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A DESCRIPTIVE STUDY OF THE BELIEFS AND
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MEASUREMENT AND FEVER MANAGEMENT

presented by

Anne Therese Hughes

has been accepted towards fulfillment
of the requirements for

Master of Science degree in Nursing


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**A DESCRIPTIVE STUDY OF THE BELIEFS AND ATTITUDES
OF PARENTS REGARDING TEMPERATURE MEASUREMENT
AND FEVER MANAGEMENT**

by

Anne Therese Hughes

A THESIS

**Submitted to
Michigan State University
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ABSTRACT

A DESCRIPTIVE STUDY OF THE BELIEFS AND ATTITUDES OF PARENTS REGARDING TEMPERATURE MEASUREMENT AND FEVER MANAGEMENT

by

Anne Therese Hughes

In an environment replete with technological options for diagnosis and treatment, persons who provide care to the sick have struggled for three centuries to puncture the barriers to caring that often accompany the use of medical technology. This study examines attitudes and behaviors surrounding the use of one piece of technology, the thermometer, in an effort to envision a method of transforming the relationship between tools and human users. Parents were asked by self-report questionnaire to indicate reasons they use, or do not use, thermometers and what methods they use to manage fevers in their own children. Factors of interest were the parent's overall comfort with the tool, the frequency of use in the sample population, and whether parents used the information revealed by the tool to guide treatment. Parents overwhelmingly reported feeling comfortable using a thermometer. While there were no cases in which parents indicated they did not use a thermometer to evaluate a suspected fever, only one third reported they would need to know the exact temperature before treating a fever.

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Introduction

As we close the twentieth century we are surrounded by technology. Tools and machines permeate our lives. They assist and encumber us. In the field of health care, increasingly complex machines extend the reach of our hands, our eyes, our ears. These sophisticated sensory information and feedback mechanisms, our technodermis, enhance our worldview (Keen, 1983). Unfortunately, they also have tremendous potential to impose barriers on relationship. Hawthorne and Yurkovich state that the meaning of caring is being eroded as a consequence of “society’s enslavement by science and technology” (1995, p. 1088). This view of technology is prevalent in our culture, and is particularly evident in writings about medical technology. Health professionals have been admonished to resist the restricted view of the patient presented by medical technology since the invention of the stethoscope in the early 19th century (Reiser, 1978). Modern medical technology, however, provides invaluable assistance in achieving the goals of disease prevention and management. The challenge is not to eliminate the use of sophisticated technology, but rather to be clear about the best use of tools. How can we exist in relationship with our machines so that our compassion is maximized and our caring touch is not negated by the plastic and steel? One possibility was poetically stated by Robert Pirsig.

The way to solve the conflict between human values and technological needs is not to run away from technology. That's impossible. The way to resolve the conflict is to break down the barriers of dualistic thought that prevent a real understanding of what technology is--not an exploitation of nature, but a fusion of nature and the

human spirit into a new kind of creation that transcends both....this transcendence should also occur at the individual level, on a personal basis, in one's own life. (1974, pp. 284-285)

The phenomenology of human/technology relations has implications for many areas of our lives. This paper examines the concepts as they relate to a particular piece of medical technology, the thermometer. Many tools and machines are available to aid in the diagnosis and treatment of illness and injury. Some are comparatively simple, such as a mercury thermometer. Some are incredibly complex, such as a linear accelerator. In either case, critical thinking requires that we ask the question: Why is this tool being used?

If we are to transcend the barriers between our selves and our technology we must begin to explore the phenomenology of human/technology relations. The use of a tool must be based on a thorough and thoughtful decision-making process. What benefit do we intend to see by using a particular piece of technology? This study will examine these concepts by describing parental use of thermometers to assess fevers in children.

Hooker, Smith, Miles and King (1996) demonstrated that the ability of mothers to subjectively assess even the presence of fever is not uniformly reliable. It is possible that in some situations the choice not to measure temperature with a thermometer is a result of insufficient experience using thermometers and/or a general lack of comfort with technology. The potential for error in evaluating temperature by touch alone increases the likelihood of overtreatment of fever.

Wilson (1995) discusses the concern expressed by many clinicians that fever itself

may be harmful to children. This "fever phobia" may be another cause of overtreatment. Fever is an adaptive host defense, not a disease entity. Eliminating fever in the absence of clear benefit to the child, such as increased comfort, is a misuse of pharmaceutical technology. However, fever phobia provides one of the best reasons to use a thermometer: to establish that the fever is not dangerous. Supporting the efforts of the body to heal itself is a basic strategy of nursing and involves bio/psycho/socio/spiritual dimensions (Nightingale, 1859). If accurate measurement can quantify the child's current temperature, perhaps educational interventions can focus on teaching parents how to identify a dangerous fever and how to appropriately select treatment. It is conceivable that decreasing worry in the parent will result in increased energy spent providing support measures such as increased fluids, reassurance and rest. Once the parent has established that the fever is not dangerous, treatment measures--including antipyretics--can be directed toward promoting comfort.

Educational protocols have, in fact, been developed and implemented which instruct parents in the correct use of thermometers and antipyretic medication. Some educational modules also include information about the nature of fever and its potential benefits. In her thesis prepared in partial fulfillment of the requirements for a Master of Science in Nursing (MSN) at Michigan State University, Patricia Baumgartner (1987) developed and implemented an educational protocol on the management of fever. The teaching module included instruction on correct use of thermometers and antipyretic medications. Her pretest/posttest data demonstrated that caregivers learned the information in her module. However, their behaviors when managing a child's fever did

not change. This finding raises the question: if lack of knowledge is not the reason parents did not use a thermometer to measure fever, what is?

The behaviors and attitudes surrounding a parent's decision whether or not to use a thermometer prior to treating a fever will be the subject of this study. An underlying assumption will be that the parent has in mind the goal of restoration of the child's health and that their efforts will involve bio/psycho/socio/spiritual factors. A data gathering instrument will be developed to assess the reasons parents use or do not use a thermometer. Of particular interest are the following hypotheses derived from the conceptual framework underlying this study:

- ♦Parents do not use a thermometer because it does not yield any information they do not already know.
- ♦Parents do not believe the tool gives them any information that would change their planned course of action.
- ♦Parents do not use a thermometer because they do not know how to properly apply the tool.
- ♦Parents do not use thermometers because they do not believe they can appropriately interpret the information they receive from the tool.

Conceptual Framework

It has been suggested by Keen (1983) that the division between science/technology and art/psychology/philosophy is not a division of labor but a neurosis in need of healing. One of the reasons machines have the effect of blocking caring is because we conceive them as “other”. When we abandon the idea that machines are things, neutral means to

accomplish our intended ends, and begin instead to regard them as extensions of our own bodies, the picture changes dramatically. Our tools extend the reach of our eyes, our ears and our hands. They become our technodermis.

Martha Rogers' conceptual model of nursing defines humans as energy fields. According to her model, energy fields are a unifying concept for both animate and inanimate environments. The fields have no boundaries, are indivisible, dynamic, and allow exchange with other fields. The point of interaction between the energy fields of the tool and the user is critical to the process of transforming our relationship with technology. We must begin to understand how the tool shapes the hand and how the hand expresses itself through the tool. One human-tool-use phenomenon, embodiment relations, is explored in depth by Ihde (1990). Embodiment is a particular use-context describing how a person may experience technologies in a specific way. An enhancement and/or transformation of the senses accompanies the use of embodied technology. Occupying a position between the self and the world, a tool that is technically capable, well designed, and which exists in good fit with the use will "withdraw" and be scarcely noticed. The result is a symbiosis between the artifact, which may be a simple tool or a complex machine, and the human user. These conditions for embodiment relations, or "withdrawal" of the tool, give direction for the perfection of technology design. Design is related not only to the tool, but also to the perceptions and actions of the human user.

Currently, there are many imperfections in our technologies. These imperfections lead to frustration because such tools do not fulfill our expectations. Ineffective or inefficient technology is unable to function as technodermis. It obtrudes into the

caregiver-patient relationship and becomes an impediment to caring. We should not expect the transformation inherent in embodiment relations to occur with the use of inefficient technology. As we expand human/technology interactions, it is increasingly important to perfect machine design along a bodily vector.

