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External Calf Compresses with Lemon as a Nursing Adjunct for Fever Treatment

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External Calf Compresses with Lemon as a Nursing Adjunct for Fever Treatment

Eira I. Klich-Heartt, MSN, RN

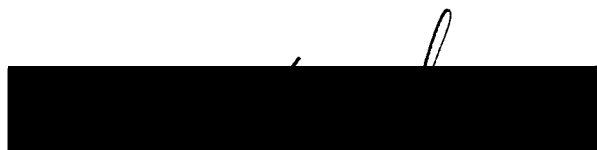
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This thesis, written under the direction of the candidate's thesis advisor and approved by the Chair of the Master's program, has been presented to and accepted by the Faculty of the Division of Nursing in partial fulfillment of the requirements for the degree of Master's of Science in Nursing. The content and research methodologies presented in this work represent the work of the candidate alone.



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Dedication and Acknowledgements

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Abstract

Fever is a common symptom of illness. Compresses are used in other areas and countries for comfort. Sponging has been studied and shown to be effective in lowering temperatures. This is a study that investigates the use of lemon calf compresses as a nursing adjunct for fever treatment.

The purpose of this study is: What are the experiences of adult patients during a febrile illness of greater than 101.5 °F. with the addition of a lemon calf compress to current treatment?

Methods: This was a prospective study with a quasi-experimental design. Ten patients identified with a fever greater than or equal to 101.5 °F., were offered the option of receiving a lemon calf wrap in addition to their standard prescribed medical therapies. The study was conducted on patients in either the emergency department or a combined medical-surgical unit of a community hospital.

Results: The lemon compresses were tolerated well by all participants. No adverse effects of allergic reaction, shivering or piloerection were reported. Comparison of mean temperatures demonstrated a continuous drop in temperature which was statistically significant at $p=0.006$. Other parameters that showed statistically significant change from pre treatment included skin temperature, face color and presence of headache.

Methods for dissemination include a report to be given to the hospital staff on the outcomes of the study, presentation to the university and Sigma Theta Tau Chapter, presentation of the research results to the Anthroposophical Nurses Association at their annual general meeting, as well as possible publication in an alternative nursing journal.

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Fever Treatment

Fever is one of the most common symptoms of illness. The symptom can range from a low grade, minor temperature elevation seen with minor colds and upper respiratory illnesses, to the extreme of febrile convulsions, sepsis, or heat stroke. It is a common reason for patients to seek medical care as well as develop during a hospitalization. Bor states that “fever is a costly clinical event” increasing hospital length of stay twofold as well as a fourfold increase in mortality.(1988, p.123) Studies on fever have centered on treating children with fever, the use of Tylenol, Aspirin and more recently Ibuprofen as antipyretics, evaluating the mechanisms for measuring fever, and the use of sponging with or without the addition of antipyretics.(Aksoylar, 1997, Abfolosu, 1997, Al-Eissa, 2000, Axelrod, 2000, Poblete, 1997, Freidman, 1990, Newman, 1985). The use of poultices and compresses are not taught in American nursing programs or evaluated in the English nursing literature. German nursing textbooks advocate the use of lemon calf wraps to assist in the adaptation to the fever state (Heine and Bay, 1995, and Van der Star, 1999). Only one research article evaluates the use of tepid lemon calf wraps and found the best results with the combined use of lemon calf wraps and lower doses of paracetamol, known in the USA as acetaminophen. (trans, Faschingbauer, 1995, p. 338)

Statement of the Problem

Fever is an elevation of the body's normal regulatory mechanism above the usual daily fluctuation of 36-38° C. Fever is defined as any temperature above this normal range, however controversy exists at which level an elevated temperature must be treated (Drwal-Klein and Phelps, 1992). Several articles mention beneficial effects of elevated temperatures including decreased morbidity in bacterial infections. Studies have shown increased "WBC activity, activation of T-lymphocytes, activation of B-cells and stimulation of interferon production and function " (Drwal-Klein and Phelps, 1992, 1007). In addition, fever treated with antipyretics delayed viral shedding in adults with rhinovirus, and children with chickenpox had a longer time to crusting of lesions with the addition of acetaminophen (Drwal-Klein and Phelps, 1992, p. 1007).

Fire was also seen in mythology as a transformative substance. "As humans observed the qualities of fire in these processes, it was natural to draw analogies between external fires and internal processes (Metzner, R. 1986, 59)."

