9). Training the nurses is a common factor across other studies, and is an element that can determine the success or failure of the study (Matsuyama et al., 2011; Rudd et al., 2009). Inappropriate training and preparation can impact negatively on the number of study participants and thus reduce the sample size (Edwards et al., 2009).

To minimise any bias anticipated by participants, especially in conducting an HL test, RNs were trained in the correct way to approach and present the REALM-SF. Using an initial opening statement ‘We are studying medical word reading in order to improve communication between healthcare providers and patients’ proved
effective, and it should be noted that HL testing should at all times be conducted in a private environment.

This study used different strategies to capture and increase the number of participants in the post-survey (Edwards et al., 2009; Nakash, Hutton, Jørstad-Stein, Gates, & Lamb, 2006). Firstly, the follow-up questionnaire, along with a posted information sheet and a prepaid reply envelope, was sent by mail. After three weeks, a reminder letter and a new prepaid reply envelope along with another set of the post-survey were sent to participants who did not respond to the initial post. Subsequently, participants who did not respond to the reminder, and who had provided their email address, were sent a soft copy version of the post-questionnaire as a final strategy to maximise the number of participants in the follow-up. Although this study followed a systematic way of approaching the participants in the follow-up stage, a large number of participants were nevertheless lost at follow-up. The large drop out of participants in the follow-up survey may be caused by the three months interval between the pre and post survey (3 months) and the absence of a physical approach between researcher and participants- the pre-survey was conducted in the ED with face to face interactions between researchers and participants.

9.4. Limitations

This was the first study to consider issues of literacy in relation to fever management for children. Although every effort has been made to recruit sufficient participants with LHL, lower numbers than desired were obtained to test the intervention. Power estimation was initially set at 80% for 25% difference. Data collection at pre-survey was constrained by the available research funding, and approximately 50% of the expected sample was recruited. In addition, the 25% improvement estimated from
other studies (Herman et al., 2009; Sarrell & Kahan, 2003) was not achieved, with 0.2% to 1.15% improvement seen in this group. This disparity may be related to the fact that there were educational interventions for both groups, which was a requirement stipulated by the local ethics committee. Additionally, as previously noted, sample sizes of approximately 2,000 or over are required in order to adequately test the intervention.

Secondly, the measurement tools demonstrated limited internal consistency (FMPS) and concerns about the number of possible responses to an item made discrimination difficult. The researcher recommends that further studies consider designing and extensively testing a standardised fever knowledge scale and fever management practices scale. The limitations of self-report scales are also noteworthy (Galesic et al., 2009). No testing of the frequency of use by parents/carers of the education program was made, and nor were any data collected on the acceptability of the DVD and brochures used. Further, no method or items included in the post survey were used to clarify whether parents viewed the education program (DVD, and brochure). A recommendation for future study is to consider these points before presenting the post-questionnaires.

Additionally, the education program could be piloted in a parents’ group prior to this trial, rather than just an expert review undertaken by experienced health professionals. However, face validity was achieved through the use of the experienced health professional review. It could be more appropriate to pilot the study with experts as well as user groups prior to the clinical trial. Further research should carefully consider these aspects of evaluation for future fever educational intervention programs.
9.5. **Implications for clinical practice**

The current study revealed issues relating to a parents’/carers’ HL status, and the importance of presenting the health instructions in a simple manner. Individuals who use English as a second language may have more difficulty understanding English-based health instructions than people who use English as a first language (Australian Bureau of Statistics, 2006; Betz et al., 2008; Pleasant, 2011). Developing a low HL educational intervention in a multicultural nation such as Australia is of great importance (Nutbeam, 2009a). Most existing low HL education programs were developed and presented in countries such as the United States, where a multicultural population live (Betz et al., 2008; McLeod-Sordjan, 2011). With a population of 7.2 million (Australian Bureau of Statistics, 2011a), the state of New South Wales is reported to have approximately 200 different nationalities and at least 10 different ethnic groups using English as a second language at home: Hindi, Chinese (Mandarin), Lao, Arabic, Samoan, Filipino, Spanish, Italian, Greek and Bengali (Australian Bureau of Statistics, 2011a). Accordingly, using and applying the concept of HL education programs to suit the majority of clients can result in improvements in health outcomes.

Measuring a patient’s level of HL during ED visits is another finding that has implications in practice. No previous studies of this nature have been undertaken within an Australian context. The researcher believes that HL assessment has been demonstrated as being of equal importance as the taking of a patient’s vital signs. For this reason, the researcher proposes the measurement of HL as the sixth vital sign (Dunn, 2010). The ability to recognise individual HL levels will guide healthcare professionals in choosing the correct and most suitable printed health instructions for their patients (Coleman, 2011; Pleasant, 2011).
Both interventions in this study (the health literacy modified fever education program and the Fever Fact Sheet) are useful fever education tools, although only the Fever Fact Sheet has been found to yield statistically significant outcomes. However, the language used in the modified program is very simple and was designed to be intelligible to the general community; that is, easy to understand by individuals with a fifth grade reading ability level. It can therefore be adapted for and applied to different cultures and contexts. Plans are in place to translate this education program into other languages including Arabic, Bengali, Filipino, Greek and Indian.

The unique intervention in this study is of benefit for parents/carers and healthcare professionals alike. The education program will give health professionals and nurses in the ED ease and clarity when explaining the contents of the fever brochure, since the language is extremely straightforward and clear. Facilitating ED nurses in handling their educational responsibilities will save time and effort, and increase productivity, which in turn will lead to improvements in the quality of service provided. Healthcare professionals can use the information in the health literacy modified fever education program to update their knowledge regarding fever and the correct way of managing it. This approach is vital, as some previous studies have shown that nurses in ED maintain misunderstandings relating to child fever management (Poirier et al., 2010).

Even though there was no way of ensuring that participants in the study viewed the DVD and brochure, the portability of these tools is a distinct advantage. Parents/carers may view the DVD as an educational tool without assistance. The DVD can be provided with the brochure for patients to take home and view at their leisure. This feature allows parents/carers an opportunity to share the benefit with others, either in group contexts or individually. The program can be used as an
educational instrument in a variety of environments including community settings, child care facilities, community health centres, and children’s zones in libraries.

In comparison with other locally available fever brochures, the colourful presentation of the brochure in this study is attractive. It is well organised and the ideas presented are simple and consistent. All local emergency direct contact telephone numbers are provided. The DVD is compatible with most DVD players and computers. Nonetheless, the continued use of the Fever Fact Sheet in EDs is supported by this study.

9.6. Conclusion

This study confirmed that 68% of ED presentations for children with fever may have been effectively managed within the home; a finding that reinforces the extent of the problem of unnecessary attendance at ED. Future investigations undertaken by the researcher will focus on why parents/carers continue to attend ED. Such research will employ qualitative methods to devise further strategies to reduce this unnecessarily high number of presentations. These interventions are urgently required. Furthermore, this study consolidates the findings of previous research studies, and confirms that many parents/carers maintain a misunderstanding of fever and its symptoms. There was a significant discrepancy between how parents/carers evaluated their children’s symptoms, and the reality of the diagnosis.

The educational intervention developed within this study resulted in increased parent/carer knowledge about fever and its management. However, the Fever Fact Sheet has been found to be more effective fever education tool for parents/carers with varying levels of HL, and is recommended for continued use at SWSLHD. Further research with a larger sample may be undertaken in the future to confirm or
refute the effectiveness of the health literacy modified fever education program
developed within this study.

The F-RCT design was appropriately applied to test the intervention, although the
sample size at follow-up was insufficient to adequately test the hypotheses relating to
the HL component. Systematic techniques used in the development of the health
literacy modified fever education program were derived from other HL programs
and are recommended for researchers or educators developing such programs in the
future. The techniques used to measure the educational level of the material are also
recommended for any health professional developing material in multicultural
populations where English is a second language (SMOG). The use of plain language
is recommended and is indeed the cornerstone for the development of any health
education material. Brief and effective HL measurement tools have been used and
the REALM-SF is recommended for use in busy clinical settings such as ED.
Privacy and the use of a defined introductory sentence for the HL test REALM-SF to
appropriately engage the patient is supported.

This study contributes to the previous findings that health education intervention is a
continuous procedure rather than a single, discrete session or educational experience.
This study has proven that parents’/carers’ knowledge and management practices
about fever are overall very poor, and that there is an urgent need for improvement.
Further, the study confirmed that such an improvement in fever knowledge and fever
management practice will contribute to a reduction in the number of inappropriate
ED/primary care presentations. Nurses and other healthcare professionals need to
have a consistent and precise knowledge about fever and its management practice,
since they are the primary source of knowledge for parents/carers and other health
consumers. Moreover, findings from this thesis corroborate previous research that
nurses and health professionals need to cultivate the ability to recognise a client’s HL status, as this knowledge and professional expertise will act as a guide enabling them to deliver appropriate instructions.

The instrument used in this study demonstrated some limitations, and the application of further valid and reliable scales to measure fever knowledge and fever management practices is recommended. Fever knowledge and management practices remained poor, even with education for both the control and intervention groups. Educational studies should examine why this is occurring beyond what might be instruments with reduced internal consistency. Assumptions relating to HL and knowledge have been challenged by this study, and future researchers may wish to explore why high scores were found in certain knowledge areas for parents/carers with LHL, while other scores for parent/carers were found to be high for the FHL group.

Finally, the health literacy modified fever education program for parents/carers could reduce overcrowding at ED/primary care facilities, costly health delivery services and improve staff and patient satisfaction. Potential advantages include improved parent/carer confidence about managing their child’s fever at home or in a surgery, allowing ED resources to be diverted to patients with critical complaints. Ensuring the capacity for nurses and other healthcare professionals to measure and judge parent/carer HL status is advised prior to the development of healthcare instructions. Fever in children remains distressing for parents/carers and some other issues apart from education may prompt parents/carers to seek assistance from health professionals.
References


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10.1080/10810730.2011.605434


Opoku-A. K., and Brew-H. Aba. (2010). ‘Literacy is the ability to read and write English’: defining and developing literacy in basic schools in Ghana.


Streiner, D., & Geddes, J. (2001). Intention to treat analysis in clinical trials when there are missing data. *Evidence Based Mental Health*, 4(3), 70-71. doi: 10.1136/ebmh.4.3.70


<table>
<thead>
<tr>
<th>Consensus statement or guideline</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both oral and rectal method of checking a child’s body temperature should be avoided.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2007, 2013)</td>
</tr>
<tr>
<td>Mercury thermometers should be avoided because of the risk of mercury exposure if the thermometer breaks.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012)</td>
</tr>
<tr>
<td>Axillary method is recommended using digital thermometer in infants less than four weeks, and it is the recommended home use for all age groups.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2007, 2013);</td>
</tr>
<tr>
<td>In this age group, the most recommended routes are axillary using electronic thermometer, chemical dot thermometer in the axilla, and the infra-red tympanic thermometer.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2007, 2013)</td>
</tr>
</tbody>
</table>
Table 1-2 Antipyretic administration

<table>
<thead>
<tr>
<th>Consensus statement or guideline</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panadol and Ibuprofen are the only recommended antipyretics for use in children of all age groups.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NSW Department of Health, 2010)</td>
</tr>
<tr>
<td>The combination of Panadol and Ibuprofen is not recommended.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2013; NSW Department of Health, 2010)</td>
</tr>
<tr>
<td>Oral administration of Panadol is more recommended over rectal.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012)</td>
</tr>
<tr>
<td>Paracetamol is the only antipyretic to be used in newborns-four weeks old – 0 to 28 days- with fever.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012)</td>
</tr>
<tr>
<td>Ibuprofen use is not recommended in case of dehydration and, children having Kawasaki disease receiving acetylsalicylic acid therapy.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012)</td>
</tr>
<tr>
<td>Antipyretic use is not recommended to decrease fever in children undergoing vaccination.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012)</td>
</tr>
<tr>
<td>There is a lack of evidence in the literature to support antipyretic use to prevent child febrile convulsions.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2007, 2013)</td>
</tr>
</tbody>
</table>
Table 1-3 Correct antipyretic dose

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose (mg/kg)</th>
<th>Frequencies (Hours)</th>
<th>Max/day/Max/day/Max/day/Max/day/ (mg/kg)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panadol</td>
<td>12 to 15</td>
<td>6</td>
<td>60</td>
<td>(Chiappini et al., 2012; Purssell, 2011; Sarrell, Wielunsky, &amp; Cohen, 2006)</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>5 to 10</td>
<td>8</td>
<td>80</td>
<td>(Chiappini et al., 2012; Purssell, 2011; Sarrell et al., 2006)</td>
</tr>
</tbody>
</table>

Table 1-4 Non-pharmacological methods

<table>
<thead>
<tr>
<th>Consensus statement or guideline</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lukewarm sponge or bath may make the child feel more comfortable.</td>
<td>(JBIEBNM, 2004)</td>
</tr>
<tr>
<td>Increase fluid intake is recommended when the child appears dehydrated.</td>
<td>(JBIEBNM, 2004; NSW Department of Health, 2010)</td>
</tr>
<tr>
<td>Breast milk is the most appropriate fluid for a breastfed child.</td>
<td>(NICE, 2007, 2013)</td>
</tr>
<tr>
<td>Undress your child from excess clothing or wrappings.</td>
<td>(JBIEBNM, 2004)</td>
</tr>
<tr>
<td>Not recommended physical methods include, bathing, sponge baths, exposure to cold air, application of cooling blankets or ice bags and rubbing the body with alcohol.</td>
<td>(Chiappini et al., 2009; Chiappini et al., 2012; NSW Department of Health, 2010)</td>
</tr>
</tbody>
</table>
Appendix 2 Children’s Fever Brochure

(See next page)
Managing Your Child’s Fever

SEEKING HELP

The following Hospitals in Western & South Western Sydney have a 24 hour Emergency Service

Auburn Hospital | 02 8759 3000
Bankstown Hospital | 02 9722 8107
Blacktown Hospital | 02 9881 8215
Camden Hospital | 02 4654 3100
Campbelltown Hospital | 02 4634 3222
Canterbury Hospital | 02 9787 0223
Fairfield Hospital | 02 9616 8140
Liverpool Hospital | 02 9828 3961
Mt Druitt Hospital | 02 9881 1611
Westmead Children’s Hospital | 02 9845 0000

Call or visit your family GP if your child’s fever does not reduce & shows any of the following:

- Temperature of 38°C or more for children less than 3 months old.
- Temperature of 38.9°C or more for children aged between 3 and 6 months.
- Temperature more than 40°C for children 7 months and older.

If your child is sleepy or less active than normal

If your child develops a skin rash

If your child has a fit (convulsion) EMERGENCY call 000

Remember: in case of emergency or if you cannot get to a doctor or hospital please call health advice line 1800022222 or dial 000

A Guide
**What is Fever?**

Fever is an increase in body temperature to a level considered to be above normal.

Normal body temperature is about 37ºC or 98.6ºF.

Temperatures above 37.5ºC are considered fever and above 40.0ºC is unsafe.

Is your child showing any of the following signs?

- Sleepy or Headache
- Coughing, crying and/or vomiting
- Refusal to eat
- Rash

**What to do if your Child Has a Fever?**

Make sure your child is comfortable:
- Remove extra clothing and blankets
- Give your child a lukewarm bath for 10-15 minutes every 3 hours. Do not give your child a cold bath
- Give your child extra fluid like water or frequent breastfeeds

Confirm that your child has a fever by checking the body temperature using a thermometer

- Under arm using an Electronic thermometer
- In the ear using an infrared thermometer

If your child’s temperature is still high, you can use medication such as Nurofen or Panadol

- Nurofen Syrup
- Panadol Syrup

Correct Method of Fever medication administration

- Give your child a cold bath
- Use icepack to cool your child
- Overdress your child
- Place your child in front of a fan

**Dosage Chart for Panadol & Nurofen**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Children’s Panadol</th>
<th>Nurofen For Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>12 - 15mg/kg</td>
<td>5 - 10mg/kg</td>
</tr>
<tr>
<td>How Often</td>
<td>Every 6 hours</td>
<td>Every 8 hours</td>
</tr>
<tr>
<td>Maximum</td>
<td>60mg/kg</td>
<td>80mg/kg</td>
</tr>
</tbody>
</table>

**DO NOT**

- Give your child a cold bath
- Use icepack to cool your child
- Overdress your child
- Place your child in front of a fan
<table>
<thead>
<tr>
<th>Scene</th>
<th>Vision</th>
<th>Audio</th>
</tr>
</thead>
</table>
| Intro | **Presenter:** On chroma key background.  
*Mother and Baby* **Presenter:**  
I would like to talk to you today about a very common childhood complaint, that is, fever and how best to manage it.  
Fever is considered one of the most frequent health complaints seen in children. Around 20% of children who come into the Emergency Departments have symptoms related to fever.  
A child's fever is the most common health concern for parents causing them to seek urgent medical assistance at hospitals or doctor’s surgeries, often unnecessarily.  
Fever can be managed at home but sometimes, when trying to help their child with a fever, parents can do the wrong thing such as trying to cool the child too rapidly or administering an incorrect dose of fever medication, even waking a sleeping child to do so.  
This program will show you how to manage your child’s fever safely at home, how to measure his or her body temperature, how to use safe methods to cool your child and when to seek medical help.  
We will show you what NOT TO DO if your child has a fever.  
We will then show you what you SHOULD DO in that situation.  
First, it is important to know that if your child is less than 3 months old and has a temperature of more than 38° you should CALL or visit your doctor  
**Now we will consider children aged 3**
### Scene 1

#### Shot 1
*At Living Room Table*

**MS:** A 6 month old child with a skin rash is sweating and irritable.  
**CU:** The mother looks worried as she nurses the baby and tries to think of what to do.

#### Shot 2

**CU:** Mother attempts unsuccessfully to take the baby’s temperature with a mercury thermometer.

#### Shot 3

**See Fan on table**

### Studio

**Presenter:** Chroma key over images of:

- **Mother taking temperature with a glass thermometer**
- **Placing child in a cold bath**

**Presenter:**

There are several things **you should not do** when your child has a fever.

Using a glass thermometer in this situation is very dangerous because the thermometer could easily break. Temperature readings taken under these conditions may not be correct.

You should not attempt to cool a child down too quickly.

Placing a child in a cold bath, using ice packs or even placing them in front of fans may increase the child’s fever.
### Appendix 3 DVD transcript

<table>
<thead>
<tr>
<th>Graphic</th>
<th>✔</th>
<th>Mother placing an ice bag on the child’s head.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✔</td>
<td>Child in front of a fan</td>
</tr>
<tr>
<td></td>
<td>✔</td>
<td>No oral medication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>if baby is sick and vomiting</td>
</tr>
</tbody>
</table>

Fade to Black

<table>
<thead>
<tr>
<th>Graphic</th>
<th>✔</th>
<th>Temperature 38º - 40ºC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Children 3 to 6 Months</td>
</tr>
</tbody>
</table>

Music Bridge

<table>
<thead>
<tr>
<th>✔</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sound of baby crying</td>
</tr>
</tbody>
</table>

Scene 2

<table>
<thead>
<tr>
<th>Shot 1</th>
<th>At Living Room Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO FAN ON TABLE</td>
<td>A 6 month old child with a skin rash is sweating and irritable. The mother looks worried as she picks up the baby and tries to think of what to do.</td>
</tr>
</tbody>
</table>

Presenter: Voice Over

Let’s see how the same situation is handled correctly.