"The Sheaths of the Lover's Body" is Keen's conceptual model of the concentric dimensions that define our being and doing as mature humans (Figure 1). Keen, a graduate of Harvard Divinity School who holds a Ph.D. in the philosophy of religion, has written extensively on the human drive for connection and fulfillment. His model envisions a human being whose tasks are to be an agent of healing and to embody health. One of the goals for personal growth is to develop the ability to glimpse the essential wholeness of the human condition while remaining aware of disease, suffering and alienation (Keen, 1983). The sheath in Keen's model that represents the technological body symbolizes the creation, care and maintenance of the media, or technology, through which we experience our world.

Panpsychism proposes that matter, as a physical manifestation of energy, is itself intrinsically sentient or experiential (DeQuincey, 1997). While perhaps more easily understood in terms of biologic matter such as the brain, this concept is intriguing in terms of technologic matter as well. One of the most valued attributes of medical technology is its ability to extend our physical senses. It assists us in discerning a fair amount of detail about a patient's state of health or illness. The term con-scentia or "knowing with" (p. 33) is the original meaning of consciousness. In connection with human users, technologies

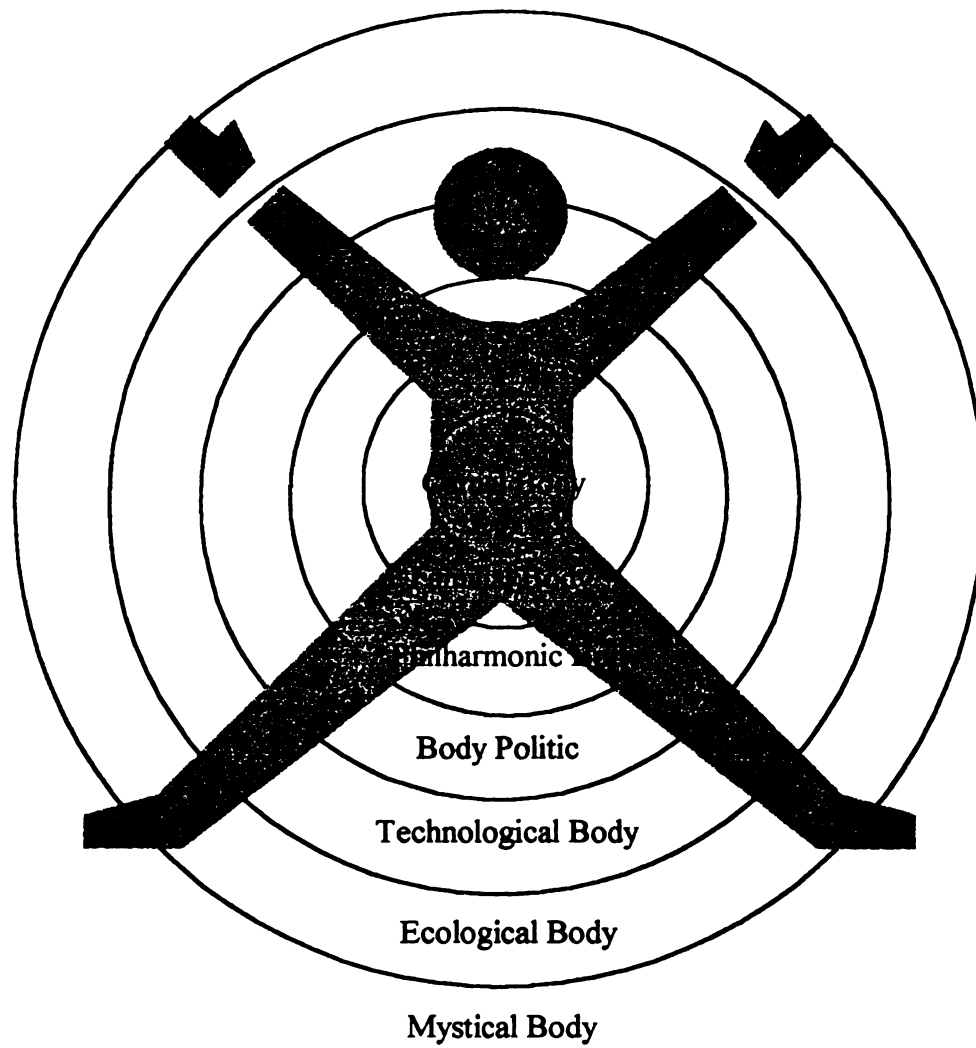


Figure 1 -- Keen's "Sheaths of a Lover's Body"

can be conceptualized as having a conscious, or sentient, element. We do "know with" our technology.

In Figure 2, Keen's technodermis is expanded to include con-scentia, defined as the human user "knowing with" the tool. The user perceives the world through the tool, and the tool itself recedes into the background. In order to achieve this level of symbiosis between human user and tool, it is important to thoughtfully determine when and how our tools will be used. Is the tool or technology truly useful in this particular instance for evaluating illness or enhancing health? Or does critical thinking lead to the conclusion that such use merely supports prior routine and is of no real benefit? When one operates within the concept of con-scentia, the relationship with tools is transformed. Tools are used to "know with," or to communicate a treatment. They are used with conscious intent in connection with the human energy field. Based on the twin premises that humans will continue to exist and that technology will continue to develop, it would seem reasonable to consider transforming our relationship with technology. The challenge is to learn to use machines in a way that maximizes our caring.

Information gathered in this study will describe attitudes regarding the use of technology, ranging from its obtrusiveness to its usefulness as a basis for decision-making. Answers to particular questionnaire items may give clues as to which aspects of technology are most problematic. The information may serve as a guide to development of a philosophy of technology that begins to steer health professionals toward a more constructive relationship with tools and technology. It may also give direction for aligning patient teaching and counseling more closely with behaviors and attitudes of patients and

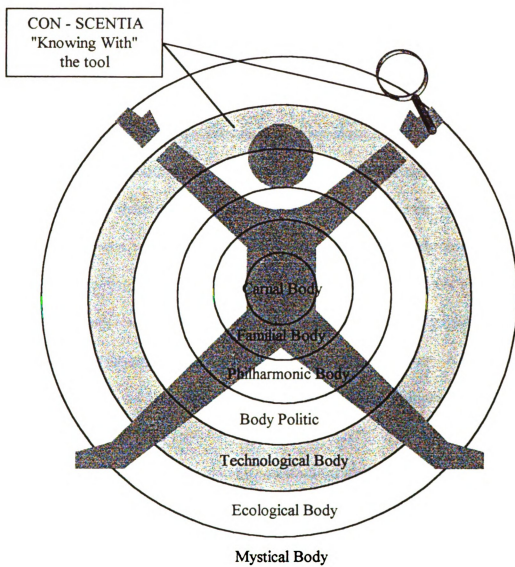


Figure 2 -- Technodermis

their caregivers. Unsafe practices may be identified and targeted for educational interventions. It is possible that a professional bias toward overuse of technology will be identified when parent practices are compared with professional expectations.

Conceptual Definitions

Attitude is defined as a persistent disposition to act in a particular manner toward a person, object or situation. Certain attitudes toward the use of technology are of interest to this study. The first attitude is overuse. Overuse is defined as the use of a technological instrument in the absence of a clearly defined reason for doing so. The second attitude is avoidance. Avoidance is defined as non-use of a technological instrument for any reason other than that it is not relevant in directing treatment. The third attitude is informed use. Informed use involves critical thinking. It is defined as basing a decision to use technology on the fact that treatment actions will be guided by the information obtained.

This study utilizes the commonly published definition of fever contained in Table 1 (Wilson, 1995; Uphold & Graham, 1994). Treatment of fever is defined as the specific intervention used by the parent to respond to an identified fever.