Standard Western medical practice for the management of fever includes use of antipyretic agents such as acetaminophen or paracetamol, aspirin and ibuprofen. In addition, physical measures used to lower fevers include removing clothing, increasing hydration, and sponging. Often these studies are done on children. Crocetti and Hilman in a review of home treatment of fevers over the last 20 years demonstrated that parents often over-treat fever and have a general phobia towards elevated temperatures. (Crocetti, 2001 and Hilman, 1987) Articles supporting treatment of fevers include management of patient comfort, prevention of adverse

complications such as shivering, prevention of dehydration, increased oxygen consumption and seizures (Berg, 1993, Casey, 2000, Sund-Levander and Wahren, 2000, Manthous, 1995). Adjuncts to adult fevers include ice packs to pulse areas in the groin or axilla and the use of hypothermia blankets, mostly done in the Pre-hospital Care and Intensive Care settings, respectively (Shackell, 1996). As nurses are often the caregivers administering antipyretics and the evaluation of cooling techniques as well as patient comfort it is important for them to be aware of the efficacy of contrasting methods of fever control, as well as transformative changes in the patients' well-being and psyche. Nursing must determine the "strength and timing of nursing interventions" (Whittmore, 2002, 118). German nursing textbooks advocate the use of compresses and poultices including lemon calf wraps as a physical cooling method that can assist the patient in experiencing and tolerating a fever. The purpose of this study is to address the research question: What are the experiences of adult patients during a febrile illness of greater than 101.5°F with the addition of a lemon calf compress to current antipyretic treatment?

Conceptual Framework

Pathophysiology

Fever is a response by the body to toxins from outside the body, or exogenous pyrogens. It is a complex response involving neurologic as well as endocrine systems, and can provide a beneficial effect in directly killing off of microorganisms. Most often bacteria or viruses trigger the febrile response.

The exogenous pyrogens trigger the release of endogenous pyrogens including interleukins, interferon, and tumor necrosis factors. In addition the exogenous pyrogens stimulate the body to mobilize leukocytes and macrophages to produce large amounts of cytokines. These cytokines and interleukins activate the febrile response in the pre-optic nucleus of the hypothalamus (McCance, 2002, p.410).

The brain then releases prostaglandins (PGE₂) and other cytokines. These are the final mediators of temperature increase. They reset the fever set point to a new higher level in the hypothalamic thermoregulatory center. The body responds in two ways; by increasing heat production and heat conservation. There are four mechanisms by which fever is regulated: convection, conduction, radiation and evaporation (Casey, 2000, p. 39).

In addition to these normal regulatory mechanisms the body releases its' own endogenous cryogens as anti-pyretics to work in a negative feedback mechanism to diminish the fever. These pyrogens are arginine vasopressin, MSH, and CRF. These

two mechanisms of endogenous pyrogens production and endogenous production can explain the cyclic nature of the febrile state, with or without the use of antipyretics.