<table>
<thead>
<tr>
<th>Shot 2</th>
<th>At Living Room Table</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CU: Electronic thermometer as mother picks it up and places it under the child’s arm pit.</td>
</tr>
<tr>
<td></td>
<td>BCU: Thermometer 38.9ºC</td>
</tr>
<tr>
<td></td>
<td>The mother has purchased an electronic thermometer and places it inside the babies clothing under the armpit.</td>
</tr>
<tr>
<td></td>
<td>His temperature is 38.9ºC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shot 4</th>
<th>Bathroom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CU: Hot tap and cold tap being turned off.</td>
</tr>
<tr>
<td></td>
<td>Sound of running water</td>
</tr>
<tr>
<td></td>
<td>To help make the baby more comfortable you should bath him in lukewarm water that is not too warm and not too cold.</td>
</tr>
</tbody>
</table>

Shot 5

|        | MS: Mother testing water                      |

<table>
<thead>
<tr>
<th>Shot 6</th>
<th>MS: Baby being washed in a warm bath.</th>
<th>Dressing the baby in light clothing will help keep him cool and make him feel more comfortable. This is a good time to see if he will take something to drink.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedroom</td>
<td>MS: Baby being dressed in light clothing</td>
<td></td>
</tr>
<tr>
<td>Shot 7</td>
<td>MS: Mother getting ready to feed the baby.</td>
<td></td>
</tr>
<tr>
<td>Shot 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shot 9</td>
<td><strong>15 Minutes Later</strong></td>
<td></td>
</tr>
<tr>
<td><strong>At Living Room Table</strong></td>
<td>MS: Mother checks the baby’s temperature again.</td>
<td></td>
</tr>
<tr>
<td>Shot 10</td>
<td>BCU: Thermometer 38.9°C</td>
<td>Sound of baby crying</td>
</tr>
<tr>
<td>Shot 11</td>
<td>MS: Mother takes the Panadol and gives the baby some using dropper</td>
<td>About 15 minutes later check the temperature again. If there is no improvement the baby should be given Panadol using the dropper provided.</td>
</tr>
<tr>
<td>Super</td>
<td><strong>15 Minutes Later</strong></td>
<td></td>
</tr>
<tr>
<td>Shot 12</td>
<td>MS: Baby on bed. Mother takes temperature again</td>
<td>Check the temperature again after another fifteen minutes to see if the temperature is going down.</td>
</tr>
<tr>
<td>Bedroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shot 13</td>
<td>CU reading shows 38.3°C.</td>
<td></td>
</tr>
<tr>
<td>RECAP</td>
<td><strong>Presenter</strong>: Chroma key over</td>
<td><strong>Presenter</strong></td>
</tr>
</tbody>
</table>
The mother has done the correct thing by taking the baby’s temperature using an electronic thermometer.

To help relax and cool the baby she gave him a lukewarm bath,

….. dressed him in light clothing and comforted him by breast feeding him

She checked the temperature again and found no change.

She also gave him Panadol using the dropper provided.

Check the temperature again after fifteen minutes.

---

### Graphic: Temperature 38° - 40ºC
Children 7 months to 5 Years

---

### What Not to do ❌

---

### Presenter on chroma key background

Presenter:

Parents will always worry about their sick children even as they get older. This little boy is 2 years old.

---

### Scene 3

Lily and Samuel

**Presenter : Voice Over**

Trying to take the temperature of a young child with fever can be very stressful for both the mother and the child.
<table>
<thead>
<tr>
<th>Shot 3</th>
<th>CU: Boy has a jumper on and is thrashing around.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot 4</td>
<td>CU: Mum is very stressed.</td>
</tr>
<tr>
<td>Shot 5</td>
<td>CU: Glass Thermometer</td>
</tr>
<tr>
<td>Studio</td>
<td><strong>Presenter:</strong> Chroma key over images of:</td>
</tr>
<tr>
<td>Freze</td>
<td><strong>Mother trying to take temperature with a glass thermometer</strong></td>
</tr>
<tr>
<td>Frame</td>
<td><strong>Presenter:</strong> Using a glass thermometer in this situation is very dangerous because the thermometer could break. Also temperature readings taken under these conditions may not be correct.</td>
</tr>
<tr>
<td>Scene 3</td>
<td><strong>Temperature 38° - 40°C</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Children 7 months to 5 Years</strong></td>
</tr>
</tbody>
</table>

**Graphic**

**What To Do** ✔
### Scene 4

**High Chair in TV Area**

<table>
<thead>
<tr>
<th>Shot 1</th>
<th>MS: The same child is confused, crying and refusing food.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CU: Mother looks concerned and is thinking what best to do in this situation.</td>
</tr>
<tr>
<td>Shot 2</td>
<td>MS: Mother picks up a digital thermometer and places it under the child’s arm.</td>
</tr>
<tr>
<td></td>
<td>CU: Thermometer 38ºC</td>
</tr>
<tr>
<td>Shot 3</td>
<td></td>
</tr>
<tr>
<td>Shot 4</td>
<td></td>
</tr>
</tbody>
</table>

**Presenter: Voice Over**

Although the boy is distressed, the mother remains calm as she decides what is the best thing to do.

Even though the child is distressed, by using an electronic thermometer the mother is able to safely obtain a correct reading of 38ºC.

<table>
<thead>
<tr>
<th>Shot 5</th>
<th>CU: Mother more relaxed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot 6</td>
<td>MS: Mother removes the child’s jumper</td>
</tr>
<tr>
<td>Shot 7</td>
<td>MS: Mother hands the boy a glass of water.</td>
</tr>
<tr>
<td></td>
<td>MLS: Mum picks up Nurofen</td>
</tr>
</tbody>
</table>

While a temperature of 38ºC isn’t too bad, she decides to cool him down by taking his jumper off. This will help him feel more comfortable.

When a child has a fever, it is important to ensure that they don’t become dehydrated, so make sure they drink plenty of water.

The boy is over six months old he can be given oral **Nurofen** or **Panadol** syrup to help reduce his temperature.
### Shot 8

syrup.

MS: Mother goes to the child who is laying down and takes his temperature

CU Thermometer 37º

His temperature is taken again 15 minutes later to see if it is going down. You should continue to monitor the child's temperature every 15 minutes until it has returned to a normal 37ºC.

### Shot 9

### Shot 10

### Studio

**Presenter:** Chroma key over images of:

- 🔄 Digital thermometer
- 🔄 Removing boy’s jumper
- 🔄 Boy drinking water
- 🔄 Oral medication
- 🔄 Mother takes temperature for a third time

*Fade to Black*

**Presenter:**

This mother has purchased a digital thermometer that is safe to use with children and gives a more accurate reading.

She removed the child’s jumper to help reduce his temperature and gave him a glass of water to prevent him from becoming dehydrated.

Given in the correct dose oral medication can be given safely to children over six months of age.

Finally the mother checked the temperature again after 15 minutes to see if the temperature was going down.

*High Temperature*  

*Music Bridge*
<table>
<thead>
<tr>
<th>Scene 5</th>
<th><strong>Presenter:</strong> Chroma key over images of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library Photo</td>
<td>Call or Visit GP</td>
</tr>
<tr>
<td>Super Libary Photo</td>
<td>Child 0 to 3 months</td>
</tr>
<tr>
<td></td>
<td>Temperature 38°C or more</td>
</tr>
<tr>
<td>Library Photo</td>
<td>Call or Visit GP</td>
</tr>
<tr>
<td>Super</td>
<td>3 months to 6 months</td>
</tr>
<tr>
<td></td>
<td>Temperature 39°C or more</td>
</tr>
<tr>
<td>Library Photo</td>
<td>Call or Visit GP</td>
</tr>
<tr>
<td>Super</td>
<td>7 months or older</td>
</tr>
<tr>
<td></td>
<td>Temperature more than 40°C</td>
</tr>
<tr>
<td></td>
<td>Drowsy child</td>
</tr>
<tr>
<td></td>
<td>Child with rash</td>
</tr>
</tbody>
</table>

**Presenter:**

When your child has a fever you should call or visit your GP if:

- * the child is younger than 3 months and has a temperature of 38 °C or more.
- *if the child is 3 to 6 months old and has a temperature of 39°C or more.
- *if your child is 7 months or older and has a temperature of 40°C or more.
- *.or if the fever does not settle and the child is getting sicker.

You should also call or visit your GP if the child becomes drowsy........

........or develops a skin rash

Remember...If your child is having a fit it is considered an emergency and you should call an ambulance by calling "TRIPLE O"
<table>
<thead>
<tr>
<th>Child having a fit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fit or convulsion</strong></td>
</tr>
<tr>
<td><strong>Call 000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presenter on chroma key background</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presenter</strong></td>
</tr>
</tbody>
</table>

Fever is not a disease in itself but it is a sign of the body's natural response to a Bacterial or Viral infection.

If your child has a fever you should play on the safe side. Always consider the child's age before taking the appropriate action as shown in this video.

We hope the information will be helpful when managing your child’s fever in the future.

<table>
<thead>
<tr>
<th>Credits</th>
<th>Music</th>
</tr>
</thead>
</table>
Appendix 4 Fever Fact Sheet

(See next page)
What is a fever?
A fever is when the body's temperature is higher than normal, which is 37.5 °C or above when the child's temperature is taken by a thermometer under the arm.

Fever is a sign of infection in the body. Infections such as colds and flu are very common, especially in pre school children. Young preschool children can have up to five to ten infections each year.

Fever is most often caused by a virus and sometimes by bacteria. Viral infections are more common and do not need antibiotics as antibiotics do not cure viruses. Bacterial infections are treated with antibiotics.

Is fever good or bad?
Fever is the body's natural response to infection. The body is not harmed by low grade fever, so it is usually not necessary to treat the fever.

However, children with fever often feel uncomfortable and unwell. Giving pain relief medication such as paracetamol or ibuprofen may be helpful for this discomfort.

Fever may occasionally bring about febrile convulsions (fits), in up to 1 in 30 children under five years of age. This means 29 out of 30 children will never have a febrile convulsion no matter what their temperature is. Febrile convulsions are not dangerous but they can be very frightening for parents. Medicines such as paracetamol or ibuprofen even when used regularly with fever have not been shown to stop or reduce the amount of febrile convulsions children have.

A high fever does not always mean your child has a serious illness. Fever itself is not harmful; a fever that does not respond to paracetamol or ibuprofen is no worse than a fever that does. Fever in itself is not bad, however in young babies it is important to find out the cause of the fever.

What causes fever?
The most common cause of a fever is a viral infection. For example colds and flu’s, other common infections, like ear infections and throat infections, may be caused by a virus or bacteria and the decision to treat the infection with antibiotics will vary.

More serious but less common causes of fever include bacteria infection of the urine, lungs (pneumonia), blood and brain (meningitis).

When do you need to see a doctor?
You need to see a doctor if your child has a fever and:
• Your child is very young (less than three months old).
• Your child seems very sick.
• You also need to see a doctor if your child:
  • Has pain – especially headache, tummy or limb pain.
  • Has difficulty swallowing.
  • Has problems with breathing.
  • Has a rash.
  • Has vomiting.
  • Has neck stiffness or the light is hurting their eyes.
  • Has bulging of the fontanelle (the soft spot on the head in babies).
  • Is very sleepy or drowsy.
• Special circumstances – if your child has a fever for more than three days, your child has travelled overseas recently, or your child has had contact with someone with a serious infection.

Older children (3 years and older) who have a cold, but are not very sick, generally do not need to see a doctor with every fever.
At Home Care

- Dress you child in enough clothing so that they are comfortable and are not shivering.
- Give your child plenty to drink; children with a fever need more fluids.
- Sponging with water and fanning children with fevers is not recommended.
- Watch your child for signs that their illness is getting worse.
- Consult a doctor if the fever does not settle or your child is getting sicker.

Remember

- Fevers are common in children and most are caused by viral infections.
- If your child seems well and is happy there is no need to treat a fever.
- Make sure your child drinks plenty of fluids.
- Babies under 3 months with a high temperature must be seen by a doctor.
- Watch your child for signs of the illness getting worse.
- Consult a doctor if the fever does not settle and your child seems to be getting sicker.
Managing your child’s fever

You have been invited to participate in this study as you have presented to the emergency department with a child that has a fever. The aim of this study is to improve your knowledge about fever and to give you information about how to take care of your child when he/she has a fever at home.

The survey will take about 20 to 30 minutes to complete. For most of the questions please indicate your response by ticking the correct box. The information you provide will be strictly confidential. This study has been reviewed by the human research committees of the University of Western Sydney and South Western Sydney Local Health District (SWSLHD).

Section 1: Medical Words

We are studying medical word reading in order to improve communication between healthcare providers and patients. Here is a list of medical words that may be difficult to read.

Q1) Can you please read the following words aloud? If you don’t recognize a word, you can say ‘pass’ and move on to the next word.

<table>
<thead>
<tr>
<th>Fat</th>
<th>Exercise</th>
<th>Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flu</td>
<td>Menopause</td>
<td>Anaemia</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Rectal</td>
<td>Jaundice</td>
</tr>
</tbody>
</table>

Source REALM-SF (Arozullah et al., 2007)
## Section 2: What parents know about fever

Here are some questions about what you know about fever.

From the table below please tick the right answer in the box, *please tick ✓ box.*

Here is an example with a possible response:

At what temperature do you like your hot drinks?  

<table>
<thead>
<tr>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42°C*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q2) If you child aged between 3 and 6 months,**

a) what temperature do you think is:

<table>
<thead>
<tr>
<th>NORMAL for your child?</th>
<th>Fever for your child?</th>
<th>HIGH Fever for your child?</th>
<th>Very High Fever for your child?</th>
<th>May Cause Harm to your child?</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.5</td>
<td>37</td>
<td>37.5</td>
<td>38</td>
<td>38.5</td>
</tr>
<tr>
<td>To the Hospital?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q3) If you child aged between 7 months and 5 years**

a) What temperature do you think is

<table>
<thead>
<tr>
<th>NORMAL for your child?</th>
<th>Fever for your child?</th>
<th>HIGH Fever for your child?</th>
<th>Very High Fever for your child?</th>
<th>May Cause Harm to your child?</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.5</td>
<td>37</td>
<td>37.5</td>
<td>38</td>
<td>38.5</td>
</tr>
<tr>
<td>To the Hospital?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q4) At what temperature would you take your child (7 months to 5 years)

<table>
<thead>
<tr>
<th>Temperature</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the Hospital?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q5) If your child has a fever what do you think is likely to happen? You can tick more than one box.

- □ Lack of fluids in the body (Dehydration)
- □ Brain damage
- □ Lung infection (Pneumonia)
- □ Nothing happens from fever alone
- □ Loss of consciousness
- □ Fit (febrile seizures)
- □ Other not stated.

Section 3: Managing your child’s fever

Here are some questions about managing your child’s fever.

Checking your child’s temperature

This question is about checking your child’s temperature.

Q6) If your child is aged between two months and five years, what is the best way to check his/her temperature? You can tick more than one box.

- □ By touch
- □ By mouth
- □ Under the arm
- □ By rectal (Back passage)
- □ By ear

Q7) What kind of thermometers do you use when you check your child’s body temperature? You can tick more than one box.

- □ Mercury.
- □ Electronic.
- □ Infrared.

Using physical methods to reduce fever

Here are some questions about managing your child’s fever using physical methods (not medicine) to reduce your child’s body temperature. Please circle the appropriate answer.

Q8) When your child has a fever at home, what do you do? *You can tick more than one answer.*

- [ ] Give fluids
- [ ] Tepid (lukewarm)sponging
- [ ] Dress the child with extra clothes
- [ ] Give a tepid(lukewarm) bath
- [ ] Give a cold bath
- [ ] Remove extra clothes
- [ ] Nothing in particular
- [ ] Other please specify

Q9) If you bathe your child to reduce his/her fevers, how long do you keep him/her in the bath?

- [ ] 10 minutes
- [ ] 11-15 minutes
- [ ] More than 15 minutes

Using fever medicines

Q10) Do you give fever medicines without getting advice from the doctor?

- [ ] Yes
- [ ] No

Q11) Do you give fever medicines without checking your child’s temperature?

- [ ] Never
- [ ] Rarely
- [ ] Sometimes
- [ ] Always.

Above what temperature do you give fever medicines? Please circle temperature

36  36.5  37  37.5  38  38.5  39  39.5  40  40.5  41  41.5  42°C

Q12) What fever medicines (include medicines you buy at the chemistry/pharmacy) do you use for your child? You can tick more than one answer.

☐ Nurofen syrup  ☐ Panadol Syrup  ☐ Others (please specify): ______

Q13) How often do you give fever medicines?

a) How often do you give Panadol (Syrup)?

☐ Every 2 hours  ☐ Every 4 hours  ☐ Every 6 hours  ☐ Every 8 hours.

☐ Other (please specify): ____________________.

b) How often do you give Nurofen?

☐ Every 2 hours  ☐ Every 4 hours  ☐ Every 6 hours  ☐ Every 8 hours.

☐ Other (please specify): ____________________.

c) How often do you give other fever medicines (other than Panadol or Nurofen)?

☐ Every 2 hours  ☐ Every 4 hours  ☐ Every 6 hours  ☐ Every 8 hours.

☐ Other (please specify): ____________________.

Section 4: Seeking help and health service use

The following questions are about when you would seek help and when you visit health services for your child with a fever.

Q14) How long do you wait to consult health care providers (doctors or nurses) when your child develops high fever (> 38.5?)

☐ Immediately (straight away)  ☐ After half a day  ☐ After one day  ☐ More than 2 days

☐ Do not consult health care providers for fever alone.
Q15) Above what temperature would you take your child to Emergency Department at the hospital? Please circle temperature.

36  36.5  37  37.5  38  38.5  39  39.5  40  40.5  41  41.5  42°C

The next two questions are about your visit to the Emergency Department today.

Q16) Did you give your child fever medication before coming to the ED today?

☐ Yes  ☐ No

Q17) Did you measure your child’s temperature before coming to the ED today?

☐ Yes, if so what was the temperature? ___________  ☐ No  go to Q18).

Q18) a) How many visits to the ED have you made because of fever for this child (with fever) within the past 3 months (Including today)?

☐ None  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5 or more

b) How many visits have you made to your local doctor because of fever for this child (with fever) within the past 3 months?

☐ None  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5 or more

Q19) a) How many visits to the ED have you made because of fever for other children (with fever) within the past 3 months?

☐ None  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5 or more

b) How many visits have you made to your local doctor because of fever for another child (with fever) within the past 3 months?

☐ None  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5 or more
Section 5: Socio-demographic information

Now some questions about you

Q20) What is your gender?
☐ Male ☐ Female

Q21) How old were you at your last birthday?
☐ _______ Years

Q22) Are you the child’s
☐ Parent ☐ Grandparent
☐ Carer ☐ Other specify: ________

Q23) If you are the parent, how many children do you have? _____

Q24a) What is your highest level of education?
☐ Primary school ☐ High school (7-10)
☐ Higher school (11-12) ☐ Certificate
☐ Tertiary (Diploma) ☐ Other: ________
☐ Non

Q24b) Please write how old are your children in the spaces provided?
    _______ years,
    _______ years,
    _______ years,
    _______ years,
    _______ years,

Q25) Are you employed?
☐ Yes, full-time ☐ Yes, part-time
☐ Casual ☐ No (go to Q27)

Q26) What is your occupation?
☐ Manager/Professional ☐ Technical & trade
☐ Community & personal service ☐ Sales
☐ Machinery operator/driver ☐ Clerical/administrative
☐ Other: ________

Now go to Q28.

Q27) If you are currently not working did you ever work?
☐ Yes ☐ No

Q28) Where were you born?
☐ Australia (go to Q30) ☐ Outside Australia

Q29) If born outside Australia, how long have you been in Australia?
☐ Under 5 years ☐ 5-9 years ☐ 10 years or more

Q30) What is the first language spoken in your home?
☐ English ☐ Arabic ☐ Samoan ☐ Filipino
☐ Spanish ☐ Italian ☐ Greek ☐ Bengali
☐ Hindi ☐ Lao ☐ Cantonese ☐ Other

Information about your child

Q31) What is the age of your child with fever? ________________.

Q32) What is the gender of your child with fever? ☐ Male ☐ Female

We would like to contact you again in three months time to see how you have managed your child’s fever

Can you please provide your postal address for the follow up survey

Name: ________________________________________________________________________________.

Address: __________________________________________ Street ________________________________.

Suburb: ___________________________________________ Postal code: ________________________.

E-mail: _____________________________ Phone: __________________. Mobile Phone: ________________.

Thank you for participating
1. Sakai, R., Niijima, S., & Marui, E.

Dear Muhammad,

Thanks so much for waiting and thank you for your interest in my study, “Parental Knowledge and Perceptions of Fever in Children and Fever Management Practices.”

I would be happy to grant you permission to use the questionnaire that we developed. I just realized that the full English version is included in the Appendix at the end of my article. My only request is that any use of the material please be acknowledged and referenced appropriately, as you had mentioned.

Thanks very much again for your interest and best of luck with your research. I definitely believe that this is a very important and relevant topic. Please feel free to let me know if you have any other questions.

Sincerely,

Rie

Rie Sakai, MD, MPH, PhD
Assistant Professor
Juntendo University School of Medicine
Department of Medical Education
Department of Pediatrics
Tel; +81-3-5802-1053
FAX; +81-3-5689-2635
E-mail; riesakai@juntendo.ac.jp

2. Dr. Anne Walsh RN, EM, PhD, FRCNA

Dear Muhammad,

I am happy to give approval for you to use the tool as long as:

- It is used only for the purposes of data collection for your research project as outlined below;
- No questions in the tool are altered/amended/deleted/added;
- Full acknowledgement is given to our research team in the referencing of the tool in your thesis;
- An electronic copy of your thesis be forwarded to me (if you use the PFMS Fever Management Tool or PCFMS instrument for data collection) upon completion of your research project; and
Appendix (6) - Permission for item use

- An electronic copy of any articles that are produced using the data from the tool are forwarded to me upon publication.