Table 1 -- Temperature At Or Above Indicated Value Constitutes Fever

	Fahrenheit	Centigrade
Rectal	100.4	38
Oral	100	37.8
Axillary	99	37.2

Literature Review

The literature review was conducted to explore two concepts that form the foundation for the research hypotheses. The first concept addresses the effectiveness of the tools and methods of temperature assessment currently available. Lack of quality may be one explanation for a disinclination to use the technology. A search for completed clinical trials involving thermometry yielded a number of studies that evaluate accuracy and ease of use for various types of instruments and for several anatomic sites used in temperature measurement. These studies illuminate some of the problems contributing to inefficiencies and/or inaccuracies in technology.

The second concept concerns the possibility that parents do not utilize the thermometer as a tool because it is not clear how doing so will help. If one cannot think of a reason to use a tool then it is merely a technology that yields irrelevant findings. Literature concerning this concept is sparse. It is possible that this has not been explored in clinical research.

Accuracy of Temperature Measurement Tools by Site

A study by Haddock, Merrow and Swanson (1996) examined the accuracy of axillary temperatures in screening for fever in infants and young children. The authors state that inability to identify fever may result in delayed identification of infections such as otitis media or meningitis and therefore, increased morbidity. The study was conducted in North Carolina at an outpatient pediatric clinic. The researchers recruited 173 children from birth to age 16 years. An electronic thermometer was used to compare axillary temperatures with either oral or rectal temperatures. The two temperatures were taken

within one minute of each other with the axillary temperature always taken first. Order was not expected to affect the reliability of findings. The mean difference between oral and axillary temperatures in the afebrile child was 1.2°F with a mean difference of 2°F in the febrile child. The differences between rectal and axillary temperatures were 2.2°F for the afebrile child and 2.8°F for the febrile child. The authors point out that the common practice of adding 1°F to axillary temperatures to approximate the oral reading and adding 2°F to approximate the rectal reading is supported by the mean afebrile temperatures but not by the mean febrile temperatures. However, when individual differences were considered, the use of this adjustment method was not supported. In over 77% of the cases, febrile rectal/axillary temperatures differed by more than 2°F. In over 70% of the cases, febrile oral/axillary temperatures differed by more than 1°F.

The conclusion of these authors was that it is not acceptable to use axillary temperatures with these corrections. Further, the low sensitivity (27%) shown by axillary measurements in this study casts doubt on the credibility of this method in screening for fever in children. Sensitivity is the ability to correctly identify the positive state. This study determined that in children who actually were febrile, the axillary temperature identified them as febrile only 27% of the time. Therefore, 63% of the fevers were missed. There is no information, however, indicating the size of the measurement error. The authors recommend that nurses teach parents to use the rectal site for detection of fever. The article closes with the statement that further study needs to be done to determine other means for accurately measuring temperatures.

A meta-analysis of 19 studies comparing tympanic temperature to oral, rectal and

core temperature in children focused on the accuracy, sensitivity and specificity of this “rapid, efficient and noninvasive measure of temperature” (Wells, King, Hedstrom & Youngkins, 1995, p. 95). Accuracy indicates the degree to which the test value agrees with a standard value. In temperature measurement studies each researcher must identify the standard by which the test instrument will be judged for accuracy.

The studies reviewed were published from 1989 to 1994 and were conducted in outpatient clinics, emergency departments and inpatient settings. In these studies, oral temperatures differed from tympanic temperatures by up to .68°C. Tympanic and rectal temperatures were found to differ by as much as 1.2°C. The authors state that the wide variation in accuracy may be influenced by the subject ages. Tympanic temperatures are not highly associated with rectal or axillary temperatures in young infants.

This meta-analysis suggested that tympanic thermometry has the greatest sensitivity and specificity in the mid-range of fever. Specificity is the ability to correctly identify the negative state. In this case, specificity means that a child who is actually afebrile will have a tympanic temperature measurement that indicates they are afebrile. This meta-analysis did find a lower association of tympanic and rectal temperatures in afebrile children, and sensitivity declined for fevers above 39°C. In their recommendations for practice, the authors noted that posterior retraction of the pinna resulted in increased accuracy for tympanic thermometry. It was also suggested that for tympanic measures over 38°C, temperatures be confirmed with oral or rectal thermometers.

Accuracy by Instrument

To examine issues related to instrument accuracy and efficiency, Pontious et al.

(1994) compared glass mercury thermometers, two types of tympanic thermometer and one type of single use chemical, disposable thermometer. The TempaDOT single use thermometer is a plastic strip with dot-like depressions filled with a chemical mixture that melts at a given temperature. This results in a color change at the dot indicating the current body temperature. The advantage of this instrument is safety in comparison to glass thermometry, infection control, and cost savings.

The study was conducted in the emergency department of a large Midwestern children's hospital and consisted of a nonrandom sample of 960 temperatures taken on 89 febrile and 83 afebrile children. Subjects ranged in age from 3 months to 6 years and were randomly assigned to sites of measurement, type of thermometer, and order of use. Oral temperatures by glass thermometer were the standard used to define accuracy of the experimental instruments. One-way ANOVA's detected a significant difference in accuracy between the three instruments. Age, behavior, tympanic membrane bulge and febrile status were not demonstrated to have an effect on instrument accuracy. TempaDOT was found to be the most clinically useful temperature measurement instrument.

A study by Weiss et al. (1995) was designed to determine the effectiveness of tympanic temperature measurement in the field during or prior to emergency transport. Tympanic temperatures and other data including patient's mental status, activity level, paramedic's suspicion of a temperature abnormality and any treatment directed toward the patient's temperature were recorded for all 182 patients. The thermometry instrument used in the study was the First Temp Genius.

Temperature readings of the right and left ear were strongly positively correlated (.91) despite inconsistent technique. Since the patient's left ear faced the paramedic during transport, measurement of right ear temperature required an awkward reach across the patient. The strong correlation suggests that the technology is less subject to inaccuracies secondary to operator error than might be supposed.

Effectiveness of Subjective Assessment

This study also investigated the paramedics' ability to subjectively assess fever. At the outset of the study, paramedics believed they could tell whether a patient was febrile without measuring. However, analysis of the data revealed that less than 35% of hyperthermic patients and less than 20% of hypothermic patients were initially suspected of having abnormal temperatures. Unfortunately, the specific question of how often a suspected fever was actually confirmed by measurement was not answered in this article.

Mothers assessing fever in their children have a greater success rate in identifying fever than did the paramedics. Banco & Veltri (1984) found that mothers who suspected fever in their children were correct 52.3% of the time. Mothers were able to correctly identify the afebrile state in their children 93.9% of the time. This study of 303 patients between 5 days and 15 years of age was conducted in a pediatric ambulatory care center. Mothers who brought children in for acute, non-trauma related care were asked by a study interviewer if their children had fever at that time, how they made this determination, and whether they used a thermometer. The interviewer then left the room while the child's temperature was assessed by a staff nurse using either an oral or a rectal thermometer, depending on the age of the child. Only 28 of the 303 children in this study had their

temperatures taken at home by thermometer. Interestingly, these children had a significantly higher incidence of antipyretic therapy at home. Among the 28 patients who had temperatures assessed at home by thermometer, 12 of 19 judged to be febrile and three of nine judged to be afebrile were given antipyretics before being seen in the ambulatory care setting. Of the 261 patients whose febrile status was determined by subjective means at home, only 40 received antipyretics. The remainder of mothers stated they used no method for determining febrile status. In view of this finding that the use of a thermometer at home was associated with a three fold increase in antipyretic use regardless of whether the child was thought to be febrile, the researchers wondered whether antipyretic use in the presence of mild or absent fever would increase as a result of more aggressive fever detection strategies. In other words, is it possible that increased use of one type of technology, such as thermometers, contributed to increased use of other types of technology, such as medications?

This study provided a critical assessment of a ritual of folk medicine, the palpation of selected anatomical sites to determine presence or absence of fever, and concluded that subjective evaluation is useful as a screening tool for fever in children of all ages. Further, it was found that mothers can correctly identify high fevers (38.9 degrees C or higher) in most young children without the use of thermometry. Finally, the authors suggest that investigations of the criteria used by parents for clinical assessment and decision-making would be useful.