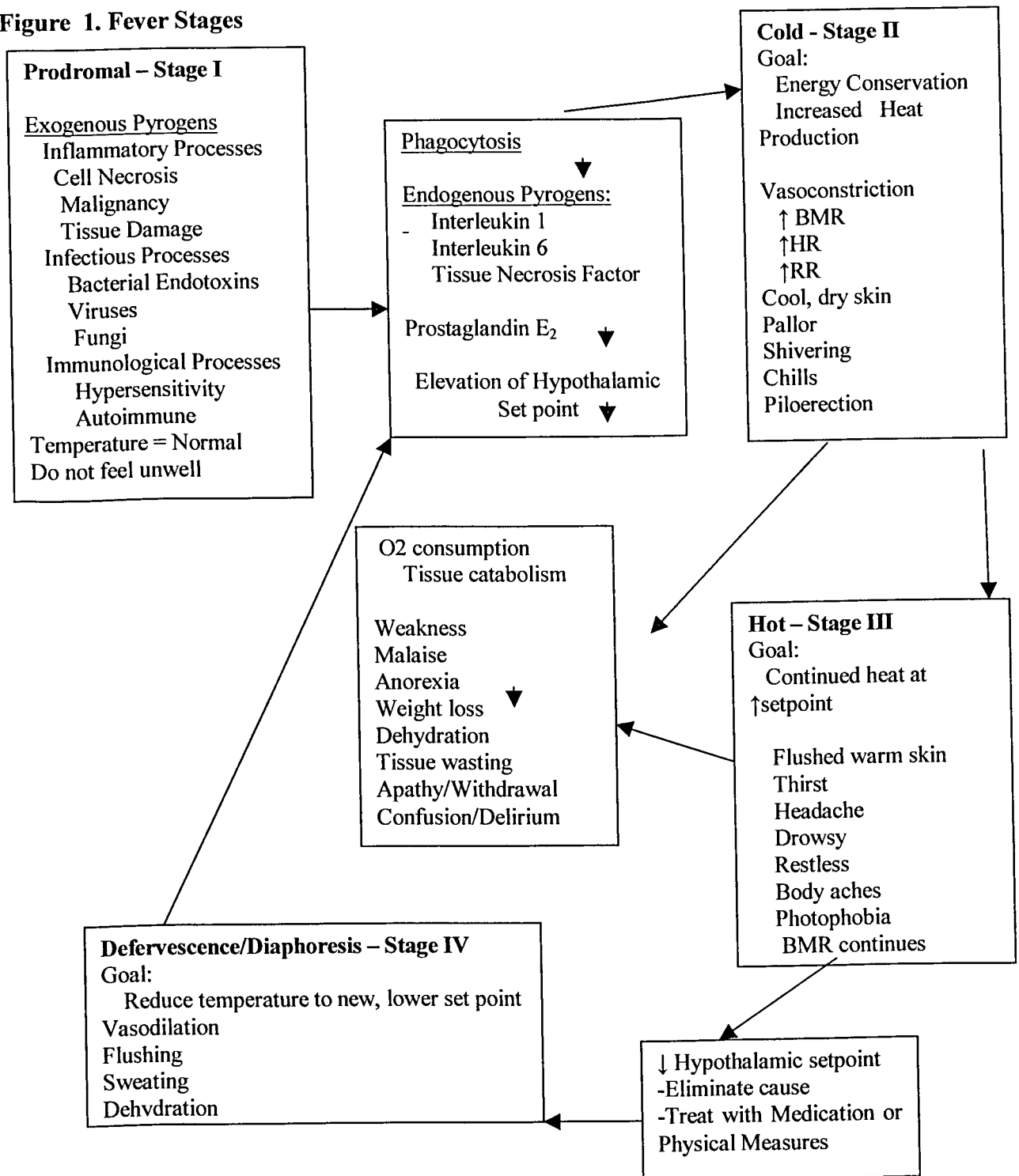
The elevation of temperature to a new higher fever state is accomplished in four stages. The first, or pro-dromal phase is one where the person is feeling unwell but the temperature is still normal. The second or chill phase, the temperature is rising, the body is increasing its' heat through shivering and the person may feel cold. In the third or flush phase, the person feels better, the temperature is now elevated to the new higher set point and the skin feels hot and dry. In the diaphoretic or fourth phase the temperature is falling, the person is flushed and sweating and the body's heat is decreasing through radiation and evaporation. With a continued source of pyrogens the cycle can repeat itself. (see Figure 1.)

Young children have higher metabolic rates and a smaller proportional body surface area to lose heat from. It is easier to disrupt the heat and fever control mechanism.

Heat in general speeds up a chemical reactions. Benefits of the febrile state include a direct action on viruses or bacteria and mobilization of protective mechanisms (Casey, 2000, p. 39). Fever as such stimulates lymphocytes and PMS's. A higher metabolic rate will utilize more energy, calories and nutrients from the body. The different metabolic rate directly inhibits production of viruses and bacteria. There does not appear to be consensus at what point this normal response becomes dangerous, although the main negative outcome noted is febrile seizures (Berg, 1993).

In a recent article Yarnell reviews rationale for “starving a fever”, particularly through the absence of dietary proteins, by fasting during a fever state to further decrease a viruses’ ability to bind lectins into HLA-II antigens and stimulate an antibody response. Their theory explained the development of autoimmune disease following a viral illness, particularly with injection of dairy products (Yarnell, 2001). While the authors concur that more research is needed and that this hypothesis has not been tested, their review of how dietary lectins, such as are found in dairy products, and viruses such as influenza can lead to auto antibody production and development of auto-immune diseases such as type I diabetes (Yarnell, 2001, p. 483). Their proposal seeks to support folk and naturopathic medicine’s advice to “starve a fever, feed a cold” (Yarnell, 2001, p. 482).

Figure 1. Fever Stages



Berg (1993) reviews theories surrounding the development of febrile seizures. Common teachings have held that the rate of rise of the fever would lead to seizures. Berg (1993) reviews precious studies and comes to the conclusion that these research studies used a faulty “hyperthermia” model for assessing the febrile response. “The problem with this and other experimental models of febrile seizures is the use of hyperthermia to study the effects of pyrexia” (Berg, 1993, p. 1101). An internal response to exogenous and endogenous pyrogens is not similar to external hyperthermia. After concluding that the rate of rise of the temperature is not the trigger, Berg cites a study by Millichap that “the height of the body temperature is the determining factor in the induction or occurrence of seizures” and that each person has their own threshold (Berg, 1993, p. 1102). They are also open to other aspects of the infection that may trigger the seizure response in the patient with fevers.