There are no fees involved for you to use this tool.

It is very good to hear of your interest in this important area of research and health care.

I have attached the complete instrument with the descriptive and theoretical sections and another document which identified the concepts for the descriptive section.

Best wishes with your studies and the educational program you are to implement.

Kind regards

Anne

Dr. Anne Walsh RN, EM, PhD, FRCNA
Lecturer, School of Nursing
Queensland University of Technology
Tel: 07 3138 3905
Fax: 3138 3814
Email: am.walsh@qut.edu.au


Dear Muhammad,

On behalf of Dr Matziou and Dr Merkouris, I attach our questionnaire used in our survey with the title: article ‘what Greek mothers know about evaluation and treatment of fever in children: An interview study’. Unfortunately it is in Greek so you have to translate into your language. I wish you good luck with your effort. Please do not hesitate to contact me for any other clarification.

Best wishes

Pantelis Perdikaris RN, MSc, PhD

Dear Muhammad Ahmad Alqudah
Please feel free to use everything you want from this paper. Unfortunately I don't have the full version of the questionnaires
Warm regards
Ernesto Kahan

Prof. Emeritus Dr. Ernesto Kahan MD MPH
University Professor - Poet – Physician
Tel Aviv University, Israel.
President- Israeli Association Writers. Spanish Branch
Vice President- World Academy of Arts and Culture USA
Former Vice President of IPPNW (Nobel Peace Prize) and the actual president of the Israeli Branch
Honorary President of SIPEA – International Society of Poets Writers and Artists
Vice President Intl Forum for Literature and Culture of Peace (IFLAC)
President -UHE- UNION HISPANOAMERICAN WRITERS.
Vice President. Global Harmony Association (GHA)
### Appendix 7 Internal Consistency

Table 14-1 Cronbach's Alpha of Knowledge and practice scale items used in the Study

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach's Alpha</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>0.715</td>
<td>14</td>
</tr>
<tr>
<td>Practice</td>
<td>0.429</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 14.2 Inter-Item Correlation Matrix (FKNS)

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Temperature that considered fever (3-6 months)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Temperature that considered hi fever (3-6 months)</td>
<td>.66</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Temperature can cause Harm (3-6 months)</td>
<td>.42</td>
<td>.52</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Temperature that considered fever (7M-5Y)</td>
<td>.85</td>
<td>.60</td>
<td>.35</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Temperature that considered hi fever (7M-5Y)</td>
<td>.73</td>
<td>.78</td>
<td>.35</td>
<td>.68</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Temperature can cause harm (7M-5Y)</td>
<td>.23</td>
<td>.30</td>
<td>.28</td>
<td>.21</td>
<td>.38</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Fever can cause dehydration</td>
<td>.00</td>
<td>.19</td>
<td>.09</td>
<td>.02</td>
<td>.08</td>
<td>-.24</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Fever can cause brain damage</td>
<td>.08</td>
<td>.08</td>
<td>-.04</td>
<td>.05</td>
<td>.05</td>
<td>-.21</td>
<td>.09</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Fever can cause pneumonia</td>
<td>-.03</td>
<td>.23</td>
<td>.09</td>
<td>.05</td>
<td>.22</td>
<td>.03</td>
<td>.10</td>
<td>.50</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Fever can cause loss conscious</td>
<td>-.08</td>
<td>.08</td>
<td>-.04</td>
<td>-.03</td>
<td>.02</td>
<td>.09</td>
<td>.32</td>
<td>.27</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Method of measurement (Mouth)</td>
<td>.20</td>
<td>.072</td>
<td>.21</td>
<td>.12</td>
<td>-.05</td>
<td>-.01</td>
<td>-.12</td>
<td>-.01</td>
<td>-.32</td>
<td>-.01</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Method of measurement (By Rectal)</td>
<td>.08</td>
<td>-.03</td>
<td>.14</td>
<td>.09</td>
<td>-.10</td>
<td>.14</td>
<td>-.14</td>
<td>.06</td>
<td>-.02</td>
<td>.06</td>
<td>.18</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Time to spend bathing your child</td>
<td>.26</td>
<td>.08</td>
<td>.06</td>
<td>.24</td>
<td>.08</td>
<td>-.08</td>
<td>-.06</td>
<td>.21</td>
<td>.27</td>
<td>-.01</td>
<td>.27</td>
<td>-.04</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14. Temperature Required ED</td>
<td>.16</td>
<td>.25</td>
<td>.06</td>
<td>.19</td>
<td>.40</td>
<td>.14</td>
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<td>.07</td>
<td>.01</td>
<td>.13</td>
<td>-.00</td>
<td>-.08</td>
<td>1</td>
</tr>
</tbody>
</table>
### Appendix 14-3
Cronbach's Alpha if item deleted (FKNS)

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Temperature that considered fever (3-6 months)</td>
<td>7.17</td>
<td>6.14</td>
<td>0.68</td>
<td>0.65</td>
</tr>
<tr>
<td>2. Temperature that considered hi fever (3-6 months)</td>
<td>7.11</td>
<td>6.14</td>
<td>0.72</td>
<td>0.64</td>
</tr>
<tr>
<td>3. Temperature can cause Harm (3-6 months)</td>
<td>7.08</td>
<td>6.79</td>
<td>0.43</td>
<td>0.686</td>
</tr>
<tr>
<td>4. Temperature that considered fever (7M-5Y)</td>
<td>7.15</td>
<td>6.26</td>
<td>0.63</td>
<td>0.65</td>
</tr>
<tr>
<td>5. Temperature that considered hi fever (7M-5Y)</td>
<td>7.21</td>
<td>6.13</td>
<td>0.67</td>
<td>0.65</td>
</tr>
<tr>
<td>6. Temperature can cause harm (7M-5Y)</td>
<td>7.63</td>
<td>7.44</td>
<td>0.21</td>
<td>0.71</td>
</tr>
<tr>
<td>7. Fever can cause dehydration</td>
<td>6.98</td>
<td>7.84</td>
<td>0.02</td>
<td>0.73</td>
</tr>
<tr>
<td>8. Fever can cause brain damage</td>
<td>7.45</td>
<td>7.32</td>
<td>0.18</td>
<td>0.72</td>
</tr>
<tr>
<td>9. Fever can cause pneumonia</td>
<td>7.58</td>
<td>7.27</td>
<td>0.26</td>
<td>0.71</td>
</tr>
<tr>
<td>10. Fever can cause loss conscious</td>
<td>7.45</td>
<td>7.50</td>
<td>0.11</td>
<td>0.73</td>
</tr>
<tr>
<td>11. Method of measurement (Mouth)</td>
<td>7.04</td>
<td>7.60</td>
<td>0.10</td>
<td>0.73</td>
</tr>
<tr>
<td>12. Method of measurement (By Rectal)</td>
<td>6.89</td>
<td>7.83</td>
<td>0.07</td>
<td>0.72</td>
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<tr>
<td>13. Time to spend bathing your child</td>
<td>7.61</td>
<td>7.40</td>
<td>0.21</td>
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<tr>
<td>14. Temperature Required ED</td>
<td>7.07</td>
<td>7.35</td>
<td>0.20</td>
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<tr>
<td>Item</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>-------</td>
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<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>1. Fever Required hospitalisation (3-6M)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Fever Required General Practitioner (3-6M)</td>
<td>.36</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>3. Fever Required hospitalisation (7M-5Y)</td>
<td>.19</td>
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<tr>
<td>4. Fever Required General Practitioner (7M-5Y)</td>
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<td>.51</td>
<td>.35</td>
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<tr>
<td>5. Fever Management by Tepid Sponge</td>
<td>-.06</td>
<td>.04</td>
<td>-.13</td>
<td>-.02</td>
</tr>
<tr>
<td>6. Fever Management by Lukewarm Bath</td>
<td>-.02</td>
<td>-.04</td>
<td>-.16</td>
<td>.14</td>
</tr>
<tr>
<td>7. Fever Management by Cold Bath</td>
<td>-.10</td>
<td>.04</td>
<td>.05</td>
<td>.16</td>
</tr>
<tr>
<td>8. Fever Management by Remove Excess clothing</td>
<td>-.05</td>
<td>-.36</td>
<td>.06</td>
<td>-.15</td>
</tr>
<tr>
<td>9. Use fever medicine without Dr advice</td>
<td>.05</td>
<td>.16</td>
<td>.25</td>
<td>.16</td>
</tr>
<tr>
<td>10. Use fever medicine without Tem checking</td>
<td>.02</td>
<td>-.14</td>
<td>.11</td>
<td>.07</td>
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<tr>
<td>Items</td>
<td>Scale Mean if Item Deleted</td>
<td>Scale Variance if Item Deleted</td>
<td>Corrected Item-Total Correlation</td>
<td>Cronbach's Alpha if Item Deleted</td>
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<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------</td>
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</tr>
<tr>
<td>1. Fever Required hospitalisation (3-6M)</td>
<td>4.00</td>
<td>2.40</td>
<td>0.15</td>
<td>0.41</td>
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<tr>
<td>2. Fever Required General Practitioner (3-6M)</td>
<td>4.15</td>
<td>2.44</td>
<td>0.19</td>
<td>0.40</td>
</tr>
<tr>
<td>3. Fever Required hospitalisation (7M-5Y)</td>
<td>4.34</td>
<td>2.72</td>
<td>0.24</td>
<td>0.40</td>
</tr>
<tr>
<td>4. Fever Required General Practitioner (7M-5Y)</td>
<td>4.21</td>
<td>2.38</td>
<td>0.38</td>
<td>0.33</td>
</tr>
<tr>
<td>5. Fever Management by Tepid Sponge</td>
<td>3.91</td>
<td>2.48</td>
<td>0.08</td>
<td>0.44</td>
</tr>
<tr>
<td>6. Fever Management by Lukewarm Bath</td>
<td>3.82</td>
<td>2.24</td>
<td>0.25</td>
<td>0.37</td>
</tr>
<tr>
<td>7. Fever Management by Cold Bath</td>
<td>3.50</td>
<td>2.61</td>
<td>0.12</td>
<td>0.42</td>
</tr>
<tr>
<td>8. Fever Management by Remove Excess clothing</td>
<td>3.52</td>
<td>2.56</td>
<td>0.14</td>
<td>0.41</td>
</tr>
<tr>
<td>9. Use fever medicine without Dr advice</td>
<td>4.11</td>
<td>2.54</td>
<td>0.09</td>
<td>0.44</td>
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<tr>
<td>10. Use fever medicine without Tem checking</td>
<td>3.74</td>
<td>2.33</td>
<td>0.20</td>
<td>0.39</td>
</tr>
</tbody>
</table>
Appendix 8 In-service presentation

The effectiveness of fever management education for parents with low health literacy

Research team:
Professor Maree Johnson
Dr Leanne Cowin
Dr. Ajesh George
PhD student, Mr Muhammad Alqudah

University of Western Sydney

The effectiveness of fever management education for parents with low health literacy

Parents

Health literacy

Child

Fever

Makadam Project
Presentation Contents

• Problem Statement
• Aim
• Overview of the literature
• Significance
• Study phases and hypothesis
• Study timeline

Problem Statement

• 20% of children reported to Emergency Departments (ED) are having a febrile illness.¹

• Non-urgent conditions account up to 82% of the total ED visits.²
Aim

Reduce inappropriate use of emergency or primary care services for children with fever

Overview of the Literature

1. Fever management: a problem for parents
2. Health literacy in Australian population
3. Fever Education Programs
4. Gap in knowledge: no fever education programs suitable for low health literacy people
1. Fever management: a problem for parents

- Inappropriate antipyretic use
- Excessive health service use
- Parents concern
- Inappropriate use of physical method

2. Health literacy in Australian Population (Campbelltown)

- 60% Inadequate literacy and health literacy[3]
- 40% Adequate literacy and health literacy[3]
- 6% High level of health literacy[3]
Campbelltown Population

53% → No qualifications \[^3\](less than Vocational degrees)

39% → Use English as a second language \[^3\]

3. Fever Education Program

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Improvement</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever Health Knowledge</td>
<td>29%</td>
<td>Baker et al., 2004[1]</td>
</tr>
<tr>
<td></td>
<td>54%</td>
<td>Robinson et al., 1989[4]</td>
</tr>
<tr>
<td>Fever Management Practice</td>
<td>13%</td>
<td>Herman et al., 2009[5]</td>
</tr>
<tr>
<td></td>
<td>46%</td>
<td>Sarrell &amp; Kahan, 2003[6]</td>
</tr>
<tr>
<td>Health Facility Usage</td>
<td>30-35% reduction</td>
<td>Robinson et al., 1989[4]</td>
</tr>
</tbody>
</table>
4. Gap in knowledge: no fever education programs suitable for low health literacy

Low Health Literacy

Audience Issues

Pictorials, plain language and (SMOG)

- Measure = check, antipyretic= fever medicine
- Written material $\rightarrow$ 5th grade reading ability

Gobbledygook (SMOG)

MAiqush Project
Significance

- Simple way of designing the education program to make it more usable for low health literacy people.
- Benefit for health care professionals.
- Reduce the inappropriate presentation to health facilities.
- Using the education program in different settings.
Study Phases and Hypothesis

PHASE 1
Development of the education program

PHASE 2
Secondary data analysis of Emergency Department presentations

PHASE 2
Randomised Controlled Trial (RCT)

Phase (3): Randomised Control Trial (RCT)

I. Pilot study
II. RCT

Pre Survey  3 months gap  Post survey
Hypothesis

- Increased ability to manage fever
- Measure a child's body temperature using an appropriate method
- Differentiate between mild, moderate and high fever
- Reduce their inappropriate presentations to EDs

Timeline (February 2012-May 2012)

- Phase 1: extracting the data from Firstnet
- Phase 1: data analysis
- Phase 2: data collection
- Pre and post surveys
References

Child Fever Management Study

Data collector’s education program

Muhammad Alquudah
University Of Western Sydney
Education Program for data collectors

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2. Learning objectives
3. Training strategy
4. Importance of the study
5. Study tools
   5.1. Information sheet
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   5.3. Questionnaires
   5.4. Education package (DVD and Brochure)
6. Data collection and Recruitment process
   6.1. Eligibility criteria
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   6.4. Study groups
   6.5. Sample size required
   6.6. Pilot study
7. Report a problem
8. Data collection timeline
9. Points to remember
10. Study appendixes
11. Script for RNs during data collection process to follow

1. Back ground

This education program has been designed to educate three Emergency Department nurses who are currently working at Campbelltown Hospital, and who will be working as research assistants for the project “The effectiveness of a fever management education program for parents with low health literacy”. Nurse or research assistants will be responsible for the study data collection, and conducting a health literacy test. Research assistants are required to: read through these pages and enrich their knowledge about the study, follow systematic steps as described in this program when carrying-out the data collection process, and be familiar with the health literacy test.

The Principal researcher in this study is Mr Muhammad Alquudah, a PhD student at the University of Western Sydney (UWS) supervised by Professor Maree Johnson:
Director of Centre for Applied Nursing Research (CANR) and lecturer at UWS, Dr Leanne Cowin, Lecturer at UWS, Dr. Ajesh George, Senior Research Fellow, CANR.

2. **Teaching Objectives:**
   i. Educate research assistants about the importance of this study
   ii. Explore research assistants knowledge about the study tools
   iii. Educate research assistants about the process of data collection
       a) How to access FIRSTNET database
       b) How to approach and invite parents to participate in the study
   iv. Educate research assistants about the eligibility criteria for parents to be included in the study
   v. Educate research assistants how to test participants level of health literacy using REALM-SF
   vi. Educate research assistants what action she/he should do when parents are assigned to the low health literacy group.
   vii. Educate the research assistants what action she/he should do when parents are assigned to the normal health literacy group
   viii. Instruct research assistants about correct protocol to follow and report any misleading situations
   ix. Research assistants to be aware of the data collection timeframe.

3. **Training strategy**
   • **Training approaches**
     1. Research assistants will receive a training course on the skills and knowledge necessary to perform their role in the data collection process.
     2. The training course will include a training session on how to access the FIRSTNET database. A sample software will be available
     3. Research assistants will be shown a role play for the expecting scenarios during the data collection process. A role play transcript is attached
     4. Research assistants will be trained on how to conduct a health literacy test using a REALM –SF tool.

   • **Training venue and equipments required**

   Research assistants are required to attend a two hours training session at the Centre for Applied Nursing Research (CANR).
   The training session will include a 15 to 20 minutes PowerPoint presentation, and a role play module to be followed during the data collection process.

• **Training Phases**

The following steps will be followed to train the research assistants:
Step (1): Accessing the FIRSTNET database
Step (2): Obtain consent and distributing the survey
Step (3): Conducting the REALM-SF
Step (4): Collecting the survey

All the above mentioned steps will be performed as a role play for the research assistants before conducting the study. The role play will give the research assistants an idea about possible scenarios they will encounter and the correct way to deal with participants in various situations.

4. **Importance of this study**

This study relates to fever in children. The aim of this study is to examine child fever presentations in the Emergency Department (ED) at Campbelltown hospital and to test a low health literacy education intervention to reduce inappropriate primary care (ED and GP) attendances. The intervention in this study is an education package which is a combination of a brochure and a Digital Video Disc (DVD).

a. This study will investigate the current Parent’s (mother or father or significant other) behaviours related to managing child fever at home before seeking help from a health professional. This includes,
   - Using antipyretic and
   - Cooling the body by water “physical way”

b. This study will be focusing on how to reduce a parent’s concerns through the educational programs. It is hoped that these programs will influence parent’s behaviour at home and reduce the inappropriate use of emergency or primary care services.

5. **Study materials**

The study material consists of a combination of a survey, participants’ information sheet, consent form, questionnaires, and an education package (DVD and the brochure).

5.1. **Participant’s information sheet**

The information sheet includes the purpose of the study, what the participants required to do, benefits and risk of participation in the study, their voluntary participation, confidentiality of the information and the principal researchers contact details for further inquiry. This form has to be presented initially to parents who agree to participate in the study. All research assistants need to be fully aware of this form and its content in case they are required to answer any questions about the study.

Please hand this sheet to each participant in the study and explain what it is for. A copy of this form is attached, (see appendix two).

5.2. **Consent form**
This is a compulsory form and needs to be signed by any person interested in participating in the study. All people who agree to participate in the study need to sign this paper before going any further in the study process. Sections in this form include participant agreement to join the study, addressing that they have been given information about the study, and have been given the opportunity to ask questions. A copy of this form is attached, (see appendix four). *All consent forms needs to have the participant’s name filled and signed*

5.3. **Survey (Questionnaires)**

This is the main tool for collecting the data from participants. The questionnaires in this study have three main parts. Part one, health literacy measurement tool using the Rapid Estimate of Adult Literacy in Medicine-Short Format (REALM-SF). Part two, fever questions; questions relating to fever general knowledge and fever management. Part three the socio-demographic items are investigating parents and child’s individual details.

We will be spending more time on the correct way to administer the REALM-SF, how to present it and how to score it. REALM-SF is very short literacy measurements that will help the researchers in determine a level of health literacy. This part of the questionnaire needs to be done by the investigator and the rest of the questionnaire can be completed by the participant.

Fever questions are in three sections. The first section of eight items, investigates parent’s fever knowledge. The second section of 12 items investigates the parents fever management practices, and the third section contains four items to explore when parents take their child/children to the hospital or general practitioner because of fever.

Socio-demographic questions consist of two sections; nine items explore parent’s details and two items about their child with fever.

A sample of both the questionnaire and the REALM-SF is attached. (see appendix three).

5.4. **Study intervention (Education Package)**

The education package in this study is a DVD and information brochure designed for low health literacy people in a very simple way. The content of the education interventions has been designed after an extensive literature review based on a systematic review of articles, international guidelines, and quality published articles. Both the DVD and the brochure contain information about pharmacological and non-pharmacological fever treatments, the correct way of measuring a child’s body temperature, and general knowledge about fever.

The reading ability of the instructions included in the education package has been examined using a readability test. The level of education required to understand the instructions is a 5th grade reading level. We have included pictures and symbols where possible to simplify the study instructions in both the DVD and the brochure. Attached
6. **Data collection and Recruitment process**

The process of data collection includes finding the eligible person to be invited to participate in the study, approaching the participants, following the correct way of assigning the participants to study groups, and knowing the number of participants required to be recruited.