More recently, a study by Hooker, Smith, Miles and King (1996) evaluated parents' subjective assessment of fever compared with tympanic and rectal measures. A

convenience sample of 180 children, aged birth to four years, was selected from patients presenting for care at an emergency department. Parents were asked a brief series of questions to determine patterns of fever assessment. Eighty-eight percent of parents owned a thermometer but only 58% had used it before bringing the child in for care. Parents overwhelmingly (91.1%) believed they could tell when their child had a fever by touch.

After completing the questionnaire, the parent was asked to subjectively assess the child. Investigators then assessed the child's tympanic and rectal temperature. Parental subjective assessment of temperature agreed with the rectal glass thermometer 79% of the time, while the tympanic and rectal measurements agreed 88.7% of the time. The overall sensitivity of the tympanic measurement in detecting fever was 78.8% with a specificity of 96.3%. Parent's subjective assessment was comparable to this technology with a sensitivity of 81.8% and specificity of 76.5%. The authors conclude that while parents are not perfect at detecting fevers subjectively, their assessment should not be ignored.

Effectiveness of Educational Interventions

Patricia Baumgartner, in her MSN thesis (1987), discussed the fact that fever is an adaptive response to illness and a normal host defense. She suggested that fever reduction has become a ritual which may have resulted in the overtreatment and misunderstanding of fever. Baumgartner designed an educational intervention intended to increase parental understanding of the adaptive nature of fever. In addition, she taught practical knowledge about assessment of fever with a thermometer and reviewed treatment of fever including supportive and pharmacological measures. This study involved 80 parents of children

aged two months to four years. Parents in both the experimental and control groups completed self report fever management logs for thirty fever episodes that occurred over five months.

Results indicated parents used multiple factors to assess fever. Fifty percent used a thermometer to check temperature, 83% stated their child felt hot, and 11% stated their child looked sick. When questioned about management strategies, antipyretic therapy was the most prevalent treatment (93%). Eighty-seven percent said they checked the temperature as an initial management strategy. Twenty-three percent took the child to the doctor. Twenty percent observed and did nothing else. Thirteen percent gave the child a sponge bath and 3% called the doctor.

Baumgartner was able to support her hypothesis that the education module would increase parental knowledge regarding fever management. However, this increase in knowledge was not demonstrated to increase the incidence of appropriate fever management behavior. In fact, the data demonstrated a negative relationship between knowledge and appropriate behavior. It is possible these results occurred because insufficient sample size produced large random variations. Or, perhaps, lack of education was not the problem. The author suggests that it may be helpful to go back to the basis for her research and gather data about parents' knowledge and behavior. A literature search was unsuccessful in finding research concerning parents' beliefs, attitudes and behavior about fever management or technology in general. Therefore, exploring that subject is the purpose of this descriptive study.

Methods

This is a quantitative study which describes certain behaviors and attitudes of parents of children aged 12 months to 12 years. The attitudes of interest are those related to the use of technology. In order to elicit examples of these attitudes, a questionnaire was developed to collect data on attitudes and behaviors concerning the use of a particular piece of technology, the thermometer. For the purpose of this study, a thermometer is defined as any instrument developed and utilized specifically for the purpose of measuring the body temperature of a human being.

Since the questionnaire contains primarily closed-ended questions, the data can be scored quantitatively. The number of subjects who choose each method of temperature measurement and treatment, for example, can be counted. The prevalence of particular responses in the sample may be of assistance in guiding educational efforts with this population. Analysis of the data also supplied information concerning certain attitudes regarding technology. This information may be useful in refocusing the attitudes and expectations of parents and professionals for technological interventions.

Operational Definitions

The behaviors of interest for this study are those surrounding the phenomenon of fever, including methods of assessment, measurement and treatment. Assessment of fever is defined as the sensory or behavioral clues a parent uses to subjectively evaluate the child's physical condition and which lead to the conclusion that the child has fever. These sensory and behavioral clues are identified in question 2 (Appendix 5).

Measurement of fever is defined as the physical action taken by the parent to

gather data on which to base a plan of action in response to a suspected fever in the child. These behaviors are examined in questions 7 and 8. Treatment of fever, the specific interventions parents used to respond to an identified fever, is examined in question 11. In addition to questions that elicit information concerning specific behaviors in the treatment of fever, question 12 links behavior with attitude. The element of interest here is whether the parent used a critical thinking pathway to decide if the use of technology was relevant to the assessment, measurement and treatment of this particular child in this particular instance. Questions 4, 5 and 6 are indicators of how perceived ease of use and comfort with the technology are related to the specific design of the thermometer.

Sample Selection

The target population for this study was parents and guardians of children aged 12 months to 12 years. Parents of children in this age group are diverse, even within the Northwest Lower Michigan setting from which the sample selected for this study was drawn. Members of the population who do not utilize the health care system at all are, regrettably, not represented in the study. Because of time and resource constraints, an accessible population was identified as the client base of a pediatric office in Traverse City. The problem of selection bias in collecting data through a physician's office is acknowledged. Some of the biases that may potentially be introduced by this single data collection site involve income level, educational level and health beliefs. Although Traverse City is a relatively small town, there is a sizable group of upper income families who have moved into the community from urban areas. Factors often associated with rural populations, such as transportation barriers to care, may not be evident in this

sample. Results of this study are potentially generalizable only to the population that utilizes this particular office for health care.

Eligibility criteria were as follows: parent or guardian of a child aged 12 months to 12 years who has had previous experience with a febrile episode with a child, could read English, and expressed willingness to participate. Parents of children with chronic illnesses such as diabetes mellitus and cystic fibrosis were excluded since a febrile episode in a chronically ill child may be perceived by the parent as a greater health risk than a fever in a child whose general health is good.

Procedures

Data collection occurred over a two week period in a pediatric office staffed by five pediatricians, one pediatric nurse practitioner and one family practice nurse practitioner. This cross sectional study design was based on a convenience sample consisting of subjects who accessed this office for a periodic health assessment or an acute care visit. At the time of check in for their appointments, parents accompanying children aged 12 months to 12 years were asked by the receptionist if they would be willing to participate in a research study involving childhood fever management. Adults who expressed willingness received a cover letter (Appendix 4) describing the study and requesting participation. In addition, parents were provided the questionnaire and written directions (Appendix 5) which specified that completion of the questionnaire indicated their consent to participate. The subjects completed the three page questionnaire on fever and one page of demographic questions while they waited either in the waiting room or the exam room. After completion, questionnaires were placed by the participant in a

provided envelope and returned to the office receptionist at the time of check out.

Recruitment yielded 39 cases.

Protection of Human Subjects

Procedures for the protection of human subjects were implemented according to guidelines of the Michigan State University Committee on Research Involving Human Subjects (UCRIHS). Approval of the UCRIHS committee was sought and obtained subsequent to the thesis proposal defense. A letter outlining the purpose of the study and separate directions for completing the questionnaire were given to each parent willing to participate in the study. The letter contained assurance of confidentiality. The directions explained that completion of the questionnaire indicated voluntary agreement to participate. Study participants were instructed not to write their names or the name of their child on the questionnaire. Since the completed questionnaires were collected by the office staff and subjects were not known to the researcher, anonymity of the child and the parent was preserved.

Instrument

The data collection instrument was developed by the researcher and reviewed by two physicians and two nurse practitioners. The instrument was also reviewed by a professional researcher and improvements were incorporated into the final form. The questionnaire was then distributed to five adults with children in the age cohort of this study as a pilot evaluation. The purpose of this pilot study was to determine the time necessary for completion of the questionnaire and to assess the instrument for clarity and readability. Participants evaluating the instrument were able to complete the questionnaire

in approximately ten minutes. Final changes were reviewed by the researcher, as well as the aforementioned professionals.

Data Analysis Techniques

Data were entered directly from the questionnaire into a computer data file. Questionnaires were numbered by case and the data file printout cross-checked with the individual questionnaires. Descriptive statistics were used to examine sample characteristics. Frequencies were used to describe responses to attitude and behavior questions, such as items 5, 6, 7, 8, 9, 10 and 12, as well as to describe the prevalence of selected attitudes and behaviors.

Results

Thirty-nine questionnaires were returned to the researcher. Three questionnaires were excluded because the age of the child fell outside stated study parameters, resulting in an n of 36. There were no instances of participants reporting that they were not the person who usually provided care when their child had a fever. Parents in the study sample were predominantly female (n=34) and ranged from 20 to 48 years of age with a median age of 34. The median age of the child these parents considered when completing the questionnaire was 5.5 years. Study subjects were generally well educated. Only one participant was not a high school graduate, and four participants had advanced degrees. Most participants (n=31) were insured by private health insurance carriers and only one participant reported being uninsured (Table 2).

All respondents reported having a thermometer at home. Ninety-seven percent (n=35) reported feeling comfortable using the thermometer. Sixty-four percent (n=23)

Table 2 -- Demographics Of Study Sample

	Frequency	Percent
Age of parent		
20 -- 29 years	9	25
30 -- 39 years	21	58.3
40 -- 49 years	6	16.7
Age of child		
1 -- 4 years	15	41.7
5 -- 8 years	16	44.4
9 -- 12 years	5	13.9
Educational level of parent		
some high school	1	2.8
high school graduate	7	19.4
some college	10	27.8
Associate's degree	8	22.2
Bachelor's degree	6	16.7
advanced degree	4	11.1
Health insurance		
private	31	86.1
public	4	11.1
none	1	2.8

described their thermometer as “very easy” to use. Although there was a suggestive indication that ear thermometers were easier to use than glass or rectal, the type of thermometer had no significant relationship to the perceived ease of use (Table 3).

Table 3 -- Ease Of Use By Type Of Thermometer

	Glass	Digital	Ear	Row total
Very easy	9 60.0%	10 66.7%	4 80.0%	23 65.7%
Easy	6 40.0%	5 33.3%	1 20.0%	12 34.3%
Column total	15 100%	15 100%	5 100%	35 100%

Note. $\chi^2 = .676$ and $p = .713$

Parents were asked to mark on a thermometer scale the temperature they interpret as fever. The range and mean for these values are reported in Table 4. For rectal and oral sites of temperature measurement, the mean value for parent definition of fever was lower than the values used to define fever in this study. The Fahrenheit value defining fever (Table 1) is included in Table 4 for clarity.

Table 4 -- Parent's Definition Of Fever (In Fahrenheit)

	Highest value	Lowest value	Mean value	Table 1
Rectal	102	97.7	99.5	100.4
Oral	101	98	99.4	100
Axillary	102	98	99.4	99

A t-test to compare means of parent definition of fever with the value used to define fever for this study showed the difference was significant in all three sites. This information is presented in Table 4a.

Table 4a -- T-test To Compare Means

	t statistic	p value
Rectal	-2.538	.021
Oral	-4.352	.000
Axillary	2.167	.039

Parents were asked to write the specific indicators that cause them to suspect their child has fever. Responses to this open-ended question were coded into eleven categories. Hot to touch and flushed skin were the most commonly reported subjective indicators of fever (Table 5).

Ninety-seven percent (n=35) of respondents in this sample verified their subjective findings by taking the child's temperature using a thermometer. When given the opportunity to include more than one subjective indicator, parents selected observation of the child's behavior and appearance in 28 cases. The use of touch to confirm the presence of fever was selected in 27 cases. These results are shown in Table 6. When asked to indicate which method provided them the best information, 77.8% chose the use of a thermometer (Table 6a).

Table 5 -- Sensory And Behavioral Clues Leading Parents To Suspect Fever

Hot to touch	23
Flushed skin	13
Lethargy	9
Glassy eyes	4
Irritability	4
Sleepy	3
Skin pale	2
Sleeplessness	1
Crying	1
Verbal complaints	1

The most commonly identified reasons for using a thermometer were to determine how high the temperature was before giving medicine and to make sure the fever was not dangerously high (Table 7). Although few parents chose other reasons as most important, many indicated that anticipating being asked the child's temperature by the doctor or nurse (n=20), uncertainty about presence of fever (n=21) and coming from a family that always used a thermometer (n=23) were reasons they considered in making the choice to use a thermometer. When asked to indicate the reason they considered most important in making the decision to use a thermometer, over one third of parents did not indicate a reason. However, for those who did, findings were fairly consistent with those in Table 7. The desire to know the exact temperature before giving medication was selected most frequently, followed by to make sure the fever was not dangerously high (Table 7a).

Table 6 -- Parent Methods Of Confirming Fever

	Frequency	Percent
Check with a thermometer	35	97.2
Observe how child acts	28	90.3
Observe how child looks	28	90.3
Take temperature with hand	27	84.4

Table 6a -- Method Selected As Most Reliable For Confirming Fever

	frequency	percent
Check with a thermometer	28	77.8
Observe how child acts	1	2.8
Did not rank	7	19.4

Table 7 -- Parent Reasons For Using A Thermometer

	Frequency	Percent
Check exact temperature before medication	32	97
Make sure fever was not dangerously high	32	97
Wasn't sure the child had fever	21	67.7
Thought doctor/nurse would ask temperature	20	62.5
Parent's family always used thermometer	23	63.9

Table 7a -- Reason Selected As Most Important For Using A Thermometer

	Frequency	Percent
Check exact temperature before medication	10	27.8
Make sure fever was not dangerously high	8	22.2
Wasn't sure the child had fever	4	11.1
Thought doctor/nurse would ask temperature	1	2.8
Did not rank	13	36.1

Only one parent completed the “did not use a thermometer” question to the exclusion of “did use a thermometer.” In this case the reason for not using the thermometer was described as “didn’t have ear refills so I used my hand, otherwise I would have used it.” In this case, the need for items in addition to the tool itself limited the usefulness of the technology. Eleven respondents completed both the “did use” and “did not use” sections. Responses to these questions were mainly in the negative. However, certain items received a few “yes” answers. Reasons given for not using a thermometer included my child feels better just to be touched (n=3), my mother always checked my fevers with her hand (n=3), the fever was nothing to worry about (n=2), the child was sleeping (n=1), the child was crying and hot (n=1) and I would have given the medicine no matter what the thermometer said (n=1). No parents reported being afraid to know how high the fever was, that the thermometer was a bother to use, or that they were concerned the thermometer would upset or injure the child.

The fever treatment most commonly selected as most important was administration

of acetaminophen, with administration of ibuprofen the next most common response. Although parents did indicate they utilized such measures as increasing fluids, removing clothes and blankets and cuddling the child, the use of “edible technologies” (Ihde, 1990, p. 113) such as Tylenol and Motrin were indicated as the most important treatment (Table 8a). This question represents the third time parents were asked to answer yes or no to several options and then indicate the most important option by placing a star beside that option. Nearly two thirds of parents did not indicate which treatment they felt was most important. However, when individual items were examined and parents were free to indicate any action they took to treat fever, increasing fluids (n=34) was included in treatment more often than any other action. Cuddling (n=31) and administering acetaminophen (n=30) were the next most frequently selected treatments (Table 8).

Table 8 -- Parent Methods Of Fever Treatment

	Frequency	Percent
Administer acetaminophen	30	90.9
Administer ibuprofen	22	68.8
Cuddle child	31	91.2
Increase oral fluids	34	94.4
Remove blankets and clothes	19	61.3
Increase blankets and clothes	7	25.9
Place child in cool bath	23	65.7
Administer aspirin	1	3.7

Only one questionnaire item showed evidence of a difference of opinion within this sample. In response to the question whether a parent would treat a suspected fever without knowing the exact temperature, 58% of parents indicated they would treat, 36% indicated they would not, and the remainder did not respond to the question.

Table 8a -- Fever Treatment Selected As Most Important

	Frequency	Percent
Administer acetaminophen	6	16.7
Administer ibuprofen	5	13.9
Cuddle child	2	5.6
Increase oral fluids	1	2.8
Did not rank	22	61.1

Interpretation

The questionnaire for this study was structured to collect yes and no answers. In approximately one third of the cases (n=11) participants indicated “yes” answers but failed to indicate any “no” answers. The missing data may represent refusal to answer a particular question, but it is likely that for the cases in which only “yes” responses were checked, the missing responses were intended to indicate a “no” response. The data was analyzed in that manner.