6.1. **Eligibility criteria (inclusion and exclusion)**

Parents will be eligible to participate if they present to the ED at Campbelltown Hospital with a child with a history of fever before presentation to ED or with a temperature of greater than 37°C and aged between three months to five years; and parent’s who are able to read, write and understand English.

The exclusion (*not eligible to participate*) criteria includes parents of children younger than three months, older than five years, and any child located in the resuscitation area and parents who cannot speak, read and write in English.

6.2. **Randomisation**

Randomisation is the process of assigning people to the study groups in a random way. There are two groups in the study. Parents will be allocated to the groups using a computer based random number generation program which is a computer software that will generate a random sequence. To be involved in the randomisation, parents and children need to meet the eligibility criteria above. The research team has prepared envelopes that will follow the randomisation sequence. Depending on the group allocation, the envelopes will contain either the DVD or brochure developed in this study (Intervention group), or a generic brochure (The Children’s Hospital brochure) and a DVD version of the same brochure (Control group). All envelopes have been opaqued and sealed to ensure the research assistants are unaware of the group allocation. Each envelope has been serially numbered and has a unique study ID number. An additional ID number has been stapled on each envelope that’s needs to be placed on each pre-questionnaire. The randomised envelopes have been placed in two boxes based on the participant health literacy level. First box is labelled as GREAT (for normal health literacy people) and the second box is labelled as GOOD (for low health literacy people). The survey form, information sheet and the consent have been placed in separate boxes.

6.3. **Data Collection procedure**

Data collection is a process to guide the researcher in collecting the data. In this study research assistants are required to liaise with the triage nurse and identify potential parents with a child. Then the research assistants can access a computer database system available at ED called FIRETNET (Internet database at
Campbelltown hospital) as a first step in data collection process. Figure 1.1, Page 10, represents the data collection procedure

**a. Accessing FIRSTNET database**
By checking the database research assistants can check the child eligibility for the study, we required to focus on the following aspects, *patient name, age, presenting problem, diagnosis, diagnosis code, presented with parents or carers, and child temperature at presentation*

**b. Approach the parents**
After identifying the eligible child, we can then approach the parents directly and ask them if they would be interested in participating in the study. Parents cannot be included in the study if they cannot read, write, and understand English.

There are three possible scenarios, these are
1. Accept to participate without any objections
2. Accept to participate with concerns, or not completely reject to participate
3. Reject to participate

A transcript has been attached to follow different scenario, please see appendix six

**An overview of the data collection process**

![Diagram](image)

**Figure 9-1: An overview of the data collection process**
6.4. Study groups
This is a Randomised Control Trial (RCT) in this design we need to have two main groups and four subgroups so we can measure the effectiveness of the intervention (the education package), distribution of the participants in these groups will be in a random way (as explained in section 5.2), with the computer software assistants as follows:

a. Intervention groups:
Functional Health Literacy (FHL) parents and low health literacy parents involved in this group will receive the education package.

b. Control groups
FHL parents and low health literacy parents involved in this group will receive an existing brochure that’s currently used at ED (appendix five) only and will not receive the education package until the completion of the trial.

6.5. Sample size required
After we made the calculation to determine the sample size required for the study based on previous studies, we expect that the interventions will be effective if we recruit 324 participants and that 81 participant in each group. Assigning the participants in these groups will be random. Randomisation will give each participant the opportunity to have the same chance in recruitment and assign in the groups. Computer software is available to help us in distributing parents groups.

6.6. Pilot study
Initially the first 100 participants in the study will be considered as a pilot and will later become a part of the main sample. This sample will help in estimating the applicability of the main study RCT. In addition using this sample will give an idea about the response rate which will help in the sample size.

7. Report a problem
During the data collection process; Mr Muhammad Alqudah is the Principal researcher. Muhammad will be available for help in the first two weeks at ED. If Muhammad is not available please contact him for any enquiry or in case of any misleading situation. You can contact the principal researcher at any time in relation to this study on his mobile phone, number 0406919568, or e-mail 16406038@student.uws.edu.au

8. Points to remember
The following points need to be addressed during and after conducting the survey and the data collection process

- We need to attract people to help us in the study, please approach them with a smile and welcome tone
Participants in the study should not know that we are testing their level of health literacy, hence the introduction for the health literacy test started with this sentence “We are studying medical word reading in order to improve communication between healthcare providers and patients”

- It is very important to make sure that both the consent form and the survey have the same study ID number as the randomisation envelope provided.
- Both consent and survey has the participant’s name
- The survey should have the participant’s address for the follow up study after three months.

9. **Data collection time frame**

This study has a time frame; we estimate a maximum of 40 recruited days (5 hours for 3 days a week over 3-4 months) is needed to achieve the required sample size. The research team suggested the time between 6pm and 11 pm for Monday, Wednesday, and Friday).

<table>
<thead>
<tr>
<th></th>
<th>a. Pilot Study</th>
<th>Pre survey</th>
<th>February-March/2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Post survey</td>
<td>April-May/2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pilot study</td>
<td>May/2012</td>
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<tr>
<td></td>
<td></td>
<td>analysis</td>
<td></td>
</tr>
<tr>
<td>b. RCT</td>
<td>Pre survey</td>
<td>May- Jun/2012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post survey</td>
<td>July/ 2012</td>
<td></td>
</tr>
</tbody>
</table>

10. **Study appendixes (during the data collection process)**

- Appendix one is the study brochure and a copy of the DVD will be provided
- Appendix two is the study participant information sheet
- Appendix three is the study questionnaires
- Appendix four is the study consent form
- Appendix five is an existing brochure that’s currently used at ED, Campbelltown Hospital
Appendix six is Script for investigators to follow in the data collection process

11. Script for RNs during data collection process to follow

After the ED nurse reviews the FirestNet, and identifies patients from the listing, he/she can approaches parents/carers and become engaged in the following scenario:

*Please keep in mind the parents/carers’ mood since they are in ED seeking a treatment for their child. We have to introduce a very friendly interview and greetings with sympathy to attract parents/carers and help them to calm down.*

Initially, we need to know if the parents/carers (mother or father or significant other) can read, write and understand English. That can be achieved throughout the conversation. Not a direct question:

- **ED nurse:** - Good morning/Afternoon/Evening, How are you today?
- **Parent** - Good thank you,
- **ED nurse:** - My name is x, I am one of the ED nurses. And I am doing a research about child fever and ways to manage their fever at home. Do you think you will be interested to join us for this study?
- **Parent**
  a. What you want me to do? (Follow scenario 1)
  b. Not really....... (Follow scenario 2)
  c. Yes, that’s fine (Follow scenario 3)
Table 9-2 Possible scenarios during the data collection process

<table>
<thead>
<tr>
<th>Scenario 1, concern</th>
<th>Scenario 2 (Not)</th>
<th>Scenario 3 (Accept)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong> .......<em>What you want me to do?</em></td>
<td><strong>Parent</strong> .......<em>Not really.</em></td>
<td><strong>Parent</strong> .......<em>Yes, that’s fine</em></td>
</tr>
<tr>
<td>ED nurse, actually we are doing a study about child fever, and we will be asking you some questions about you, and about your child?</td>
<td>Or my child is sick, I am not alright.</td>
<td>ED nurse.... Ok thanks. Actually the study is about child fever, and we will be asking you some questions about you, and about your child, what happened to him? What you did for him? And why you came to ED today? And we will be giving you some useful information about fever management.</td>
</tr>
<tr>
<td>And we will be giving you some useful advices about child fever, and how to manage your child fever, what is the correct way of management, some information about fever medication, and where to go. You will be more relaxed in the future with any similar problems.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At the end of each scenario, ED nurse need to offer the Nurofen leaflets to everybody including people who reject to participate.

The following steps should be followed when the parents/carers agrees to participate (scenario one or three)

- **ER Nurse**, give the information sheet and consent form, would you like to read through and I will come back after five minutes, or I can read it for you.

Scenario (A) **Parent**, I will be alright to read through.  
**ED Nurse**, ok then I will be back in five minutes.

Scenario (B) **Parent**, yes please if you can explain it to me that will be great.  
**ED Nurse** starts explaining the information sheet.

At the end, **ED Nurse**, is that Ok.

**Parent**..... Yes that’s fine.

- **ED Nurse**, Ok. So please can I get you to sign this paper, as approval that you accept to join us in this study. (Give consent form to participant).

- **ED Nurse**, anything do you want to ask.

- **ED Nurse**, so in this study I will ask you to read nine medical words in front of me, then I will leave you with the questionnaire to answer, that will takes approximately twenty minutes.
• **ED Nurse** gives the questionnaires

ED Nurse, to start with REALM test first

At the end of the questionnaires there will be a box about your address and contact details, (Show the box). So we can send you the next survey after three months.

ED Nurse is to evaluate the client level of health literacy, if the client level of health literacy is normal then ED nurse need to give him/her an envelope from the Great labelled box. And if the client level of health literacy is low then ED nurse needs to give him/her an envelope from the Good labelled box). Take a sticker from the envelop and place it on the questionnaire, write the ID number on the consent form. At the end of the questioners, asked the client to view the package as soon as convenient but prior to completing the second survey.

Thank you again for your help.

**REALM-SF Test**

Suggested Introduction

‘We are studying medical word reading in order to improve communication between healthcare providers and patients. Here is a list of medical words that may be difficult to read.’

Interviewer: Show the participant the Word List.

Then say, ‘Starting at the top of the list, please read each word aloud to me. If you don’t recognize a word, you can say ‘pass’ and move on to the next word.

Interviewer: If the participant takes more than five seconds on a word, say ‘pass’ and point to the next word. Hold this scoring sheet so that it is not visible to the participant.

<table>
<thead>
<tr>
<th>Table 9-3 REALM-SF test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fat</strong></td>
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<tr>
<td><strong>Flu</strong></td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
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<tr>
<td><strong>Exercise</strong></td>
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<tr>
<td><strong>Menopause</strong></td>
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<tr>
<td><strong>Rectal</strong></td>
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<tr>
<td><strong>Antibiotics</strong></td>
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<tr>
<td><strong>Anemia</strong></td>
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<tr>
<td><strong>Jaundice</strong></td>
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</tbody>
</table>
### REALM-SF Scoring

<table>
<thead>
<tr>
<th>Total Correct (0-7)</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 -5 words or less</td>
<td>Low=(Good box)</td>
</tr>
<tr>
<td>6-7 words or more</td>
<td>Normal=(Great box)</td>
</tr>
</tbody>
</table>

- Please follow the following flow chart during data collection process

1. **Take one survey set from the survey box**
2. **Give the information sheet and consent form**
3. **Collect the signed consent form, check the participant name, and signature**
4. **Leave the questionnaire with participant to complete**
5. **Mark the literacy test, and obtain score**
6. **Give the questionnaire after filling the date and conduct the literacy test**
7. **Depending on the test score, take the appropriate randomization envelop** (Follow the sequence) . . .
8. **Write the study ID on the consent form**
9. **Collect the questionnaire, check the box in last page, name, address, and telephone number, and place the study ID label**
10. **Ask the client to view the package as soon as convenient but prior to completing the second survey**

*Figure 9-2 Flow chart to be followed within the recruitment process*
Dear Parent/Caregiver:

We are inviting you to participate in this study as you have come to the Emergency Department with a child aged between three months and five years who has a fever. The main aim of this study is to improve your knowledge about fever and to give you information about how to take care of your child when he/she has a fever at home. This Information Sheet provides you with the details of a research project that will be conducted to test the success of a fever education program. The researchers would like to learn what you know about child fever and how you manage your child when he/she has fever.

Name of investigator:

Mr Muhammad Alqudah - PhD Student, Centre for applied Nursing Research (CANR) and the School of Nursing, University of Western Sydney, Sydney

Supervisory Panel

1. Professor. Maree Johnson - CANR, South Western Sydney Local Health District (SWSLHD) and the School of Nursing, University of Western Sydney, Sydney.
2. Dr. Leanne Cowin - School of Nursing & Midwifery, College of Health and Science, University of Western Sydney, Sydney.
3. Dr. Ajesh George - Senior research Fellow, CANR, and SWSLHD.

The investigators are qualified nurse academics and researchers who work for the University of Western Sydney (UWS), and collaborate with SWSLHD to carry out nursing research. UWS and the SWSLHD have both given permission for this research to be carried out and the project has received approval from the Human Research Ethics Committees in each of these organisations.

What is the purpose of this study?

Fever is a common childhood problem causing about 20% of emergency department visits. Parents and caregivers get worried when their child has a fever which can result in the incorrect treatment and use of hospital service.
This study will focus on how to decrease a parent or caregivers concerns. This will be achieved through an educational program designed to improve knowledge about fever.

This study is being undertaken as a part of a Doctor of Philosophy degree conducted under the help of the supervisory team from the University of Western Sydney and CANR.

**What will happen in the study?**
If you agree to take part in this research, you will be asked to read aloud nine medical words. You need to read the words in front of the investigator for us to understand your health knowledge. You will first be asked to fill in the attached survey form and return it to the research team by hand, mail or to the staff at Emergency Department reception. The survey will take approximately 20 to 30 minutes to complete. You will be given an education package to review. After three months we will send you another survey.

**Are there any benefits or risks in participating?**
There is no risk in participating in this study, and you will not receive any payment for participation, however there are a number of possible benefits. As a participant in this study you will receive information on fever management, telling you about the right way of checking your child’s temperature, suitable ways of managing fever, when to seek help, and a list of emergency contact numbers in your local area.

**Do you have a choice?**
Your participation in the study will be voluntary (by choice) and you have the right to not continue at any stage of the study with no direct or indirect impact on you or your child’s care. Being part of this study will not pose any risk to you or your child.
Handling of the information and confidentiality

Your private information will be treated confidentiality. All individual data for example your name, age and your child’s information will be coded (using numbers) for the study purpose. Nobody will have access to this information except the research team. All of the research data will be kept by the research team in a locked cabinet at UWS. You can receive a copy of any results from the study by asking the research team.

Complaints may be directed to the Ethics Secretariat (Western Zone), SWSLHD, Locked Bag 7017, LIVERPOOL BC, NSW, 1871 (phone 9612 0614, fax 9612 0611, email righa.saroo@sswhs.nsw.gov.au).

If you have any questions, please feel free to call:

Mr. Muhammad Alqudah

Working hours Telephone No –02 96120671. Any time on 0406919568 or by e-mail 16406038@uws.edu.au
1. I, ........................................................... Of ..........................................................., aged ......................................years, agree to participate as a subject in the study described in the subject information statement set out above.

2. I have been selected as I am a (mother, father, carer) of a febrile child 3 months to 5 years old who has come to the Emergency Department at Campbelltown Hospital.

3. I acknowledge that I have read the Subject Information Statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.

4. Before signing this Consent Form, I have been given the opportunity to ask any questions relating to any possible physical and mental harm I might suffer as a result of my participation. I have received satisfactory answers to any questions that I have asked.

5. My decision whether or not to participate will not prejudice my present or future treatment or my relationship with South Western Sydney Local Health District (SWSLHD) or any other institution cooperating in this study or any person treating me. If I decide to participate, I am free to withdraw my consent and to discontinue my participation at any time without prejudice.

6. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.

7. I understand that if I have any questions relating to my participation in this research, I may contact Mr. Muhammad Alqudah on telephone, 02 96120671 during working hours, any time on 0406919568, by e-mail 16406038@uws.edu.au, or his supervisor, Prof. Maree Johnson on telephone, 02 96120671 who will be happy to answer questions.

8. I acknowledge receipt of a copy of this Consent Form and the Subject Information Statement.

Complaints may be directed to the Ethics Secretariat (Western Zone), SWSLHD, Locked Bag 7017, LIVERPOOL BC, NSW, 1871 (phone 9612 0614, fax 9612 0611, email righa.saroo@sswahs.nsw.gov.au).

Signature of subject ___________________ Signature of witness____________________
Please PRINT name ___________________ Please PRINT name____________________
Date ___________________ Date ___________________
Signature(s) of investigator(s) ________________________________
Please PRINT Name ___________________ Date: __________________________
Managing your child’s fever

This survey has been sent to you as you have agreed to participate in the study at Campbelltown Hospital E.D three months ago. The aim of this survey is to ensure that you benefit from our study, and that you have a good understanding about fever. This survey will take about 15 to 20 minutes to complete. For most of the questions please indicate your response by ticking the correct box. The information you provide will be strictly confidential. Kindly when you complete the questionnaire please send it back in the enclosed stamped envelope.

Section 1: What parents know about fever

Here are some questions about what you know about fever.

From the table below please tick the right answer in the box, please tick box.
Here is an example with a possible response;

At what temperature do you like your hot drinks?

<table>
<thead>
<tr>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
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<th>40.5</th>
<th>41</th>
<th>41.5</th>
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</tbody>
</table>

Q1) If you child aged between 3 and 6 months,

   a) what temperature do you think is:

<table>
<thead>
<tr>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
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<th>39.5</th>
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<th>41</th>
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<th>42°C</th>
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</tbody>
</table>
Appendix 12 Post-Questionnaire

b) At what temperature would you take your child

<table>
<thead>
<tr>
<th>Temperature</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
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<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42°C</th>
</tr>
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<tr>
<td>To the Hospital?</td>
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<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
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</tbody>
</table>

Q2) If you child aged between 7 months and 5 years
a) What temperature do you think is

<table>
<thead>
<tr>
<th>Temperature</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42°C</th>
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<tr>
<td>NORMAL for your child?</td>
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<td>Fever for your child?</td>
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<td>HIGH Fever for your child?</td>
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<tr>
<td>Very High Fever for your child?</td>
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b) At what temperature would you take your child

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<th>39</th>
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<th>41</th>
<th>41.5</th>
<th>42°C</th>
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</tbody>
</table>

Q3) If your child has a fever what do you think is likely to happen? You can tick more than one box.

- [ ] Lack of fluids in the body (Dehydration)
- [ ] Brain damage
- [ ] Lung infection (Pneumonia)
- [ ] Nothing happens from fever alone
- [ ] Loss of consciousness
- [ ] Fit (febrile seizures)
- [ ] Other not stated.

Section 2: Managing your child’s fever

Here are some questions about managing your child’s fever.
Appendix 12 Post-Questionnaire

Checking your child’s temperature

This question is about checking your child’s temperature.

Q4) If your child is aged between two months and five years, what is the best way to check his/her temperature? You can tick more than one box.

- By touch
- by mouth
- under the arm
- by rectal (Back passage)
- by ear

Q5) What kind of thermometers do you use when you check your child’s body temperature? You can tick more than one box.

- Mercury
- electronic
- infrared.

Using physical methods to reduce fever

Here are some questions about managing your child’s fever using physical methods (not medicine) to reduce your child’s body temperature. Please circle the appropriate answer.

Q6) When your child has a fever at home, what do you do? You can tick more than one answer.

- Give fluids
- Dress the child with extra clothes
- Give a cold bath
- Nothing in particular
- Tepid (lukewarm)sponging
- Give a tepid(lukewarm) bath
- Remove extra clothes
- Other please specify
Appendix 12 Post-Questionnaire

Q7) If you bathe your child to reduce his/her fevers, how long do you keep him/her in the bath?

☐ 10 minutes  ☐ 11-15 minutes  ☐ More than 15 minutes

Using fever medicines

Q8) Do you give fever medicines without getting advice from the doctor?

☐ Yes  ☐ No

Q9) Do you give fever medicines without checking your child’s temperature?

☐ Never  ➔ Go to Q11)  ☐ Rarely  ☐ Sometimes  ☐ Always.

Q10) Above what temperature do you give fever medicines? Please circle temperature

☐ 36  ☐ 36.5  ☐ 37  ☐ 37.5  ☐ 38  ☐ 38.5  ☐ 39  ☐ 39.5  ☐ 40  ☐ 40.5  ☐ 41  ☐ 41.5  ☐ 42°C

Q11) What fever medicines (include medicines you buy at the chemistry/ pharmacy) do you use for your child? *You can tick more than one answer.*

☐ Nurofen syrup  ☐ Panadol Syrup  ☐ Others (please specify): ____________________

Q12) How often do you give fever medicines?

a) How often do you give Panadol (Syrup)?

☐ Every 2 hours  ☐ Every 4 hours  ☐ Every 6 hours  ☐ Every 8 hours.

☐ Other (please specify): ____________________.

b) How often do you give Nurofen?

☐ Every 2 hours  ☐ Every 4 hours  ☐ Every 6 hours  ☐ Every 8 hours.

☐ Other (please specify): ____________________.
Appendix 12 Post-Questionnaire

c) How often do you give other fever medicines (other than Panadol or Nurofen)?
- Every 2 hours
- Every 4 hours
- Every 6 hours
- Every 8 hours
- Other (please specify): ____________________.