Three of the study hypotheses were formulated based on the premise that some parents would report they did not take objective measurement of temperature. There were no cases in which a parent checked no to the item “I take the temperature with a

thermometer.” In one case this item was unanswered and therefore a “no” answer was entered in the data file. All other subjects checked yes to indicate they take the temperature with a thermometer. The responses of the study sample, therefore, do not support the basic assumption that parents do not routinely assess suspected fevers in their children by using a thermometer. Because the null hypothesis for three out of the four hypotheses assumes that parents do use a thermometer, it is not possible to reject the null or support these three study hypotheses.

Although parents listed many subjective indicators that led them to suspect fever in their child, most (n=23) included “hot to touch.” This finding differs from all others listed by parents in that it can be objectively quantified by a tool. A number can be assigned to indicate exactly how hot. We do not have tools to quantify lethargy, pallor, flushing or irritability. Is hot to touch really any more reliable an indicator of fever than other signs, or is attention focused on this finding because temperature can be measured?

Three of the study questions were intended to explore general reasons parents might not use a thermometer. These reasons were: parents feel the tool does not yield any information they do not already know, parents do not know how to properly apply the tool and parents do not believe they can appropriately interpret the information they receive from the tool. It was hoped that chi square analysis could be used to explore patterns of behavior and attitudes related to these hypotheses by contrasting answers of thermometer users with those of nonusers. This statistical analysis was not possible given the available data.

The perception that parents do not regularly assess their child’s fever with a

thermometer is expressed in literature and by health care providers in Traverse City, including those practicing at the physician office from which the study sample was drawn. The fact that the data did not confirm this perception was an unexpected finding. It is possible that this sample, by chance or bias, included only parents who typically do use thermometers to assess fever. Level of education for this sample was quite high, a potential influence for the use of technology. Another possible explanation is that parents felt it would be inappropriate to admit they did not use thermometers. Also, despite written directions to choose one incident of fever management as a reference when completing the questionnaire, it may be that parents merged several incidents and in some but not all of the instances they used a thermometer.

Parents indicated they were comfortable using thermometers and described them as easy or very easy to use. This perception may have been influenced by their high level of education, despite the fact that this speculation was not supported by the data from this particular sample (Table 9). Intuitively, one suspects that parents of this age and educational level have a general comfort with technology. A working knowledge of technology may allow the user more flexibility in making adjustments to compensate for minor inconveniences of thermometers.

The fact that the user can adapt is not sufficient indication that the technology is a good fit with the use. Also, the technology may be useable but excessively precise. In a child of this age group, is it necessary for a parent to discriminate between a fever of 100.6°F and 101.8°F? Or is it merely necessary to know whether a fever is dangerously high? A paper strip thermometer that changed from green to yellow at 99°F and from

yellow to red at 104° F may provide an acceptable level of precision. The thermometer reading itself then diminishes in significance and can be integrated with other subjective findings for a holistic view of the sick child.

Table 9 -- Analysis Of Educational Level And Ease Of Use

	Very easy to use	Easy to use	Total
Less than college degree	5 62.5	3 37.5	8 100
College degree	17 70.8	7 29.2	24 100
Total	22 68.8	10 31.3	32 100

Note. $\chi^2 = .194$ and $p = .660$

Parental educational level seems to be associated with the use of thermometers to confirm a suspected fever. In the 1987 thesis by Baumgartner, 87% of parents in the experimental group used the thermometer to confirm the presence of fever. In her study, the highest level of education for 62% of parents was a high school diploma and only 8% had earned a Bachelor's or advanced degree. While a significant relationship was not found, data in the present study suggest a positive relationship between educational level and the perceived need to know the exact temperature before administering treatment (Table 10). Parents with a college degree or higher were more likely to depend on the thermometer to direct treatment. In addition, a similar relationship is suggested by a cross tabulation of education level and the use of acetaminophen to treat fever (Table 11). It has been noted previously that medications are another type of technology, an edible

technology. However, the tendency to rely on technology does not necessarily imply right use. Baumgartner found a negative relationship between education and fever management behavior. It is interesting to note that in the current study the administration of aspirin, a potentially harmful action, was selected as a fever treatment by a parent with a college degree.

Table 10 -- Analysis Of Education Level And Need To Know Exact Temperature

	Yes	No	Total
Less than college degree	3 42.9	4 57.1	7 100
College degree	17 73.9	6 26.1	23 100
Total	20 66.7	10 33.3	30 100

Note. $\chi^2 = 2.329$ and $p = .127$

Table 11 -- Analysis Of Education Level And Acetaminophen Use

	Yes	No	Total
Less than college degree	5 62.5	3 37.5	8 100
College degree	21 87.5	3 12.5	24 100
Total	26 81.3	6 18.8	32 100

Note. $\chi^2 = 2.462$ and $p = .117$

There is no evidence from the data gathered in this sample that parents perceived the thermometer as an impediment to caring. It is conceivable that some parents consider

the use of a thermometer in confirming the presence of fever to be an expression of caring. Within the theoretical framework that serves as the basis for this paper, this is a potential function of the use of a tool. Physicians began to use thermometry to guide therapy in the early eighteenth-century (Reiser, 1978). Today it is a familiar technology. The parents in this study sample had a mean age of 33.8 years, were well educated and had regular access to medical care. The combined factors of a well-known tool in the hands of an experienced user are conditions that promote embodiment relations. The data suggest that parents use the thermometer to “know with.” Use of a thermometer was the most prevalent action taken to confirm the presence of a suspected fever.

The reason cited most often (n=32) for using a thermometer was to determine the temperature before administering antipyretics. This finding suggests that some parents use thermometers to guide their treatment actions. It is also possible that the decision to medicate was made for other reasons and the parent was seeking an objective finding on which to justify the plan.

Implications For Advanced Practice Nursing

The question regarding administration of aspirin was included to screen for unsafe practices. Most parents answered no to the option of aspirin as treatment for fever. However, one parent responded yes and nine parents gave no response. Since aspirin administration has been associated with Reye’s syndrome, this finding indicates professionals must continue to be vigilant in educating parents on the dangers of aspirin use in children (Fox, 1997).

With the exception of the axillary measure, parents in this study defined fever significantly lower than does the medical literature (Table 12). Despite their relatively high level of education, many parents in this sample did not know what constitutes fever. Cross tabulations of educational level and identification of fever as a value at or above that used as the standard for this study are reported in Tables 12a, 12b and 12c. These findings, while not statistically significant, suggest an opportunity for client education. In the absence of accurate knowledge, appropriate treatment is difficult. Teaching parents to identify and manage fever can begin in prenatal classes with instructions in the use of an axillary thermometer. Any temperature over 99°F in a baby under three months of age should be reported to the health care provider. As the child grows, fever management education specific to the age and health status of the child can be included during health assessments and acute care visits.

Table 12 -- Percent Who Indicate Fever Cutoff At Or Higher Than Study Standard

	Frequency	Percent
Oral	9	33.3
Axillary	21	75
Rectal	3	16.7

Periodic review of fever management strategies may be more effective than a single educational intervention. Baumgartner's (1987) nursing intervention to increase parental knowledge about fever had limited effectiveness. The study demonstrated that

Table 12a -- Correct Identification Of Axillary Fever By Educational Level

	< Standard	≥ Standard	Total
Less than college degree	2 40.0	3 60.0	5 100
College degree	4 21.1	15 78.9	19 100
Total	6 25	18 75	24 100

Note. $\chi^2 = .758$ and $p = .384$

Table 12b -- Correct Identification Of Rectal Fever By Educational Level

	< Standard	≥ Standard	Total
Less than college degree	3 100.0		3 100
College degree	9 75.0	3 25.0	12 100
Total	12 80	3 20	15 100

Note. $\chi^2 = .938$ and $p = .333$

Table 12c -- Correct Identification Of Oral Fever By Educational Level

	< Standard	≥ Standard	Total
Less than college degree	3 50.0	3 50.0	6 100
College degree	13 68.4	6 31.6	19 100
Total	16 64.0	9 36.0	25 100

Note. $\chi^2 = .672$ and $p = .412$

parents' knowledge about fever and fever management could increase without resulting in more appropriate fever management behaviors. It is certainly important for Advanced Practice Nurses (APNs) and other primary care providers to assess parent knowledge regarding fever management and provide correction and affirmation as appropriate. Critical thinking in the management of fever is not possible in the absence of accurate and current scientific evidence. Many parents rely on health care providers for this information.