Section 3: Seeking help and health service use

The following questions are about when you would seek help and when you visit health services for your child with a fever.

Q13) How long do you wait to consult health care providers (doctors or nurses) when your child develops high fever (> 38.5?)
- Immediately (straight away)
- After half a day
- After one day
- More than 2 days
- Do not consult health care providers for fever alone.

Q14) Above what temperature would you take your child to Emergency Department at the hospital? Please circle temperature.

36  36.5  37  37.5  38  38.5  39  39.5  40  40.5  41  41.5  42°C

Q15) a) How many visits to the ED have you made because of a child with fever within the past 3 months?
- None
- 1
- 2
- 3
- 4
- 5 or more

b) How many visits have you made to your local doctor because of a child with fever within the past 3 months?
- None
- 1
- 2
- 3
- 4
- 5 or more

Thank you for participating.
Dear Parent/Caregiver:

This Information sheet provides you with the details of a research project to test the success of fever education program that you were involved in three months ago at Campbelltown Hospital E.D. We are inviting you to complete a survey as you have agreed to participate in the study at Campbelltown Hospital E.D three months ago. The aim of this survey is to ensure that you benefit from our study, and that you have a good understanding about fever. The researchers would like to know what you learnt about child’s fever and how you manage, will manage your child when he/she has fever.

Name of investigator:
Mr Muhammad Alqudah- PhD Student, Centre for applied Nursing Research (CANR) and the School of Nursing, University of Western Sydney, Sydney

Supervisory Panel
1. Professor. Maree Johnson- CANR, South Western Sydney Local Health District (SWSLHD) and the School of Nursing, University of Western Sydney, Sydney.
2. Dr. Leanne Cowin- School of Nursing & Midwifery, College of Health and Science University of Western Sydney, Sydney.
3. Dr. Ajesh George- Senior research Fellow, CANR, and SWSLHD.

The investigators are qualified nurse academics and researchers who work for the University of Western Sydney (UWS), and collaborate with SWSLHD to carry out nursing research. UWS and the SWSLHD have both given permission for this research to be carried out and the project has received approval from the Human Research Ethics Committees in each of these organisations.

What is the purpose of this study?
Fever is a common childhood problem causing about 20% of emergency department visits. Parents and caregivers get worried when their child has a fever which can result in the incorrect treatment and use of hospital service.

This study will focus on how to decrease a parent or caregivers concerns. This will be achieved through an educational program designed to improve knowledge about fever.

This study is being undertaken as a part of a Doctor of Philosophy degree conducted under the help of the supervisory team from the University of Western Sydney and CANR.

What will happen in the study?
As you agreed to take part in this research three months ago at Campbelltown Hospital E.D, we are sending you another set of survey. Please fill in the attached survey form and resend it to the research team using the reply paid envelope attached.

Are there any benefits or risks in participating?
There is no risk in participating in this study, and you will not receive any payment for participation, however there are a number of possible benefits. If we find the DVD and the brochure of benefit to you, this education material can be then given to other parents presented to ED in the future.
Do you have a choice?
Your participation in the study will be voluntary (by choice) and you have the right to not continue at any stage of the study with no direct or indirect impact on you or your child’s care. Being part of this study will not pose any risk to you or your child.

Handling of the information and confidentiality
Your private information will be treated confidentiality, all individual data for example your name, age and your child’s information will be coded (using numbers) for the study purpose. Nobody will have access to this information except the research team. All of the research data will be kept by the research team in a locked cabinet at UWS. You can receive a copy of any results from the study by asking the research team.

If you have any questions, please feel free to call:
Mr. Muhammad Alqudah
Working hours Telephone No–02 96120671. Any time on 0406919568 or by e-mail 16406038@uws.edu.au

Complaints may be directed to the Ethics Secretariat (Western Zone), SWSLHD, Locked Bag 7017, LIVERPOOL BC, NSW, 1871 (phone 9612 0614, fax 9612 0611, email righa.saroo@sswhs.nsw.gov.au).

Thank you for your help in this study
Muhammad Alqudah
PhD student
University of Western Sydney
School Of Nursing and Midwifery
Centre for Applied Nursing Research (CANR).
Appendix 14 Reminder letter

UNIVERSITY OF WESTERN SYDNEY
Child fever management study

REMINDER

Dear Parents

You may recall receiving a survey from us with regard to your child who presented to the Emergency Department at Campbelltown hospital three months ago. If you have not yet completed the survey we would like to extend a friendly reminder to you that you are still able to do so. If you have recently returned the survey please ignore this letter.

Your participation in this survey is very important and valuable to us. Your answers will be used to confirm the success of the child fever study that you were involved in.

Please take a moment to fill-out the enclosed survey and return it in the reply paid envelope provided.

Thank you for your time and participation in this survey.

Sincerely

Research Team
Appendix 15 Online survey in survey monkey

(See next page)
Dear participant,
You are receiving the following survey as the final part of your participation in the Fever Management Study at Campbelltown Hospital Emergency Department 3 months ago. This survey has been sent to you now as an on-line survey as you have provided your email address.

The aim of this survey is to ensure that you benefit from our study, and that you have a good understanding about fever. Your initial responses were excellent however; your final responses are now required in order to complete your participation in this project.

This survey will take about 5 to 10 minutes to complete. For most of the questions please indicate your response by ticking the correct box. The information you provide remain strictly confidential.

Many thanks for your kind assistance
Managing your child’s fever

Demographic Questions

* 1. Please type your full name
### Managing your child’s fever

#### Section 1: What parents know about fever

Here are some questions on what you know about fever. From the table below please tick the select the correct answer.

**2. If your child is aged between 3 and 6 months, what temperature do you think is:**

(Please tick "Not applicable" if your child is not aged between 3 and 6 months)

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<th>41.5</th>
<th>42</th>
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</thead>
<tbody>
<tr>
<td>NORMAL for your child?</td>
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<tr>
<td>Fever for your child?</td>
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<td>HIGH Fever for your child?</td>
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<td>May Cause Harm to your child?</td>
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</tbody>
</table>

**3. If your child is aged between 3 and 6 months, at what temperature would you take your child:**

(Please tick "Not applicable" if your child is not aged between 3 and 6 months)

<table>
<thead>
<tr>
<th></th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the Hospital?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Managing your child’s fever**

*4. If your child is aged between 7 months and 5 years, What temperature do you think
is
(Please tick "Not applicable" if your child is not aged between 7 months and 5 years)*

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Not Applicable</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal for your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Fever for your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>High Fever for your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Very High Fever for your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>May Cause Harm to your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

*5. If your child is aged between 7 months and 5 years, at what temperature would you
take your child: (Please tick "Not applicable" if your child is not aged between 7 months
and 5 years)*

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Not Applicable</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the Hospital?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>To the local Doctor (Doctor Surgery)?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
6. If your child has a fever what do you think is likely to happen? (You can tick more than one box)

- Lack of fluids in the body (Dehydration)
- Brain damage
- Lung infection (Pneumonia)
- Nothing happens from fever alone
- Loss of consciousness
- Fit (febrile seizures)
- Other not stated
Section 2: Managing your child’s fever

Checking your child’s temperature

Here are some questions about managing your child’s fever.

**7. If your child is aged between two months and five years, what is the best way to check his/her temperature? (You can tick more than one box)**

- [ ] By touch
- [ ] by mouth
- [ ] under the arm
- [ ] by ear
- [ ] by rectal (Back passage)

**8. What kind of thermometers do you use when you check your child’s body temperature? (You can tick more than one box)**

- [ ] Mercury
- [ ] Electronic
- [ ] Infrared
Managing your child’s fever

Using physical methods to reduce fever

Here are some questions about managing your child’s fever using physical methods (not medicine) to reduce your child’s body temperature. Please select the appropriate answer.

**9. When your child has a fever at home, what do you do? (You can tick more than one answer)**

- [ ] Give fluids
- [ ] Tepid (lukewarm)sponging
- [ ] Nothing in particular
- [ ] Dress the child with extra clothes
- [ ] Give a tepid(lukewarm) bath
- [ ] Other please specify
- [ ] Give a cold bath
- [ ] Remove extra clothes

**10. If you bath your child to reduce his/her fevers, how long do you keep him/her in the bath?**

- [ ] 10 minutes
- [ ] 11-15 minutes
- [ ] More than 15 minutes
Using fever medicines

**11. Do you give fever medicines without getting advice from the doctor?**

- [ ] Yes
- [ ] No

**12. Do you give fever medicines without checking your child's temperature?**

- [ ] Never
- [ ] Rarely
- [ ] Sometimes
- [ ] Always

**13. Above what temperature do you give fever medicines?**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>36</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticks</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**14. What fever medicines (include medicines you buy at the chemist/pharmacy) do you use for your child?**

- [ ] Nurofen syrup
- [ ] Panadol syrup
- [ ] Others

Others (please specify)

**15. How often do you give the following fever medicines?**

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Every 2 hours</th>
<th>Every 4 hours</th>
<th>Every 6 hours</th>
<th>Every 8 hours</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panadol?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Nurofen?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Other fever medicines?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Other (please specify)
Managing your child’s fever

Section 3: Seeking help and health service use

The following questions are about when you would seek help and when you visit health services for your child with a fever.

* 16. How long do you wait to consult health care providers (doctors or nurses) when your child develops high fever (> 38.5?)
   - [ ] Immediately (straight away)
   - [ ] After one day
   - [ ] After half a day
   - [ ] More than 2 days
   - [ ] Do not consult health care providers for fever alone.

* 17. Above what temperature would you take your child to Emergency Department at the hospital?

<table>
<thead>
<tr>
<th>Temperature</th>
<th>36</th>
<th>36.5</th>
<th>37</th>
<th>37.5</th>
<th>38</th>
<th>38.5</th>
<th>39</th>
<th>39.5</th>
<th>40</th>
<th>40.5</th>
<th>41</th>
<th>41.5</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please tick temperature</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

* 18. How many visits to the ED have you made because of a child with fever within the past 3 months?
   - [ ] None
   - [ ] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5 or more

* 19. How many visits have you made to your local doctor because of a child with fever within the past 3 months?
   - [ ] None
   - [ ] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5 or more
Thank you for participating in this survey!
Appendix 16 Normality test and Transformation

Table 16-1 Tests of Normality pre-survey (N=155)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>FKNS</td>
<td>.106</td>
<td>155</td>
</tr>
<tr>
<td>FMPS</td>
<td>.146</td>
<td>155</td>
</tr>
</tbody>
</table>

a. Lilliefors Significance Correction

1. Normality test histograms, plots for the pre-survey items (N=155)

a. Pre-survey FKNS (N=155)

Figure 16-1 Histogram for the pre-survey FKNS (N=155)
Figure 16-2 Q-Q plot for the pre-survey FKNS (N=155)

b. Pre-survey FMPS (N=155)

Figure 16-3 Histogram for the pre-survey FMPS (N=155)
2. **Normality test histograms, plots and Tables for the post-survey items (n=46)**

Table 16-2 Tests of normality for the post-survey items (n=46)

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Pre-survey (FKNS)</td>
<td>0.14</td>
<td>46</td>
</tr>
<tr>
<td>Post-survey (FKNS)</td>
<td>0.16</td>
<td>46</td>
</tr>
<tr>
<td>Mean difference in (FKNS)</td>
<td>0.186</td>
<td>46</td>
</tr>
<tr>
<td>Pre-survey (FMPS)</td>
<td>0.16</td>
<td>46</td>
</tr>
<tr>
<td>Post-survey (FMPS)</td>
<td>0.20</td>
<td>46</td>
</tr>
<tr>
<td>Mean difference in (FMPS)</td>
<td>0.16</td>
<td>46</td>
</tr>
<tr>
<td>Pre-survey (ED/primary care presentations)</td>
<td>0.20</td>
<td>46</td>
</tr>
<tr>
<td>Post-survey (ED/primary care presentations)</td>
<td>0.17</td>
<td>46</td>
</tr>
<tr>
<td>Mean difference (ED/primary care presentations)</td>
<td>0.14</td>
<td>46</td>
</tr>
</tbody>
</table>

Lilliefors Significance Correction

*Figure 16-4 Q-Q plot for the pre-survey FMPS (N=155)*
Histograms and plots for each outcome reported below

- **Per, Post and mean difference for the (FKNS-14)**

a. Pre-survey FKNS-14 (n=46)

*Figure 16-5* Histogram for the pre-survey FKNS-14

![Histogram for the pre-survey FKNS-14](image)

*Figure 16-6* Q-Q plot for the pre-survey (FKNS-14)

![Q-Q plot for the pre-survey (FKNS-14)](image)
b. Post-survey FKNS-14 (n=46)

Figure 16-7 Histogram for the post-survey FKNS-14

Figure 16-8 Q-Q plot for the post-survey (FKNS-14)
c. Mean difference between pre- and post-survey (n=46)

Figure 16-9 Histogram for the mean difference between pre- and post-survey (FKNS-14)

Figure 16-10 Q-Q plot for mean difference between pre and post-survey (FKNS-14)
• **Per, post and mean difference for the (FMPS-10)**

a. Pre-survey FMPS-10 (n=46)

![Histogram for the pre-survey (FMPS-10)](image)

*Figure 16-11* Histogram for the pre-survey (FMPS-10)

![Q-Q plot for the pre-survey (FMPS-10)](image)

*Figure 16-12* Q-Q plot for the pre-survey (FMPS-10)
b. Post-survey FMPS-10 (n=46)

*Figure 16-13* Histogram for the post-survey (FMPS-10)

*Figure 16-14* Q-Q plot for the post-survey (FMPS-10)
c. Mean difference between pre and post FMPS-10 (n=46)

*Figure 16-15* Histogram for the mean difference between pre and post (FMPS-10)

*Figure 16-16* Q-Q plot for the mean difference between pre and post (FMPS-10)
• **Per, post and mean difference for ED/primary care presentations (n=46)**

  a. Pre-survey ED/primary care presentations (n=46)

  ![Histogram for the pre-survey ED/primary care presentations](image1)

  *Figure 16-17* Histogram for the pre-survey ED/primary care presentations

  ![Normal Q-Q Plot of pre-survey children ED/primary care presentations](image2)

  *Figure 16-18* Q-Q plot for the pre-survey children ED/primary care presentations

  b. Post-survey ED/primary care presentations (n=46)
Figure 16-19 Histogram for the post-survey children ED/primary care presentations

Figure 16-20 Q-Q plot for the post-survey children ED/primary care presentations
c. Mean difference between pre and post ED/primary care presentations (n=46)

Figure 16-21 Histogram for the mean difference between children pre and post ED/primary care presentations

Figure 16-20 Q-Q plot for the mean difference between children pre and post ED/primary care presentations
- Normality test for the data after transformation (n=46)

Table 16-3 Tests of Normality

<table>
<thead>
<tr>
<th>Transformed</th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Pre-survey (FKNS)</td>
<td>0.20</td>
<td>46</td>
</tr>
<tr>
<td>Post-survey (FKNS)</td>
<td>0.16</td>
<td>46</td>
</tr>
<tr>
<td>Mean difference in (FKNS)</td>
<td>0.19</td>
<td>46</td>
</tr>
<tr>
<td>Pre-survey (FMPS)</td>
<td>0.15</td>
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</tr>
<tr>
<td>Post-survey (FMPS)</td>
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<td>46</td>
</tr>
<tr>
<td>Mean difference in (FMPS)</td>
<td>0.26</td>
<td>46</td>
</tr>
<tr>
<td>Pre-survey (ED/primary care presentations)</td>
<td>0.17</td>
<td>46</td>
</tr>
<tr>
<td>Post-survey (ED/primary care presentations)</td>
<td>0.15</td>
<td>46</td>
</tr>
<tr>
<td>Mean difference (ED/primary care presentations)</td>
<td>0.13</td>
<td>46</td>
</tr>
</tbody>
</table>

<sup>a</sup> Lilliefors Significance Correction
## Appendix 17 Full items in the Survey

Table 17-1 FKNS between literacy groups (N=155)

| Knowledge items                                      | LHL (n=33) |   | FHL (n=122) |   |
|------------------------------------------------------|------------|-------------------------------|-------------------------------|
|                                                       | N          | %                            | N                            | %  |
| 1. Normal temperature (3-6 months)                   | 32         | 97                            | 120                          | 98.2 |
| 2. Temperature that considered fever (3-6 months)     | 27         | 81.8                          | 74                            | 60.7 |
| 3. Temperature that considered hi fever (3-6 months)  | 26         | 78.8                          | 93                            | 76.2 |
| 4. Temperature can cause harm (3-6 months)            | 25         | 75.8                          | 94                            | 77   |
| 5. Normal temperature (7months - 5 years)            | 32         | 97                            | 116                           | 95.1 |
| 6. Temperature that considered fever (7M-5Y)          | 22         | 66.7                          | 85                            | 69.7 |
| 7. Temperature that considered hi fever (7M-5Y)       | 24         | 72.7                          | 77                            | 63.1 |
| 8. Temperature can cause harm (7M-5Y)                 | 7          | 21.2                          | 28                            | 23   |
| 9. Fever can cause dehydration                       | 28         | 84.8                          | 103                           | 84.4 |
| 10. Fever can cause brain damage                     | 11         | 33.3                          | 42                            | 34.4 |
| 11. Fever can cause pneumonia                        | 6          | 18.2                          | 20                            | 16.4 |
| 12. Fever can cause nothing                          | 32         | 97                            | 111                           | 91   |
| 13. Fever can cause loss conscious                   | 13         | 39.4                          | 52                            | 42.6 |
| 14. Fever can cause fit                              | 12         | 36.4                          | 80                            | 65.6 |
| 15. Method of measurement (touch)                    | 22         | 66.7                          | 76                            | 62.3 |
| 16. Method of measurement (mouth)                    | 27         | 81.8                          | 95                            | 77.9 |
| 17. Method of measurement (axillary)                 | 27         | 81.8                          | 97                            | 79.5 |
| 18. Method of measurement (by rectal)                | 31         | 93.9                          | 112                           | 91.8 |
| 19. Method of measurement (by ear)                   | 16         | 48.5                          | 66                            | 54.1 |
| 20. Type of Thermometer (mercury)                    | 31         | 93.9                          | 119                           | 97.5 |
| 21. Type of Thermometer (electronic)                 | 29         | 87.9                          | 99                            | 81.1 |
| 22. Type of Thermometer (infrared)                   | 10         | 30.3                          | 50                            | 41   |
| 23. Time to spend bathing your child                  | 9          | 27.3                          | 19                            | 15.6 |
| 24. Correct fever medicine                           | 2          | 6.1                           | 1                             | 0.8  |
| 25. Temperature required ED                          | 20         | 60.6                          | 85                            | 69.7 |
Table 17-2 FMPS between literacy groups (N=155)

<table>
<thead>
<tr>
<th>Practice item</th>
<th>LHL (n=33)</th>
<th></th>
<th>FHL (n=122)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fever required hospitalisation (3-6M)</td>
<td>13</td>
<td>39.4</td>
<td>51</td>
<td>41.8</td>
</tr>
<tr>
<td>2. Fever required General Practitioner (3-6M)</td>
<td>9</td>
<td>27.3</td>
<td>10</td>
<td>8.2</td>
</tr>
<tr>
<td>3. Fever required hospitalisation (7M-5Y)</td>
<td>2</td>
<td>6.1</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>4. Fever required General Practitioner (7M-5Y)</td>
<td>6</td>
<td>18.2</td>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>5. Fever management by give fluid</td>
<td>32</td>
<td>97</td>
<td>117</td>
<td>95.9</td>
</tr>
<tr>
<td>6. Fever management by tepid Sponge</td>
<td>12</td>
<td>36.4</td>
<td>65</td>
<td>53.3</td>
</tr>
<tr>
<td>7. Fever management by dress with excess clothing</td>
<td>32</td>
<td>97</td>
<td>118</td>
<td>96.7</td>
</tr>
<tr>
<td>8. Fever management by lukewarm Bath</td>
<td>13</td>
<td>39.4</td>
<td>65</td>
<td>53.3</td>
</tr>
<tr>
<td>9. Fever management by cold bath</td>
<td>26</td>
<td>78.8</td>
<td>107</td>
<td>87.7</td>
</tr>
<tr>
<td>10. Fever management by remove excess clothing</td>
<td>25</td>
<td>75.8</td>
<td>102</td>
<td>83.6</td>
</tr>
<tr>
<td>11. Use fever medicine without Dr advice</td>
<td>14</td>
<td>42.4</td>
<td>17</td>
<td>13.9</td>
</tr>
<tr>
<td>12. Use fever medicine without check</td>
<td>24</td>
<td>72.7</td>
<td>84</td>
<td>68.9</td>
</tr>
<tr>
<td>13. Mange fever by Nurofen</td>
<td>9</td>
<td>33</td>
<td>21</td>
<td>17.2</td>
</tr>
<tr>
<td>14. Mange fever by Panadol</td>
<td>7</td>
<td>21.2</td>
<td>27</td>
<td>22.1</td>
</tr>
<tr>
<td>15. Waiting time before seeking help</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>4.9</td>
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</table>
Table 17- 3 FKNS between literacy groups (n=46)