Knowledge is necessary but not sufficient for implementation of a critical thinking pathway. Behaviors will also be affected by attitudes. Nearly all the parents in this sample (n=34) used a thermometer to evaluate a suspected fever. Fifty-eight percent expressed the attitude that they would treat the child even if they did not know the exact temperature. This combination suggests overuse of technology, defined as use of a tool without a clear reason for doing so. What is the source of this attitude? Over half the parents in this sample indicated that one of the reasons they used a thermometer was because they thought the doctor or nurse would ask them the exact temperature. Is it possible that parents who regularly access the health care system are affected by the attitudes of providers? Do we as professionals overuse technology by using tools and tests even when the results will not change our plan of care? Do we, by our expectations and questions of parents, encourage their overuse of thermometers? The concept of informed use of technology, basing decisions to use a tool on the expectation that treatment actions will be guided by the results, is worthy of our exploration and thought. If we are to "know with" and care through tools, we must cultivate an attitude of

informed use.

Implications For Research

As an initial trial of a self report instrument to examine behaviors and attitudes related to thermometer use and fever treatment, this study utilized a small and relatively homogenous sample. Replication of the study using a revised instrument with a larger sample may reveal significant findings in cases where there was a suggested correlation in the present study. For example, the chi square for type of thermometer and ease of use suggested a relationship ($\chi^2 = .676$) but did not show significance ($p = .713$).

This particular questionnaire could be revised to be more effective in revealing parental attitudes and behaviors regarding temperature assessment. Questions such as “In the last year, when your child has been sick, how often have you used a thermometer to confirm your impression that your child had a fever? Always, Sometimes, Rarely, Never” may be more acceptable to parents and document more variability in thermometer use than the yes/no approach of the current questionnaire. The concept of ease of use may be more clearly defined by the question “Does your thermometer need technological improvement? Much, Some, Little, None.”

This data was collected by self report questionnaire, a method that allows the subject a fair degree of latitude in interpreting questions and directions. In this case, the possibility that subjects drew on several instances of fever rather than just one, may have resulted in an overstatement of thermometer use. A verbal survey, which allows feedback from the researcher, may avoid this problem. This method might also minimize the number of omissions when parents are asked to indicate a “most important” response.

Regular access to health care has been demonstrated to correlate with increased use of thermometers (Schwartz, Guendelman & English, 1997). Since data was collected exclusively at a pediatrician's office, this bias is acknowledged. Using a different site for data collection, such as an urgent care center or a shopping mall, may result in a more diverse data set.

While 89% of parents indicated that when they did use the thermometer it was for the purpose of determining the child's exact temperature before administering medication, 58% indicated they would treat a suspected fever without knowing the exact temperature. This seems to support the hypothesis that many parents do not believe the tool would give them any information that would change their planned course of action. It would be useful to know whether parents would be deterred from administering medication if the temperature reading was low. If not, perhaps their decision to medicate was based on the child's discomfort and the temperature reading perceived as an objective finding that could justify an existing plan.

Verbal comments of local health care providers concerning parental use of thermometers suggest that professionals believe that all fevers should be assessed objectively. Determining if such a perspective exists would be an interesting focus of study. As would the degree to which attitudes and expectations of professionals drive the behavior of parents in their fever management strategies.

Implications For Nursing Education

As we educate nursing professionals at all levels, it is imperative that we reformulate the relationship between health care providers and their technology.

Literature reviewed for this paper provides support for the premise that technology is often viewed as an impediment to caring (Reiser, 1978; Sandelowski, 1997). Rather than to simply exhort novice nurses to remember that there is a patient on the other side of their instruments, a tactic that has been insufficient for three hundred years to change the distancing effects of medical technology, nursing educators must reconceptualize the approach to technology. A starting point for this transformation could be to teach nurses to critically examine each use of technology as clinicians, health educators and patient advocates.

Concerning the implications of this study relative to fever identification and management, it is important that all nurses caring for expectant mothers and children be educated about the meaning of fever and appropriate management strategies. Health care providers must be aware of what fever is and is not, how the risks associated with fever change with the age and general health of the child, and what place thermometers have in fever management. It may not be necessary for all fevers to be assessed objectively. Subjective findings give useful information, clues to the child's response to the illness and direction for treatment that will promote comfort and healing. Thermometers are necessary for identifying any fever in an infant less than 90 days old and screening for dangerously high fever in a child of any age. It is important that nurses and nurse aides working in primary care know when a fever is dangerous. It is also important to have the ability to discriminate a fever that is most likely benign. When health professionals overcome "fever phobia," parents and children will be better served.

A Proposal For Ritual

Baumgartner (1987) suggests that fever management strategies, including the use of thermometers and antipyretics, have become a ritual that may not be rooted in scientific principles. The transformation of our relationship with technology will involve the development of new rituals that synthesize technology and caring. As an illustration of information gathered in this study, the following vignette is submitted as a proposal for an integrated ritual for fever management. It is presented with the caveat that an underlying cause for the fever has been identified and treatment measures instituted as needed.

A mother observes that her 5 year old daughter is warm to touch and has flushed cheeks. Because the child's body fluid reserves are reduced during periods of high metabolic activity, the mother begins oral fluid replacement. The child is dressed in a tee shirt and underwear to allow body heat to radiate freely, because fevers above 103°F result in increased physical discomfort for the child (Fox, 1997). Skin to skin contact is comforting for mother and child and also provides the mother with subjective data on the fever. The child may fall asleep. On the other hand, the child may become increasingly irritable as the fever rises. The child's discomfort interferes with her own emotional reserves for healing and is unsettling to the mother as well. The decision is made to administer acetaminophen to the child to promote comfort. The child falls asleep in the mother's arms. An hour later the sleeping child feels quite hot to touch. The mother becomes concerned that the child's sleep may be evidence of lethargy and a dangerous fever. Rather than wake the child, the mother uses a thermometer to assess the temperature. The reading is 102°F. The mother is reassured that this fever is not a threat

but an adaptive host response.

Reflections

We must remind ourselves that while medical tools do enhance our senses, they give only a partial and somewhat mythical representation of the world we seek to understand. There are significant differences between machines and organisms. A tool or machine will perform only within the parameters of its design. With care and maintenance, a machine can be expected to perform predictably and consistently. Organisms, on the other hand, can be expected to perform unpredictably. Some organisms possess the ability to function in the absence of adequate care and maintenance; they adapt to challenge. However, in order to maximize their potential, most organisms benefit from observation, feedback and awareness of their multidimensionality.

Transformation of the relationship between humans and their tools requires an understanding of the strengths and limitation of the tool, as well as those of the organisms on both sides of the tool, the observer and the observed. What do we hope will be revealed to us by the tool? What human performance do we hope can be enhanced by the use of a tool? As we make tools part of ourselves, part of our technodermis, our expectations will become increasingly focused. If we demand it, and only if we demand it, those expectations will be fulfilled.

APPENDICES

MICHIGAN STATE UNIVERSITY

February 25, 1998

TO: Linda Spence
A230 Life Sciences

RE: IRB#: 98-104
TITLE: A DESCRIPTIVE STUDY OF THE BELIEFS AND ATTITUDES
OF PARENTS REGARDING TEMPERATURE MEASUREMENT AND
FEVER MANAGEMENT
REVISION REQUESTED: N/A
CATEGORY: 1-C
APPROVAL DATE: 02/19/98

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Anne Therese Hughes



OFFICE OF
**RESEARCH
AND
GRADUATE
STUDIES**

University Committee on
Research Involving
Human Subjects
(UCRIHS)

Michigan State University
245 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX: 517/432-1171

APPENDIX B

Memo

To: Anne Hughes, RN MSU graduate student

From: Michael J. Eldredge, MD Kid's Creek Children's Clinic

Subject: Thesis proposal "A Descriptive Study of the Beliefs and Attitudes of Parents Regarding Temperature Measurement and Fever Management"

It is acceptable for you to recruit subjects for your study at Kid's Creek with the understanding that patient confidentiality will be preserved by the following procedures:

- 1) patient and caregiver names will not be written on the data collection questionnaire and**
- 2) the questionnaire will be distributed and collected by front office staff rather than the researcher.**

As discussed, findings of the study will be shared with us at the conclusion of the study.