<table>
<thead>
<tr>
<th>Knowledge Items literacy groups</th>
<th>LHL (n=10)</th>
<th>FHL (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Normal temperature (3-6 months)</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>2. Temperature that considered fever (3-6 months)</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>3. Temperature that considered hi fever (3-6 months)</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>4. Temperature can cause harm (3-6 months)</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>5. Normal temperature (7months -5 years)</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>6. Temperature that considered fever (7M-5Y)</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>7. Temperature that considered hi fever (7M-5Y)</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>8. Temperature can cause harm (7M-5Y)</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>9. Fever can cause dehydration</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>10. Fever can cause brain damage</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>11. Fever can cause pneumonia</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>12. Fever can cause nothing</td>
<td>9</td>
<td>90</td>
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<tr>
<td>13. Fever can cause loss conscious</td>
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<td>14. Fever can cause fit</td>
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<td>15. Method of measurement (touch)</td>
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<td>16. Method of measurement (mouth)</td>
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<td>17. Method of measurement (axillary)</td>
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<td>18. Method of measurement (by rectal)</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>19. Method of measurement (by ear)</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>20. Type of Thermometer (mercury)</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>21. Type of Thermometer (electronic)</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>22. Type of Thermometer (infrared)</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>23. Time to spend bathing your child</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>24. Correct fever medicine</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>25. Temperature required ED</td>
<td>7</td>
<td>70</td>
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Table 17-4 FMPS between literacy groups (n=46)

<table>
<thead>
<tr>
<th>Practice item</th>
<th>LHL (n=10)</th>
<th></th>
<th>FHL (n=36)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Fever required hospitalisation (3-6M)</td>
<td>5</td>
<td>50</td>
<td>12</td>
<td>33.3</td>
</tr>
<tr>
<td>2. Fever required General Practitioner (3-6M)</td>
<td>4</td>
<td>40</td>
<td>6</td>
<td>16.7</td>
</tr>
<tr>
<td>3. Fever required hospitalisation (7M-5Y)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>4. Fever required General Practitioner (7M-5Y)</td>
<td>3</td>
<td>30</td>
<td>4</td>
<td>11.1</td>
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<tr>
<td>5. Fever management by gve fluid</td>
<td>10</td>
<td>100</td>
<td>34</td>
<td>94.4</td>
</tr>
<tr>
<td>6. Fever management by tepid Sponge</td>
<td>3</td>
<td>30</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>7. Fever management by dress with excess clothing</td>
<td>10</td>
<td>100</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>8. Fever management by lukewarm Bath</td>
<td>4</td>
<td>40</td>
<td>21</td>
<td>58.3</td>
</tr>
<tr>
<td>9. Fever management by cold bath</td>
<td>8</td>
<td>80</td>
<td>32</td>
<td>88.9</td>
</tr>
<tr>
<td>10. Fever management by remove excess clothing</td>
<td>8</td>
<td>80</td>
<td>32</td>
<td>88.9</td>
</tr>
<tr>
<td>11. Use fever medicine without Dr advice</td>
<td>8</td>
<td>80</td>
<td>31</td>
<td>86.1</td>
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<tr>
<td>12. Use fever medicine without check</td>
<td>7</td>
<td>70</td>
<td>22</td>
<td>61.1</td>
</tr>
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<td>13. Mange fever by Nurofen</td>
<td>1</td>
<td>10</td>
<td>8</td>
<td>28.2</td>
</tr>
<tr>
<td>14. Mange fever by Panadol</td>
<td>3</td>
<td>30</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>15. Waiting time before seeking help</td>
<td>0</td>
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Table 17-5

Comparison between Parents’s correct fever knowledge answers in the current study for the pre and post survey with other studies

<table>
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<tr>
<th>ITEM (Months=M, Year=Y)</th>
<th>155 N</th>
<th>%</th>
<th>46 N</th>
<th>%</th>
<th>Other studies% of correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Normal temperature (3-6 months (M))</td>
<td>152</td>
<td>98.1</td>
<td>45</td>
<td>97.8</td>
<td>_ _ _ _ _</td>
</tr>
<tr>
<td>2. Temperature that considered fever (3-6 M)</td>
<td>101</td>
<td>65.2</td>
<td>29</td>
<td>63</td>
<td>_ _ _ 62.4 _</td>
</tr>
<tr>
<td>3. Temperature that considered hi fever (3-6 M)</td>
<td>119</td>
<td>76.8</td>
<td>32</td>
<td>69.9</td>
<td>_ _ _ _ _</td>
</tr>
<tr>
<td>4. Temperature can cause harm (3-6 M)</td>
<td>119</td>
<td>76.8</td>
<td>33</td>
<td>71.7</td>
<td>_ _ _ _ _</td>
</tr>
<tr>
<td>5. Normal temperature (7M-5 years)</td>
<td>148</td>
<td>95.5</td>
<td>44</td>
<td>95.7</td>
<td>_ 95.9 _ _ _</td>
</tr>
<tr>
<td>6. Temperature that considered fever (7M-5Y)</td>
<td>107</td>
<td>69</td>
<td>30</td>
<td>65.2</td>
<td>_ 24.3 66.1 62.4 _</td>
</tr>
<tr>
<td>7. Temperature that considered hi fever (7M-5Y)</td>
<td>101</td>
<td>65.2</td>
<td>27</td>
<td>58.7</td>
<td>_ 51 25.7 40.6 50</td>
</tr>
<tr>
<td>8. Temperature can cause harm (7M-5Y)</td>
<td>35</td>
<td>22.6</td>
<td>9</td>
<td>19.6</td>
<td>_ 9.3 16.2 _</td>
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<tr>
<td>9. Fever can cause dehydration</td>
<td>131</td>
<td>84.5</td>
<td>38</td>
<td>82.6</td>
<td>68.2-68.7 7.6 _ 18.8 _</td>
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<tr>
<td>10. Fever can cause brain damage</td>
<td>53</td>
<td>34.2</td>
<td>16</td>
<td>34.8</td>
<td>27.3-44.4 14.4 _ 35.9 21</td>
</tr>
<tr>
<td>11. Fever can cause pneumonia</td>
<td>26</td>
<td>16.8</td>
<td>10</td>
<td>21.7</td>
<td>15.9-28.4 _ _ _ _</td>
</tr>
<tr>
<td>12. Fever can cause nothing</td>
<td>143</td>
<td>92.3</td>
<td>43</td>
<td>93.5</td>
<td>_ _ _ _ _</td>
</tr>
<tr>
<td>13. Fever can cause loss conscious</td>
<td>65</td>
<td>41.9</td>
<td>16</td>
<td>34.8</td>
<td>6.8-13.7 _ 34.6 _</td>
</tr>
<tr>
<td>14. Fever can cause Fit</td>
<td>92</td>
<td>59.4</td>
<td>27</td>
<td>58.7</td>
<td>57.3-77.3 57.1 _ 69.3 32</td>
</tr>
<tr>
<td>15. Method of measurement (touch)</td>
<td>98</td>
<td>63.2</td>
<td>30</td>
<td>65.2</td>
<td>_ _ _ _ _</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td></td>
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<td>----</td>
<td>------</td>
<td>-----</td>
<td>----</td>
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<tr>
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<td>80</td>
<td>39</td>
<td>84.8</td>
</tr>
<tr>
<td>18</td>
<td>Method of measurement (by rectal)</td>
<td>143</td>
<td>92.3</td>
<td>42</td>
<td>91.3</td>
</tr>
<tr>
<td>19</td>
<td>Method of measurement by ear</td>
<td>82</td>
<td>52.9</td>
<td>30</td>
<td>65.2</td>
</tr>
<tr>
<td>20</td>
<td>Type of thermometer (mercury)</td>
<td>150</td>
<td>96.8</td>
<td>43</td>
<td>93.5</td>
</tr>
<tr>
<td>21</td>
<td>Type of thermometer electronic</td>
<td>127</td>
<td>81.9</td>
<td>35</td>
<td>76.1</td>
</tr>
<tr>
<td>22</td>
<td>Type of thermometer infrared</td>
<td>60</td>
<td>38.7</td>
<td>25</td>
<td>54.3</td>
</tr>
<tr>
<td>23</td>
<td>Time to spend bathing your child</td>
<td>28</td>
<td>18.1</td>
<td>9</td>
<td>19.6</td>
</tr>
<tr>
<td>24</td>
<td>Correct fever medicine</td>
<td>3</td>
<td>1.9</td>
<td>2</td>
<td>4.3</td>
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<tr>
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<td>Temperature required ED</td>
<td>105</td>
<td>67.7</td>
<td>34</td>
<td>73.9</td>
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Table 17.6

Comparison between Parents’ correct practice answers in the current study for the pre and post survey with other studies

<table>
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<tr>
<th>ITEM</th>
<th>Item Description</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>Other studies% of correct answers</th>
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</thead>
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<tr>
<td>1</td>
<td>Fever required hospitalisation (3-6M)</td>
<td>64</td>
<td>41.3</td>
<td>17</td>
<td>37</td>
<td>_</td>
</tr>
<tr>
<td>2</td>
<td>Fever required General Practitioner (3-6M)</td>
<td>19</td>
<td>12.3</td>
<td>10</td>
<td>21.7</td>
<td>_</td>
</tr>
<tr>
<td>3</td>
<td>Fever required hospitalisation (7 M-5Y)</td>
<td>5</td>
<td>3.2</td>
<td>1</td>
<td>2.2</td>
<td>_</td>
</tr>
<tr>
<td>4</td>
<td>Fever required General Practitioner (7M-5Y)</td>
<td>11</td>
<td>7.1</td>
<td>7</td>
<td>15.2</td>
<td>_</td>
</tr>
<tr>
<td>5</td>
<td>Fever management by give fluid</td>
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<td>96.1</td>
<td>44</td>
<td>95.7</td>
<td>49</td>
</tr>
<tr>
<td>6</td>
<td>Fever management by tepid Sponge</td>
<td>77</td>
<td>49.7</td>
<td>21</td>
<td>45.7</td>
<td>23.8</td>
</tr>
<tr>
<td>7</td>
<td>Fever management by dress with excess clothing</td>
<td>150</td>
<td>96.8</td>
<td>46</td>
<td>100</td>
<td>_</td>
</tr>
<tr>
<td>8</td>
<td>Fever management by lukewarm Bath</td>
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<td>50.3</td>
<td>25</td>
<td>54.3</td>
<td>_</td>
</tr>
<tr>
<td>9</td>
<td>Fever management by cold bath</td>
<td>133</td>
<td>85.8</td>
<td>40</td>
<td>87</td>
<td>_</td>
</tr>
<tr>
<td>10</td>
<td>Fever management by remove excess clothing</td>
<td>127</td>
<td>81.9</td>
<td>39</td>
<td>84.8</td>
<td>_</td>
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<tr>
<td>11</td>
<td>Use fever medicine without Dr advice</td>
<td>31</td>
<td>20</td>
<td>12</td>
<td>26.1</td>
<td>_</td>
</tr>
<tr>
<td>12</td>
<td>Use fever medicine without check</td>
<td>108</td>
<td>69.7</td>
<td>29</td>
<td>63</td>
<td>_</td>
</tr>
<tr>
<td>13</td>
<td>Mange fever by Nurofen</td>
<td>30</td>
<td>19.4</td>
<td>9</td>
<td>19.6</td>
<td>_</td>
</tr>
<tr>
<td>14</td>
<td>Mange fever by Panadol</td>
<td>34</td>
<td>21.9</td>
<td>12</td>
<td>26.1</td>
<td>_</td>
</tr>
<tr>
<td>15</td>
<td>Waiting time before seeking help</td>
<td>7</td>
<td>4.5</td>
<td>2</td>
<td>4.3</td>
<td>_</td>
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</table>
Appendix 18 Planned contrast

Planned contrasts for primary and secondary outcome measures for the final sample (n=46).

Normality test

Table 18-1 Test of Homogeneity of Variances

<table>
<thead>
<tr>
<th>Difference in score</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED/primary care visit</td>
<td>2.63</td>
<td>3</td>
<td>42</td>
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</tr>
<tr>
<td>FMPS-10</td>
<td>0.17</td>
<td>3</td>
<td>42</td>
<td>0.91</td>
</tr>
<tr>
<td>FKNS-14</td>
<td>0.93</td>
<td>3</td>
<td>42</td>
<td>0.43</td>
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</tbody>
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Extra analysis between groups

Table 18-2: Descriptive analysis between contrast groups on outcome measures

<table>
<thead>
<tr>
<th>Difference</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Std. Error</th>
<th>95% Confidence Interval for Mean</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
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<td>7</td>
<td>1.71</td>
<td>3.68</td>
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<td>B</td>
<td>3</td>
<td>0.66</td>
<td>2.08</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19</td>
<td>0.78</td>
<td>2.20</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>17</td>
<td>0.11</td>
<td>3.10</td>
<td>0.75</td>
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<td>0.67</td>
<td>2.76</td>
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<td>FMPS-10</td>
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<td>7</td>
<td>1.28</td>
<td>1.79</td>
<td>0.68</td>
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<td>0.00</td>
<td>3.00</td>
<td>1.73</td>
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<td>19</td>
<td>1.00</td>
<td>2.18</td>
<td>0.50</td>
</tr>
<tr>
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<td>D</td>
<td>17</td>
<td>0.88</td>
<td>1.86</td>
<td>0.45</td>
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<tr>
<td></td>
<td>Total</td>
<td>46</td>
<td>0.93</td>
<td>2.01</td>
<td>0.29</td>
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<tr>
<td>ED/primary care visit</td>
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<td>7</td>
<td>1.85</td>
<td>2.79</td>
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<td>19</td>
<td>1.47</td>
<td>3.30</td>
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<td>1.11</td>
<td>2.05</td>
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<td>Total</td>
<td>46</td>
<td>1.39</td>
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### Table 18-3 Test of Homogeneity of Variances

<table>
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<th></th>
<th>Levene Statistic</th>
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<th>df2</th>
<th>Sig.</th>
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<td>0.93</td>
<td>3</td>
<td>42</td>
<td>0.431</td>
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<td>FMPS-10</td>
<td>0.17</td>
<td>3</td>
<td>42</td>
<td>0.91</td>
</tr>
<tr>
<td>ED/primary care visit</td>
<td>2.63</td>
<td>3</td>
<td>42</td>
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### Table 18-4 ANOVA contrast groups

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<th>df</th>
<th>Mean Square</th>
<th>F</th>
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</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>331</td>
<td>42</td>
<td>7.88</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
<td>344</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMPS-10</td>
<td>Between Groups</td>
<td>3.61</td>
<td>3</td>
<td>1.20</td>
<td>0.28</td>
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<td></td>
<td>Within Groups</td>
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<td>42</td>
<td>4.26</td>
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<td></td>
<td>Total</td>
<td>182</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/primary care visit</td>
<td>Between Groups</td>
<td>2.93</td>
<td>3</td>
<td>0.97</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>378</td>
<td>42</td>
<td>9.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>380</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 18-5 Contrast Coefficients

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>3</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
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<td>2</td>
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<td>3</td>
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<td>3</td>
<td></td>
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<td>-1</td>
<td>3</td>
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<td></td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 18-6 Contrast Tests between contrast groups on outcome measures

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Value of Contrast</th>
<th>Std. Error</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKNS-14</td>
<td>Assume equal variances</td>
<td>1</td>
<td>3.56</td>
<td>3.69</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>-0.62</td>
<td>5.06</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>-0.13</td>
<td>2.81</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>-2.81</td>
<td>2.88</td>
<td>-0.97</td>
</tr>
<tr>
<td>FMPS-10</td>
<td>Assume equal variances</td>
<td>1</td>
<td>1.97</td>
<td>2.71</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>-3.16</td>
<td>3.72</td>
<td>-0.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.83</td>
<td>2.07</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.36</td>
<td>2.12</td>
<td>0.17</td>
</tr>
<tr>
<td>ED/primary care visit</td>
<td>Assume equal variances</td>
<td>1</td>
<td>1.64</td>
<td>3.94</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>-0.44</td>
<td>5.41</td>
<td>-0.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.11</td>
<td>3.01</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>-1.31</td>
<td>3.08</td>
<td>-0.42</td>
</tr>
</tbody>
</table>
Appendix 19 Publication and resources

(See next page)
An Innovative Fever Management Education Program for Parents, Caregivers, and Emergency Nurses

Muhammad Alqudah, RN, MSN
Maree Johnson, RN, PhD
Leanne Cowin, RN, PhD
Ajesh George, BDS, PhD

Abstract
Parents frequently present to the emergency department (ED) concerned about their child’s fever. Fever management education programs have been found to improve parents’ knowledge of managing fever, although no education program was identified that specifically considered parents with lower functional health literacy. This article describes the development of an easily understood children’s fever management education program for parents with varying levels of health literacy. A review of existing literature and guidelines was conducted. Pictorial images and written material constrained to fifth-grade level of readability were used. Academics and ED experts confirmed the content of this evidence-based program. The education program, a combination of Digital Video Disc (DVD) and a brochure in relation to child fever management, is currently being trailed at an ED in Sydney and is appropriate for EDs or primary care settings. Tailoring education programs with plain and simple language is potentially beneficial to all parents (or caregivers) presenting to the ED with children experiencing fever. This program will provide nurses with a simple and clear fever management brochure or DVD to give to parents or caregivers with varying levels of health literacy. We envisage that this program will be continuously televised within local EDs and available for parents or caregivers to view online. Key words: child, education, emergency nursing, fever, health literacy

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Disclosure: The authors report no conflicts of interest.

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Fever in children is one of the major reasons why parents seek health care assistance and become concerned for their child’s immediate health (Baker, Monroe, King, Sorrentino, & Glaeser, 2009; Dawood, Ibrahim, & Palaian, 2010). Approximately 20% of children reported to emergency departments (EDs) are for a febrile illness (Baker et al., 2009; Wammanda & Onazi, 2009). Continuous fever education for parents and caregivers is required to improve knowledge, practice, and minimize their fears.
Emergency nurses are the main source of information for parents with a febrile child (Considine & Brennan, 2006; Poirier, Collins, & McGuire, 2010). These nurses play a pivotal role in providing essential health information on fever identification, home management, and when to seek health professional support. This article outlines a fever management education program developed for use by parents, caregivers, and emergency nurses.

Fever education programs are the best way to increase parent confidence, reduce their concerns for any future fever episode, and support appropriate use of health care services (Baker et al., 2009; Cohee, Crocetti, Serwint, Sabath, & Kapoor, 2010; Dawood et al., 2010; Herman, Young, Espitia, Fu, & Farshidi, 2009; Walsh, Edwards, & Fraser, 2008). A substantial number of studies have reported the implementation of fever education programs (Baker et al., 2009; Cohee et al., 2010; Considine & Brennan, 2006; Herman et al., 2009). These programs appear to be effective in improving parents’ knowledge (Baker et al., 2009), practice (Cohee et al., 2010) and in minimizing inappropriate health service use (Herman et al., 2009). Indeed, implementing a fever education program showed 29%–54% improvement in parents’ fever health knowledge (Baker et al., 2009), 13%–46% improvement in correct fever management practice (Herman et al., 2009), and 13%–30% reduction in the inappropriate use of health services for children with fever (Herman et al., 2009).

To make education interventions more accessible to the general community and within hospitals and other health settings, health care professionals need to consider a parent’s level of literacy, health literacy, and his or her ability to understand any given instructions (Ferguson & Pawlak, 2011; Garcia et al., 2010; Otal et al., 2012; Yin, Forsis, & Dreyer, 2007). Additional approaches such as considering the structure and design of information (Garcia et al., 2010; Peters, Dieckmann, Dixon, Hibbard, & Mertz, 2007), using numbers to indicate better health outcomes for selected treatment option (Peters et al., 2007), pictorial representations (Garcia et al., 2010; Peters et al., 2007), using media presentations (Galesic, Garcia-Retamero, & Gigerenzer, 2009), and limiting the information and simplifying the readability of the information (Ferguson & Pawlak, 2011; Garcia et al., 2010), have all been used to improve health outcomes for patients with limited health literacy.

Issues in developing the education programs for individuals with limited health literacy have been considered in relation to diverse health problems and patient or client groups. Examples of these programs include low health literacy education programs for children with asthma (Robinson, Calmes, & Bazargan, 2008), a stroke education intervention (Hoffmann & McKenna, 2006), testing epilepsy instructions (Elliott & Shneker, 2009), educating patients with cancer (Amalraj, Starkweather, Nguyen, & Naeim, 2009), injury prevention materials (Trifiletti, Shields, McDonald, Walker, & Gielen, 2006), and in
exemplifying a patient’s medication schedule (Kripalani et al., 2007). These programs have resulted in a range of outcomes such as improvements in patients’ reading level, self-efficacy (Robinson et al., 2008), and understanding of their health conditions (Ferguson & Pawlak, 2011); the readability of the content of health education programs (Elliott & Shneker, 2009); the knowledge, quality of life, and satisfaction with care (Otal et al., 2012); the use of education material (Trifiletti et al., 2006); and the understanding and use of prescribed medication (Kripalani et al., 2007). Although previously designed fever education interventions share most of the aforementioned outcomes, to date no education program or material was found relating to fever management for parents with lower functional health literacy. Accordingly, this article will describe the steps used to develop a low health literacy fever education program for parents or caregivers with a febrile child.

AIM

The aim of this article is to detail the development of a unique fever educational program that can be used to educate parents (or other caregivers) with low literacy and likely lower functional health literacy.

Developing Health Education Programs

Developing an education program requires attention to the presentation of health information or health instructions (Kripalani et al., 2007). Additional principles are required when designing educational material targeting people with limited health literacy (Garcia et al., 2010; Scudder, 2006). The most common strategies found in the literature to improve the usability of health information are using plain language, reinforcing written material with pictorials where possible, testing the readability of the contents, and validating the program contents (Ferguson, 2012; Scudder, 2006).

Plain language is “clear writing that tells the reader exactly what he/she needs to know without unnecessary words or expressions” (Yin et al., 2007, p. 272). This includes the use of simple common language, using active voice, presenting main ideas first, avoiding medical vocabularies, and avoiding abbreviations and statistics unless they are absolutely necessary (Yin et al., 2007). Reducing anatomy and physiology terminology and color-coding of tabular instructions are necessary when presenting health instructions (Elliott & Shneker, 2009; Ferguson, 2012). Font sizes of 12 and larger are preferred in designing written material, and a font size 14 is preferred by older people (Ferguson & Pawlak, 2011; Scudder, 2006). Furthermore, authors suggest replacing polysyllable words (words that include more than three syllables) with words that have two syllables or less such as replacing immediately with right away and excessive with too much (Scudder, 2006); likewise, use the word give instead of administer and birth control instead of contraception. Following these rules will enhance the usability of any written material and this will benefit patients (Ferguson & Pawlak, 2011; Scudder, 2006).

Simple health information is preferable even for good readers. Previous research indicates that even people with average literacy prefer simple medical language rather than complicated terminology (Elliott & Shneker, 2009; Otal et al., 2012). It is important to make the education document look friendly for readers by using less complicated fonts, appropriate spacing between words, and avoiding long sentences (Ferguson & Pawlak, 2011; Scudder, 2006).

Pictorials are another useful and important tool in developing and delivering education programs to people with limited health literacy. Using pictorials such as pictures, graphics, and pictograms increases the utilization of education material, especially when reinforced with short text labels (Kripalani et al., 2007; Rajda & George, 2009). For example, using pictures improved the medication administration regimen among older people and among patients with limited health literacy level. The researchers used the pictures to
show patients the frequency of medication administration, number of dosage units prescribed daily, and the daily prescribed duration of therapy (Yin et al., 2007).

In a randomized controlled trial that used a picture-based education program (Pill Card), the results showed that 76.3% of the participants found the card very helpful. The program also helped older people to remember which medicines to take, the medication name, indication for use, dosage, and time of administration (Kripalani et al., 2007).

Another step in making written materials more useful is testing the readability of the contents. A range of tools is available to test the readability of written material. The most common are the Fry (Svider et al., 2013), Simple Measure of Gobbledygook (SMOG; Rajda & George, 2009; Svider et al., 2013), and the Flesch-Kincaid, Suitability Assessment of Materials (Svider et al., 2013; Trifiletti et al., 2006). We used these tools to match written documents with (fifth to sixth) grade reading ability, as it is the most recommended reading ability grade for limited health literacy groups (Ferguson, 2012; Ferguson & Pawlak, 2011). People with less than fifth-grade reading ability are considered to be functionally illiterate (Scudder, 2006). Reading ability tools are available not to simplify the material but rather to identify the readability level for the represented material. Accordingly, complex words can be replaced with simple ones to suit the majority of patients. Education material can then be validated for its content. Information should be valid, and the education program must provide contemporary knowledge that patients and caregivers require (Elliott & Shneker, 2009; Hoffmann & McKenna, 2006).

Methods of Developing an Education Program for Parents With Varying Health Literacy

There were six steps in developing the program: defining the scope of information through an extensive literature review, selecting the medium for presenting health information, developing pictorial images to represent key points, using plain and syntactically simple language, assessing the readability level using established tools, and finally reviewing the prepared material by experts to establish the content validity of the education program.

Step One: Reviewing the Literature to Determine the Scope of Health Information

The databases, Cochrane Library, Google Scholar, MEDLINE, OVID, ScienceDirect, and Scopus were searched using the following key words: child, education, fever, health literacy, and emergency nursing. The comprehensive literature review was undertaken in two stages starting with extensive research about health literacy and research relating to education programs for people with lower functional health literacy (Amalraj et al., 2009; Elliott & Shneker, 2009; Ferguson, 2012; Ferguson & Pawlak, 2011; Hoffmann & McKenna, 2006; Rajda & George, 2009; Robinson et al., 2008; Svider et al., 2013; Trifiletti et al., 2006). Second, fever and child fever research and best practice were examined and a significant number of studies producing evidence-based guidelines for fever management in children were identified. The content of the education interventions has been, therefore, extracted from international guidelines, evidence-based practice information sheets, and systematic reviews. For example, in developing the education program, researchers used information from the National Institute for Health and Clinical Excellence (NICE, 2007) and the update (NICE, 2013), a Summary of the Italian Pediatric Society Guidelines (Chiappini et al., 2009) and the update (Chiappini et al., 2012), and evidence base for the acute management of fever (NSW Department of Health, 2010). Components derived from these evidence-based guidelines on fever management formed the material incorporated within the educational program (see Table 1).

The main health messages included in the program are summarized as follows:

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Table 1. Elements of the educational program and their origins

<table>
<thead>
<tr>
<th>Statements</th>
<th>References</th>
<th>DVD</th>
<th>Brochure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) General knowledge about fever</td>
<td>NICE, 2007; NSW Department of Health, 2010</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>(b) What to do if your child has a fever</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012; NSW Department of Health, 2010</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>(c) What not to do when your child has a fever</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2007, 2013; NSW Department of Health, 2010</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>(d) Fever medication, correct method of fever medication administration</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>(e) Dosage chart for Panadol &amp; Nurofen</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) When to seek health</td>
<td>NICE, 2007, 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Contactable details for emergency departments in the area health districts</td>
<td>NSW Department of Health, 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Acts and signs for incorrect fever management practice for a child older than 3 months and younger than 5 years</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2013</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>(i) Acts and signs for correct fever management practice for a child older than 3 months and younger than 5 years</td>
<td>Chiappini et al., 2009; Chiappini et al., 2012; NICE, 2013</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

Note. NICE = National Institute for Health and Clinical Excellence; NSW = New South Wales.

a. General knowledge about fever such as what is mild, moderate, and high fever.
b. The correct way of measuring a child’s temperature. Under arm axillary method using an electronic thermometer is the recommended method for children younger than 5 years.
c. Fever medicine (antipyretics), the correct dose and correct method of administration. For example, ibuprofen and paracetamol are the recommended fever medicine for children.
d. What parents should not do in the case of a febrile child: use of fans, cold water, ice packs, or antipyretics.
e. The physical method of reducing body
temperature, correct and incorrect
practices.
f. Situations that require further assistance,
such as when the child’s temperature ex-
ceeds 41.1°C.
g. Emergency contact telephone numbers
are provided for the ambulance service
and EDs of local hospitals.

Step Two: Selecting the Appropriate Medium
for the Presentation of These Messages

Different approaches to education have been
used for diverse levels of literacy and health
literacy. Education programs can be delivered
verbally in the form of group lectures, classes,
and interaction between patients (Garcia et al.,
2010). Other methods—such as written
materials or multimedia products—may be
preferred where patients wish to keep and
take material home, to share with others, or
view in their own space (Garcia et al., 2010;
Hoffmann & McKenna, 2006). Multimedia
products include visual aids, audiotape
instructions, videotapes, and interactive com-
puter programs (Ferguson & Pawlak, 2011).
In this study, audiovisuals were chosen as
educational tools, because they are easy to
manage, and parents or caregivers can have
their own copy of the Digital Video Disc (DVD)
to view in their free time. Parents can
also share this form of health information
with other friends and family members in a
stress-free environment (Garcia et al., 2010).
Using the audiovisual tool is very helpful for
people with limited health literacy or English
language skills, because even if the parent
cannot understand the language, they can
observe a demonstration by the actors in the
presentation (Garcia et al., 2010; Robinson
& Mercer, 2007). Brochures, on the contrary,
can be used in helping parents to recall and
reinforce the audiovisual instructions (Elliott
& Shneker, 2009). Written instructions
within brochures allow for message consist-
cency, reusability, portability, and flexibility
(Hoffmann & McKenna, 2006).

Some aspects of audiovisual presentations
require consideration. Audiotaped instruc-
tions need to be less than 5 min in length,
with no more than two messages per pre-
sentation. Digital Video Discs and videotapes
need to run a maximum of 8 min, as short
messages promote individuals’ action, moti-
vation, and self-empowerment than long de-
tailed messages (Ferguson, 2012; Ferguson &
Pawlak, 2011). It is further recommended to
give parents or caregivers one message per
visual image, place images in context, and
avoid using visual aids for decoration (Garcia
et al., 2010). Key messages were identified
and incorporated into a DVD and brochure. A
transcript was developed for the DVD, which
was filmed by professional film staff using
actors. The contents of both the DVD and
the brochure are similar, and both tools were
used. The DVD is 8 min long and the brochure
is a colored double-faced paper presentation.

Step Three: Developing Pictorial Images to
Represent Key Points

In the developed education program, symbols
and pictures have been used where possible
in designing and simplifying the written mes-
sages. For example, in Figure 1, pictures were
used to indicate the correct way to measure
temperature using the correct thermometer,
and Figure 2 has been used to illustrate fever
symptoms that required urgent attention such
as a child having seizures.

Messages in the DVD were combined with
pictures, for example, a cross mark (×) was

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Step Four: Presenting Information Using Plain and Syntactically Simple Language

Simple words and everyday common language were used in the program (both the brochure and the DVD transcript). For example, the word not correct was used instead of not reliable, and the word check instead of measure. Medical terms have been avoided unless necessary. For example, the words under arm were used instead of axillary, fever medicine instead of antipyretic. Abbreviations have been avoided, for example, emergency department instead of ED or oral thermometer instead of OT.

Step Five: Assessing the Readability Level

The readability of all chosen materials in the education package, both the DVD transcript and the brochure, has been tested to support a fifth-grade reading level. The SMOG readability test has been chosen because it is the most recommended readability tool and is commonly used in the literature, easy to perform, and has an online calculator (Rajda & George, 2009). In this method, the researcher selects 30 sentences from the document (10 from the beginning, 10 from the middle, and 10 sentences from the end) and then inserts them into the SMOG calculator. The SMOG calculator then obtains the reading ability of the document on the basis of the total number of words that contain three or more syllables (Hoffmann & McKenna, 2006; Svider et al., 2013). The SMOG calculator provides the following features: the text supplied, total words given, total number of polysyllabic words in the text, and the total number of sentences in the paragraph. The formula used in the SMOG to test readability is $3 + \sqrt{\text{polysyllabic count}}$. For example, two sentences were included in the proposed education program: “Give your child a lukewarm bath for 10–15 minutes every 3 hours. Do not give your child a cold bath.” The output generated by the SMOG calculator for this paragraph is total words: 21, total number of polysyllabic words: two, and total number of sentences: two (see Figure 4). Using the SMOG formula, the result or the reading level required to read this sentence will be $3 + \sqrt{2} = 3 + 1.4 = 4.4$ (less than fifth-grade reading level). The online SMOG calculator with further instructions is available online at http://www.niace.org.uk/misc/SMOG-calculator/smogcalc.php.
Step Six: Reviewing the Prepared Material

After preparing the written material and testing all the contents to match fifth-grade reading ability, the program was reviewed by 11 academic experts and professionals in ED (general practitioner and professor of medical education, two nursing professors, two emergency nurses, the emergency physician leader, and the research team). All comments and feedback were reviewed and minor modifications undertaken to the education package.

DISCUSSION

Fever educational programs, likewise general health education programs, are written at a higher level of health literacy than the general population can understand or gain benefit from (Ferguson & Pawlak, 2011; Trifiletti et al., 2006). Individuals at all levels of education prefer simple language for health instructions (Elliott & Shneker, 2009). We have described in detail the design of a unique fever education program to be distributed in an ED.

Patient education is one of the major tasks of the ED nurse (Coleman, 2011; Hudson & Marshall, 2008); the presence of a simply introduced health instruction can help reduce future visits by parents or caregivers to ED and minimize unnecessary health care utilization (Herman et al., 2009). Health literacy interventions have shown a significant decrease in both hospitalization and the number of ED visits (Robinson et al., 2008).

This program can be of benefit for both patients and ED nurses. Nurses are the main source of information for parents, regarding fever presentations (Considine & Brennan, 2006). Emergency nurses often influence patients’ knowledge and practice as they provide role models for patients and their families (Considine, 2006; Considine & Brennan, 2006). Previous studies showed that ED nurses have some misunderstanding of child fever management (Poirier et al., 2010). Accordingly, ED nurses can use information provided in the program as an evidence-based instruction in their daily clinical practices.

A simply designed educational program will give nurses ease and clarity in explaining the contents of the fever brochure because the language is very simple and clear. The DVD can be provided with the brochure for patients to take home. Facilitating ED nurses in handling their educational responsibilities will save time and effort and increase their productivity, which in turn can lead to improvements in the quality of service provided. Moreover, in a survey of 1,000 patients, 96% of participants in the study demonstrated their satisfaction from an audiovisual educational session (Otal et al., 2012) similar to that presented here.

Defined steps have been followed in developing this modified health literacy educational program. These steps have been
derived from similar educational interventions for patients with lower functional health literacy (Kripalani et al., 2007; Trifiletti et al., 2006). The literature review was an initial step to understand the scope of the information relating to fever management in children. Second, colorful pictures were used to attract patient’s attention in both modules (the DVD and the brochure). The essentials of these programs have been integrated into this approach. Plain language has been clarified by testing the readability of the written material to ensure the simplicity of the presented information. Medical terminology was converted to commonly used words. In addition, polysyllable words were also converted to single syllable words as another strategy to simplify the written material. This fever education program for parents is currently being trailed at an ED with a large pediatric caseload in Sydney. The DVD and brochure is given to parents or care givers while waiting within this area. Parents take material home and review it when convenient.

We envisage that this program will improve parents and caregivers’ knowledge, fever management practices, and ultimately reduce inappropriate ED presentations for febrile children. This simple fever education program is to be shown on health education television systems in the EDs within local health services and could be viewed in other primary care settings where children present with fever. The program can be an educational tool in community settings, childcare facilities, community health centers, and/or library children zones. Furthermore, this education program involving the DVD and brochure will be accessible online for parents and caregivers and can currently be viewed at http://www.sswahs.nsw.gov.au/services/canr/links.html.

CONCLUSION

Fever is a common childhood problem that causes many concerns for parents and caregivers, and educational interventions have been found to be effective. We have outlined the essential steps in developing a fever education program for parents or caregivers with varying health literacy. The use of simple language has benefits for all health consumers. The use of pictorials and simple language is important in designing simple instructions. The prepared materials consist of a DVD and a brochure that can be distributed by emergency nurses to benefit parents or caregivers. The program will be accessible within EDs from hospitals within our local health district and online for all parents or caregivers of children worldwide.

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An Innovative Fever Management Education Program

Emergency Nursing Journal, 9(3), 101-111. doi:10.1016/j.aenj.2006.03.005


ORIGINAL RESEARCH

Measuring health literacy in emergency departments

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Abstract

Background: Literacy and health literacy are important concepts that are related to how important health care messages are understood by patients. Emergency nurses are engaged in health promotion and require an understanding of the patient’s health literacy. To assist emergency nurses in assessing a patient’s level of health literacy a series of valid and reliable health literacy measurement tools have been presented. The aim of this paper is to nominate one of these tools to be used by emergency nurses in testing individual and group levels of health literacy.

Methods: Databases searched included Scopus, Science direct, PubMed, PsycINFO and Educational Resources Information Center (ERIC). Included articles were published between 1990 and 2011, English language only, and articles that discussed word recognition tools and tools that take five minutes or less to administer resulting in sixteen articles.

Results: The Rapid Estimate of Adult Literacy in Medicine-Short Format (REALM-SF) has been used successfully within an emergency setting to identify patients’ level of health literacy and to supply appropriate health information. This tool was found by nursing staff to be easily administered, and more acceptable when used in private areas. However, further research within varying age groups is recommended.

Conclusion: Most of the available tools are related to each other and have the ability to measure varying levels of health literacy. The REALM-SF is a simple quick approach to measuring health literacy in busy clinical settings. Emergency nurses require training in administering these tests in a non-threatening and accurate manner.

Key words
Literacy, Health literacy, Measures, Emergency, Nursing

1 Introduction

Health literacy, or how health consumers understand and act upon health information, has become a priority in the delivery of health care, as consumers with limited health literacy skills experience poorer health outcomes [¹] and are often high users of health services [²,³]. Literacy and health literacy are associated concepts. Literacy has been defined as the ability to read, write and speak with a certain level of proficiency [⁴], while health literacy is defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make..."
appropriate health decisions” [5]. Health literacy assessment has been demonstrated as being as important as patient vital signs and is proposed as the sixth vital sign [6].

The extent of the health literacy problem is only now becoming known within countries with increased proportions of their population from culturally and linguistically diverse backgrounds. Surveys across various countries such as the National Assessment of Adult Literacy (NAAL) [7] have revealed unexpected figures, with one third of Americans being found to have limited health literacy [8] while approximately 20% of the British population are illiterate [9]. In Canada, 65% of the population lack basic health literacy [10], and more than 60% of Australians are reported as having inadequate health literacy skills [11]. According to an international report, Australian teenagers’ skills in reading, writing and arithmetic were found to be much worse now than they were 10 years ago [12] indirectly influencing the health literacy level of the general population.

Poor health literacy skills result in potential inappropriate use of a health facility, increased hospitalisations, poorer health outcomes and increased costs of health care [1, 3, 13]. Emergency Departments (ED) are often the first point of contact for patients. This busy clinical setting is often managing the delivery of important health information. For patients with limited health literacy there is an increased demand for clarification of instructions for these patients by busy ED staff [14]. Other aspects of the ED environment such as ED overcrowding, longer waiting times, decreased ED staff productivity and increased ED staff frustration may also occur [2, 14]. Although the measurement of health literacy may be relevant to all nursing settings, this paper explores the measurement of health literacy within the ED. This focus was highlighted as part of a clinical trial on fever management education for parents with limited health literacy.

Given the extent of the problem of limited health literacy within Australia (the location of the study) and other countries, we believe that nurses and other health professionals should assess patients’ level of health literacy prior to delivering any health information. Nurses continue to assume that health messages are being received by patients, with no knowledge of whether the health information is delivered in a manner that is understood. By assessing the level of health literacy, this information can be tailored or modified to increase the likelihood of the information being received [15]. This is particularly relevant to ED nurses since they are continuously and directly involved in patient consultation. Emergency nurses can easily assess their patient’s level of health literacy, as there are a range of suitable tools or approaches that could be used in practice.

**Aim**

The aim of this study is to use a systematic approach to critically analyse tools to measure health literacy that would be suitable for use by emergency nurses. Specific features of these tools to be considered included: advantages, disadvantages, selected psychometric properties of the tools such as reliability and validity, and the time needed to administer and score the patient.