APPENDIX C

A LETTER TO FRONT DESK STAFF AT KID'S CREEK

First, let me tell you how grateful I am for your help in this data gathering process. This thesis describing behaviors and attitudes of parents/guardians regarding the use of thermometers to assess fever in children is part of my graduate studies in the MSU College of Nursing. I will be exploring how the use of the thermometer relates to underlying attitudes about technology in general and the treatment of fever in particular. I am very interested in this topic and excited to be at this phase of the project.

The process for recruiting subjects for the study is as follows: Please ask parents who bring a child in for **any** reason if they would consider participating in the study. They are eligible to participate if they have a child who is aged 12 months to 12 years and they have taken care of that child when he or she had a fever. The age of the child they brought in today and the reason for their visit doesn't really matter, as long as the parent, at some time, has managed a fever in a child 12 months to 12 years old. Please do not ask parents of children with chronic illness (such as diabetes and cystic fibrosis) to participate in the study.

The cover letter attached to the questionnaire explains the study to the parent and directs them to return the completed questionnaire (in a provided envelope) to front desk

staff after completion. The directions explain that they are not to write their name or their child's name on any materials and that their completed questionnaire indicates their consent to participate. If you see that names have been written on the envelope, please blot them out. Then place the questionnaires in this box and I will pick them up.

Thank you again for your help!

Anne Hughes, RN

APPENDIX D

A LETTER TO PARENTS

Dear Parents,

Thank you for taking the time to read this letter explaining a research study. This study is being conducted by Anne Hughes, RN, a graduate student at Michigan State University, College of Nursing. Information from the study questionnaire will be used to describe how and why parents and guardians use (or decide not to use) thermometers to evaluate fevers in children. In addition, it gives some idea of the methods parents/guardians use to manage fever.

There are no known risks or direct benefits to you if you participate in this study. Your decision to participate or not will have no effect on the health care your child is receiving at Kid's Creek. You are free to refuse to participate in this study or withdraw from it at any time. Also you have the right to refuse to answer any of the study questions. Participation in this study will not cost you anything nor will you be paid for your participation. If you have any questions, you may contact the nurse researcher, Anne Hughes at (616) 223-4681. Linda Spence Ph.D., RN, Assistant Professor and Thesis Chairperson, College of Nursing, Michigan State University can also be reached for questions at (517) 353-8684.

If after reading this letter you decide to participate, please fill out the attached

questionnaire. So that your information stays confidential, do not write your name or your child's name on the questionnaire. The questionnaire takes about 10 minutes to complete. You may take it into the exam room with you if you need more time to finish. Then place it in the envelope provided and return it to front desk staff as you leave. This way, you and your family remain anonymous to the researcher. By filling out the questionnaire it is understood that you have consented freely to participate in this study and I am very grateful for your help. If you are interested in the results of the study, they will be available at this office next May.

Thank you,

Anne Hughes, RN

Family Nurse Practitioner Candidate, Michigan State University

APPENDIX E

Treatment of Temperature in Children -- A Questionnaire

Think about the last time your child had a fever and what you did for him or her. For most of the questions you will check yes or no to indicate the answers that best describe what you did for that fever. Remember not to write your name or your child's name on the questionnaire. When you are done, place the completed questionnaire in the envelope and give it to the receptionist when you leave. That way your privacy and your child's privacy are preserved. You indicate your voluntary agreement to participate by completing and returning this questionnaire.

1. Who usually takes care of your child when he or she has a fever?
☐ I do ☐ another person does
2. What makes you suspect that your child has a fever?
describe how you know _____
3. Do you have a working thermometer at home?
☐ yes (go to question 4) ☐ no (go to question 8)
4. What kind is it?
☐ glass ☐ digital ☐ ear ☐ paper strips
☐ other (describe) _____
5. Do you feel comfortable using the thermometer?
☐ yes ☐ no
6. How easy is it for you to use?
☐ very easy ☐ easy ☐ hard ☐ very hard

7. If you use a thermometer, what temperature tells you your child has fever?

Mark an X on the thermometer scales to show this temperature.

98 99 100 101 102 103 104 105 106 in the mouth
|_|_|_|_|_|_|_|_|_|

98 99 100 101 102 103 104 105 106 under the arm
|_|_|_|_|_|_|_|_|_|

98 99 100 101 102 103 104 105 106 rectal
|_|_|_|_|_|_|_|_|_|

8. When you suspect your child has a fever, how do you make sure?

CHECK yes or no for each of the following, and place a STAR (*) beside the ONE answer you feel gives you the BEST information.

- a) I take the temperature with my hand. ☐ yes ☐ no
- b) I observe how my child looks. ☐ yes ☐ no
- c) I take the temperature with a thermometer. ☐ yes ☐ no
- d) I observe how my child acts. ☐ yes ☐ no
- e) I take other action. ☐ yes ☐ no
please describe _____.

9. If you DID USE A THERMOMETER the last time your child had a fever,

CHECK yes or no for each of the following, and place a STAR (*) beside the MOST IMPORTANT reason.

- a) I wasn't sure whether my child had a fever. ☐ yes ☐ no
- b) I thought the doctor/nurse would ask me what the exact temperature was. ☐ yes ☐ no
- c) I wanted to make sure the fever wasn't dangerously high. ☐ yes ☐ no
- d) In my family we have always used a thermometer. ☐ yes ☐ no
- e) I wanted to know how high the temperature was before I gave any medicine. ☐ yes ☐ no
- f) I had other reasons. ☐ yes ☐ no
please describe _____.

10. If you **DID NOT USE A THERMOMETER** the last time your child had a fever
CHECK yes or no for each of the following, and place a **STAR (*)** next to the
MOST IMPORTANT reason.

- | | | |
|---|------------------------------|-----------------------------|
| a) I don't have a thermometer. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| b) I thought using the thermometer would upset my child. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| c) My child was sleeping and I didn't want to wake him/her. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| d) My mom/dad always checked my fevers with their hand. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| e) I think it makes my child feel better just to be touched. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| f) My child was crying and hot. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| g) I would have given the medicine no matter what the thermometer said. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| h) My thermometer is a bother to use. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| i) The thermometer doesn't tell me more than I already know. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| j) I'm afraid the thermometer might injure my child. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| k) I was afraid to know how high the fever was. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| l) The fever was nothing to worry about. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| m) I had other reasons. | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| Please describe _____ | | |

11. What do you do to treat a fever?

CHECK yes or no for each of the following, and place a **STAR (*)** beside the
treatment you feel is the **MOST IMPORTANT**.

- | | | |
|---|------------------------------|-----------------------------|
| a) give Tylenol | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| b) give Motrin/Advil | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| c) give Aspirin | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| d) give other medicine. please describe _____ | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| e) cover my child with blankets and clothes | <input type="checkbox"/> yes | <input type="checkbox"/> no |
| e) take blankets and clothes off my child | <input type="checkbox"/> yes | <input type="checkbox"/> no |

f) give my child more to drink ☐ yes ☐ no

g) cuddle my child ☐ yes ☐ no

h) place my child in a cool bath ☐ yes ☐ no

i) I take other action. ☐ yes ☐ no
please describe _____

12. Would you treat fever if you didn't know the exact temperature? ☐ yes ☐ no

Would you please indicate a few pieces of information about yourself.

13. How old are you? _____ years

14. How old is the child you thought about when you answered these questions?
_____ years

15. What is your gender? ☐ male ☐ female

16. What is your highest grade completed in school or college?

☐ completed grade school

☐ some high school

☐ completed high school

☐ some college

☐ Associate's degree

☐ Bachelor's degree

☐ advanced degree

17. What type of medical insurance does your child have?

☐ private (Blue Cross, North Med, CHAMPUS, etc.)

☐ public (Medicaid)

☐ no insurance

LIST OF REFERENCES

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