**Literature review**

Both informal and formal approaches to measuring health literacy exist. A patient’s level of health literacy can be measured in an informal way simply by observing their behaviour. For example, observing a patient’s ability to fill out forms correctly, such as misspelling or misinterpretation can indicate poor literacy and most likely poor health literacy [4]. However, it has been argued that this is not efficient since the patient may feel shy or embarrassed [16] and it is not a formal method of measurement. Formal methods are more organised, created for research and clinical purposes, and are more suitable for testing individual and group levels of health literacy. The creation of formal tools is based on systematic testing, using large sample sizes and through confirmation of the validity and reliability of the instruments [17, 18].

Various tools have been used to measure health literacy among populations and within clinical settings including computerised tools, language-specific tools and disease specific tools. Instruments such as the Adult Literacy and Life Skills Survey (ALLS) in Australia [11], the Health Activities Literacy Scale (HALS) in America [17], and the International Adult
Literacy and Skills Survey (ALL) in Canada (2003) [10] have been used to assess populations. Other instruments include: the health literacy screening questions [1], The Functional Health Literacy in Adults (TOFHLA) [19], Rapid Estimate of Adult Literacy in Medicine (REALM) [16, 18, 20-22], The Medical Achievement Reading Test (MART) [23], the Newest Vital Sign (NVS) [24], a single item health literacy screening question [25], the Slosson Oral Reading Test (SORT) [26, 27], and the Wide Range Achievement Test (WRAT) [28, 29].

Some tools have been developed for computer use to facilitate the health screening process such as English-Spanish Talking Touchscreen (TT) [30] and the Health Literacy Assessment Using Talking Touchscreen Technology (Health LiTT) [31]. However, researchers argue that the use of these tools can be limited since people with low health literacy skills concurrently also have poor computer skills [30]. Other tools have been designed to test the level of understanding of presented material by media such as the Media Health Literacy (MHL) tool [32].

A systematic review by Berkman, et al. [13] highlighted tools using word recognition tests and comprehension assessment. Many of these tools are language specific as in the Hebrew Health Literacy Test (HHLT) [33] or the Short Assessment of Health Literacy for Spanish Adults (SAHLSA) [34]. Some tools are disease or focus specific such as the Literacy Assessment for Diabetes (LAD) or Nutritional Literacy Scale (NLS) [35]. Other tools reflect literacy as in Subjective Literacy Screener or numeracy only, as in Lipkus Numeracy Test, Schwartz and Woloshin Numeracy Test, and Subjective Numeracy Scale (SNS) [13].

Although the above mentioned tools are valid and reliable, choosing an appropriate tool to be used in the emergency department requires some consideration as this setting has specific features. Emergency departments operate 24 hours, accept both urgent and non-urgent cases, and have direct contact with patients [14, 36]. For this reason tools that may be used by nurses need to be easy to administer, time efficient and reliable. Due to the substantial number of tools that are available, the authors believe that only a critical analysis of existing tools using a systematic approach can provide direction on the appropriate tools for use in the emergency setting.

2 Method of review: Search strategy

An extensive search of the literature was conducted to identify tools that measure health literacy. The search technique was a combination of a computer database search and hand search for unpublished literature. The search terms included: literacy, health literacy, tools, measurement, and a combination of these words. During the literature search, a variety of terminologies were used and the spelling of key words was considered to aid the identification of relevant literature. The combination of key words were thoroughly researched using “Boolean” operators (or and not), truncation, phrase searching, and MeSH (Medical Subject Heading) keywords were also used in the search strategies. Databases searched included Scopus, Science direct, PubMed, PsycINFO and Educational Resources Information Center (ERIC), and the search was limited to articles that were published between 1990 and 2011. The authors have included the original source of the instrument where required, which may be beyond the range of dates noted in the search.

Inclusion criteria

Tools were considered for inclusion based on three criteria: tools using word recognition procedures, tools taking a maximum of five minutes administration time and tools with demonstrated concurrent validity (correlation between the levels identified by the comparison instruments) with other well validated tools [22, 26]. Word recognition tests are more acceptable as individuals who have difficulty in reading will most likely have difficulty comprehending written information [5]. In addition, there is a strong association between an individual’s reading ability level and their level of health literacy [6, 16, 35, 37]. Tools included in the review needed to be time efficient and could be undertaken in five minutes or less. The five minute duration was based on the time required to administer the most commonly used tool to measure health literacy level; that is the revised version of WRAT (WRAT-R). Only publications in English were included in this review.
The references and abstracts identified from the search were imported into Endnote Version X4 software. Duplicate references were removed and the title and abstract of the remaining studies were assessed against the inclusion criteria.

3 Results

Identification of studies

The broad search strategy used identified 346 articles in all. A majority of the articles were removed after reviewing the abstract since they focused on descriptive papers relating to literacy and health literacy rather than the measurement of health literacy, resulting in 109 articles. Only articles in English with full text were retrieved, resulting in 101 articles. Sixteen articles that met the inclusion criteria were included in this review (see Figure 1).

![Figure 1. Methodology: Inclusion and Exclusion Criteria](image)

The most common health literacy screening tools available and frequently reported within the literature are NVS, REALM, TOFHLA, and WRAT [5, 26]. Although TOFHLA is one of the most commonly used health literacy screening tool, this tool along with its shortened format (TOFHLA-SF) have been excluded from this review because they are too long to administer (TOFHLA -22 minutes, TOFHLA-SF- 10 minutes). The Newest Vital Sign (NVS) [24], the Rapid Estimate of Adult Literacy in Medicine –Short Format (REALM-SF) [20], and the Wide Range Achievement Test Revised (WRAT-R) or WRAT version 3 (WRAT-3) [20], are the shortest health literacy screening tools found in the literature and have been examined extensively for their psychometric properties and their ease of use for consideration within the emergency setting (see Table 1).
Newest Vital Sign (NVS)

The NVS was first introduced in 2005 by Weiss and co-workers to develop a quick and accurate screening tool for low literacy people. This test is available in two languages, English (NVS-E) and Spanish (NVS-S) [24].

In this test patients are required to answer six questions based on the information provided on a nutrition label. Questions are then scored whether correct or incorrect. The scores range between zero and six: four or more correct answers = adequate literacy, three = marginal literacy, and two or less = inadequate literacy [24, 38]. This tool is designed for literacy skills rather than health literacy skills and it takes approximately three minutes to administer.

NVS was tested within the south west of the United States of America (US) which has high numbers of English and Spanish speakers [24] and has been used in large surveys of 2824 Australians in 2009 [38]. The NVS is used by researchers in literacy and health literacy measurement because it measures maths, reading, and comprehension skills as well as abstract reasoning [4]. The NVS demonstrated a strong correlation and sensitivity with the TOFHLA [24]. The internal consistency (Cronbach’s α = 0.76) and criterion validity of the English version of the NVS was satisfactory (r = 0.59) [4, 24], (see Table 1). The NVS is an internationally recognised tool designed to suit people aged from 18 years or older. This tool can be accessed at no cost from: http://www.pfizerhealthliteracy.com/asset/pdf/NVS_Eng/files/nvs_flipbook_english_final.pdf [39].

Rapid Estimate of Adult Literacy in Medicine (REALM-SF)

The Rapid Estimate of Adult Literacy in Medicine (REALM) health literacy measurement tool was first introduced in 1991 by Davis and co-workers, includes 125 words, and requires three to five minutes to administer and score [18]. The REALM was re-constructed again in 1993 to contain 66 words and can be undertaken in less than two minutes. It was

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**Table 1. Features of the Reviewed Tools (Summary)**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>NVS-E</th>
<th>REALM-SF</th>
<th>WRAT-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Items</td>
<td>6 nutritional questions</td>
<td>7 medical words</td>
<td>For the reading subtest. (15 letters 42 words)</td>
</tr>
<tr>
<td>Age group</td>
<td>18 years or older</td>
<td>Adolescence</td>
<td>Between 5 and 74 years</td>
</tr>
<tr>
<td>Time required</td>
<td>Up to 3 minutes</td>
<td>&lt; 1 minute</td>
<td>3 to 5 minutes</td>
</tr>
<tr>
<td>Scoring</td>
<td>≥ 2 = inadequate HLL</td>
<td>Total correct</td>
<td>Uses a row of scores from 1 to 57 converted to grade-equivalent reading levels</td>
</tr>
<tr>
<td></td>
<td>3 = marginal HLL, ≤ 4 = adequate HLL</td>
<td>0-3 = inadequate HLL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-6 = marginal HLL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 = adequate HLL</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>Cronbach’s α = 0.76 in English version</td>
<td>Strong test-retest reliability coefficient (r = 0.97 )</td>
<td>Strong test-retest reliability coefficient (r = 0.91 to 0.98).</td>
</tr>
<tr>
<td>Validity</td>
<td>Demonstrates moderate correlation with TOFHLA. Criterion validity (r = 0.59, p &lt; .001 )</td>
<td>Excellent agreement between REALM-SF and REALM (Numbers). Strong correlations with SORT-R (0.96, p &lt; .001), PIAT-R (0.97, p &lt; .001), and WRAT-R (0.88, p &lt; .001)</td>
<td>Moderate to strong correlation with the California Test of Basic Skills and Stanford achievement test, 0.72 and 0.87 respectively.</td>
</tr>
<tr>
<td>Cost</td>
<td>Free</td>
<td>$10.00 [26].</td>
<td>$95.00 [26].</td>
</tr>
<tr>
<td>Advantages</td>
<td>Available to measure, maths, reading, and comprehension. Available in two languages.</td>
<td>Time efficient, contains only health words.</td>
<td>Measures reading, spelling, and mathematics.</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Designed for literacy skills rather than health literacy skills.</td>
<td>Unable to distinguish between patients with ninth grade reading level and above.</td>
<td>Comprehension not tested. Words not chosen from health care context, contains some difficult terms and issues.</td>
</tr>
</tbody>
</table>

**Note.** HLL= Health Literacy level.
initially tested in African American and Caucasian populations \([20]\). Being the most common method used in the health care context, the REALM is time efficient, and contains only health words \([4, 22]\). This tool has been revised many times thereby producing different versions such as the REALM-R in Bass III \textit{et al.} \([16]\), a new version of REALM (REALM-Teen) \([22]\), and REALM short form (REALM-SF) \([20]\). Only the REALM-SF is explored here because it is the most usable form found in the research studies. REALM-SF takes less than a minute to administer and score. REALM-SF also has a strong correlation with other literacy tools such as WRAT-R (concurrent validity).

The words in the REALM-SF are arranged in one column based on the difficulty of the word and number of syllables. The test is usually carried out by asking patients to pronounce the words in a loud voice starting with the first word. However, if patients find it difficult to read a word, they are asked to try again or say “skip” and then move on to the next word. If patients are unable to continue, they are asked to look at the list of the words and read as many as they can from the remaining words. The level of health literacy is determined based on the number of words pronounced correctly, a total correct 0-3 indicates inadequate level of health literacy, 4-6 indicates marginal health literacy and seven indicates an adequate health literacy level. REALM has been designed for people within the adolescent aged group. However, REALM-SF has been validated and tested on varying age groups \([20]\). The full version of REALM costs $10.00 to purchase \([26]\).

The contents of REALM were extracted from educational materials and forms that were used in Louisiana State University Hospital Clinic \([18]\). Both the REALM and the revised versions, demonstrate high correlations with earlier commonly used tools, such as SORT-R (0.96 \(p < .001\)), the Peabody Individual Achievement Test-Revised (PIAT-R) PIAT-R (0.97, \(p < .001\)), as well as WRAT-R (0.88, \(p < .001\)) \([4, 20, 22, 26]\). In addition, the REALM demonstrates face validity in measuring patient’s level of health literacy and can be undertaken in public health clinics \([4, 18]\). The REALM has high test–retest reliability \((r = 0.97, p < .001)\) \([18, 22, 26]\) (see Table 1).

The Wide Range Achievement Test (WRAT), was introduced for the first time in 1946 by Jastak and Bijou, and was revised in 1984 to WRAT-R by Jastak and Wilkinson \([29, 40]\). WRAT-R was also modified in 1993 and renamed the WRAT version 3 (WRAT-3) \([29, 40]\). WRAT-3 is the most frequently used version of the WRAT tool according to the literature \([26, 29]\). The WRAT-3 was designed to measure basic skills of reading, spelling, and mathematics for general literacy skills in the shortest time \([26]\). The main WRAT was tested in seven different US states, in diverse cultural groups including Caucasian, Afro-Americans and Hispanics. It is the oldest and the second most common health literacy tool used for both patients and their caregivers aged between five years and 74 years \([26, 28]\). The test contains two sections: a letter test and a word test. The letter section of the test requires the patient to pronounce 15 letters, while the word reading section requires the patient to pronounce 42 words. The words in this test are arranged in ascending order of difficulty. The test takes approximately three to five minutes to administer and score.

The WRAT-3 test can be marked by using the raw scores, which range from 1 to 57, and can be converted to grade-equivalent reading levels \([16, 22, 26]\). The main limitation of the WRAT-3 is that it contains some difficult terms such as assuage, terpsichorean, and epithalamion. In spite of this, WRAT-3 is the second most common word recognition test used in medical settings \([16, 22]\). This test costs $95.00 to purchase \([26]\).

Concurrent validity of WRAT-3 is supported through a strong correlation with the California Test of Basic Skills and the Stanford achievement test of 0.72 and 0.87 respectively. WRAT-3 has demonstrated high test-retest reliability with scores ranging from 0.91 to 0.98 \([16, 26]\) (see Table 1).

4 Discussion

The relationship between patients’ health literacy level and health outcomes has been established \([3, 25]\). Emergency nurses play a significant role in patient education \([41]\), requiring the use of appropriate forms of health instruction, potentially
modified for varying health literacy levels. Knowing a patient’s level of health literacy can help the ED nurse choose and design suitable educational materials that match the patient’s level of understanding [4], and use effective communication strategies that draw the patient’s attention to any delivered instructions [14]. Health care professionals need to be aware of these health literacy tools, how to use them, and how to gauge a patient’s level of health literacy.

Although many instruments exist to measure both literacy and health literacy, only limited numbers have demonstrated extensive use in health settings with adequate psychometric properties. Some of these instruments are commonly used in practice and frequently reviewed in the literature, for example the REALM and the WRAT [16, 26]. A critical analysis of three key instruments NVS, REALM-SF, and the WRAT-3 has highlighted some important differences and similarities. All the tools are word recognition tests and useful when used in the health care context.

There is limited evidence of the psychometric properties of some of the tools as in the WRAT-R/3. The REALM-SF and the WRAT-3 have reported satisfactory inter-rater reliability and the NVS has demonstrated internal-consistency. Validity testing for all the instruments was limited with REALM-SF noting good face validity [22] and WRAT-3 describing a process of content validation [16, 26]. Further confirmation of the psychometric properties of these instruments is recommended in diverse populations.

One of the most commonly used tools in the health care setting is the REALM as it is efficient and relevant to health. Two short revised versions of the REALM are available in the literature; the REALM-R and the REALM-SF [16, 20]. The REALM-SF has been identified from this analysis as the preferred instrument to be used in an ED for individual and group assessment of health literacy. This tool has been chosen due to its contemporary revision and demonstrated concurrent validity with other tools, with fewer limitations than REALM-R, and being time efficient to administer (< 1 minute). Although, REALM-R and REALM-SF are quite similar, the REALM-R has only been tested on populations that are relatively well educated and on elderly patients [20]. Consequently, Arozullah and colleagues argue that the applicability of the REALM-R has not been established for people with low literacy.

REALM-SF will give ED nurses a simple approach to measuring health literacy in varying situations. The REALM-SF can be used by ED nurses to measure a patient’s level of health knowledge in both urgent and non-urgent situations, within waiting areas, treatment rooms, diagnostic areas, during medical consultation, or while waiting for staff re-evaluation. Less than a minute of time will not disturb or interfere with staff work and easy administration will not affect patient compliance unless the patient’s illness has impeded the patient’s speech. Accordingly, this tool will be an appropriate health literacy tool to be used in a busy clinical health context [20].

The four revised versions of the REALM demonstrated a reliable record when used in the health context in which they demonstrate continued satisfactory validity and reliability. For example, all revised versions have face validity because all test words are commonly used health terms [20, 22]. The REALM words have been minimised from 125 words in the main REALM in 1991 to end up with seven words in the REALM-SF (2007). The latest version of WRAT-3 consists of 57 items, 15 letters and 42 words.

The concern about the REALM (125 words) and the 66 word, shortened version, is that both are unable to differentiate people with a health literacy level above ninth grade reading ability [4]. In addition, Bass III, et al. [16] and Arozullah, et al. [20] agreed that the average time (two to three minutes) to administer the REALM could be too long in a very busy clinical setting such as in ED or in busy outpatient clinics, therefore recommending the REALM-SF. The NVS does have the ability to assess not only health literacy but also basic literacy, and where this is required may be useful to emergency nurses.

Emergency nurses and other health care professionals involved in the testing of a patient’s level of literacy or health literacy need to be aware of how to test health literacy in a safe way [20, 25, 26]. Training on how to conduct a health literacy test is required. Training ED nurses to administer a health literacy test is an important step and will significantly improve
the patient-clinician interaction as well as increase the patient’s confidence in receiving information that is appropriate for their needs [20]. Training also is required to emphasize how to deliver the test in a non-threatening way to patients or clients [25]. For example Arozullah et al. [20] suggested starting the REALM-SF with the statement “We are studying medical word reading in order to improve communication between healthcare providers and patients. Here is a list of medical words that may be difficult to read.” (p. 1033). Online training courses are available at the Centre for Disease Control (http://www.cdc.gov/healthliteracy/training/) for health professionals and also at other sites relating to culture, health and ethnicity (http://www.hrsa.gov/culturalcompetence/index.html). Given the high proportion of the population that is reported to have limited health literacy, ED nurses may need to consider regular screening of patients presenting for triage.

Although the focus of this study is on the measurement of health literacy, ED nurses may actively implement strategies to improve the understanding of health information. Numerous educational approaches or interventions have been used to improve health outcomes for patients with low health literacy. Educational strategies such as considering the structure and design of information [42, 43], using numbers to indicate higher quality options [44], pictorial representations [43], using media presentations [44], limiting the information and simplifying the readability of the information [42, 44], have all been used to improve health outcomes for patients with low health literacy. Emergency nurses can potentially design material for specific levels of education such as fifth grade reading ability (as recommended) for patients with limited health literacy level using available tools which measure readability [45].

Health literacy tools discussed in this paper are more appropriate for culturally and linguistically diverse populations, and in fact most of these tools were established within populations speaking English as a second language [20, 21, 24]. The nominated tool has been trialled in a busy metropolitan hospital in Sydney, Australia. The Campbelltown Hospital Emergency Department, includes a large paediatric caseload, and serves health consumers from lower socio-economic backgrounds. Approximately (39%) of the population speak English as a second language or were born in countries other than Australia [46]. We have trained ED nurses to use the REALM-SF within a busy metropolitan emergency setting in Sydney as part of a clinical trial, testing an education program on fever management in children, for parents and carers with limited health literacy (Alqudah, Johnson, George & Cowin, in press). This experience did highlight some important considerations when administering the REALM-SF. Patients were asked to read the list of words in the test, any word that is not attempted or mispronounced is considered an error. Patients with scores of six or more have a functional health literacy level, while patients scoring five or less were considered at risk of inadequate health literacy. After implementing the test in ED, emergency nurses recommended that the test be given in a private area.

5 Conclusion and implications

The ability of ED nurses to assess a patient’s level of health literacy can help nurses to deliver health information in an accessible form for all patients. This review has confirmed that the REALM-SF is the preferred instrument for ED nurses. The REALM-SF is easy to administer and can be used quickly to assess both the patient and their carer’s level of health literacy, and to tailor educational messages for patients and their carers. Emergency nurses should consider regular screening of patients within private areas within emergency where high levels of low health literacy may exist within local communities. Emergency nurses should also receive training in how to administer these tests in a non-threatening and accurate manner. The inclusion of REALM-SF within the normal practice of emergency nurses has the potential to assist in the delivery of comprehensible information for all patients, which may result in decreased re-presentations within emergency departments.

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Presentations


2. Alqudah, M., Johnson, M., Cowin, L., & George, A. (2013) A randomised controlled trial of fever management education for parents or carers with functional or limited health literacy. Research and Teaching Showcase, Ingham Institute and South Western Sydney Local Health District: 29 November 2013, Liverpool Hospital. Sydney, Australia


**Other Presentations**

The health literacy modified fever management education program for parents or carers has been accepted to be included as an education resource for sharing across the NSW health system and beyond through The Australian Resource Centre for Healthcare Innovations (ARCHI).
Appendix 20 University Award for best presenter 2013

(See next page)
May 2013

Dear Algudah,

Re: Wiley Research Futures Forum

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