Humoral Medicine

Humoral medicine can be traced back through the middle ages with Celsius, to Galen and Hippocrates in ancient Greece. Hippocrates spoke of the four body humors; blood, phlegm, black bile, and yellow bile. Health was seen to be a result of these four fluids being in balance. “Illness results from an imbalance in the humors, and treatment seeks to restore the balance” (Burke, Wieser, Keegan, 1995, p.43). Foster describes humoral medicine as “the most important and widespread ethnomedical system in Latin America” (1987, p. 355). The humors and the diseases they cause are categorized as being hot or cold. Consequently any disruption of one humor is treated with a remedy having the opposite quality. A hot disease, such as fever would be

treated or balanced with a cold remedy. Diseases and symptoms are also seen in their metaphorical sense as well as physical. In order to gain compliance with treatment regimes, the understanding of fever as a hot disease needs to be appreciated by the health care provider. Hispanic or Latino families will accept treatment when they see the medical provider addressing their cultural practices, belief of the health state, and incorporating them into the plan of care.

Hispanic families frequently will come to the emergency department stating that they have sponged their child with water and alcohol in order to bring down a fever. This is one example of treating the “hot” disease with a cold treatment; however, alcohol has been shown to be absorbed through the skin and respiratory system and has caused intoxication among young children (Moss, 1970). An important factor would be to acknowledge that sponging could be appropriate, during the right phase of the febrile cycle, but perhaps only with tepid water or perhaps with lemon. During the chill phase of fever production the application would only cause the already shivering person to feel even cooler. During the phase where the temperature is at the higher set point or the vasodilatory fourth phase, cooling the skin and assisting the body with evaporation may be beneficial (Casey, 2001). The sponging would support the body’s own intrinsic cooling mechanisms. It would be important not to induce shivering or heat production, so the use of tepid water, a few degrees cooler than the fever itself, and the addition of a cooling substance such as lemon. To understand this answer health professionals need to become familiar with the properties of the lemon directly.

Lemon as a Therapeutic Agent

The lemon is at home in warm and sunny climates. Originally from China, it is at home in the warmth of the Mediterranean. It is relatively unaffected by seasonal changes. It has a remarkably prolific growth and metabolism, being able to have ripe fruits still on the tree while it is already in bloom for the next season. One tree can produce thousands of lemons. It usually remains as a small thorny tree, not usually over 10 ft. tall.

The leaves are oval, and have a slightly waxy appearance. The flower is small, while with some pink tinged edges. The fruit is often hard to recognize through the waxy green leaves, and the fruit is round or egg-shaped. The peel is shiny and tight with porous “pores” that give off the etheric oils when cut or bruised. The oil gives the lemon its refreshing aroma. In the use of the lemon we utilize the whole fruit, specifically for its’ etheric oils found in the surface of the skin. Under the porous area is a white, soft skin, inside that are housed the highly organized juice sections.

Upon cutting open a lemon one sees a highly organized structure, with compartments for more minute fluid or juice filled pods. The juice filled pods is attached to the outer white membrane and are filled towards the center of the lemon.

Even when the lemon is fully ripe it still retains its sour taste. When one recalls a lemon, or even sees, and smells a lemon it causes a pulling together of the tongue, a puckering of the lips. Its’ juices are cool and refreshing. Here one experiences the outflowing of the etheric oils in the lemon’s smell and the contraction of the lemon’s taste in its’ juices. It can have similar effects when used

therapeutically; it can pull us together, and help us to regain our form (Bahlman, 2000). In this sense, the lemon can guard itself against the intense warmth and light from the environment that it lives in and retain its' juices and sour contraction where other fruit would rot. To bring this picture to the ill patient we can see how during a fever, an outpouring of energy, and excessive metabolism could be restructured and in a sense redistributed, cooled and "pulled together". The lemon can also help the individual separate themselves from that excessive warmth and heat in the illness picture and regain control and balance over their health (Bahlman, 2000, p.5). It can also help with places where there are excessive secretions, such as in a cold or sore throat, a cup of lemon with honey helps to break up the secretions.

Anthroposophical Theory of Action

Our entire organism is an open system of inter-acting processes, which allows it to be a vehicle for spirit qualities(Evans, 1992). Anthroposophy, a term used by its' founder Rudolf Steiner is truly a science of the spirit. In addition to using knowledge from clinical medicine, biochemistry, and physiology anthroposophical medicine acknowledges the knowledge that man is more than the sum of its cells, and the cell is more than the sum total of its elements. With such an expanded view of thinking, one looks to see how mans body is determined by his life, his life by his mind and spirit. This form of thinking and applying it to medicine is a true form of mind-body-spirit medicine.

The anthroposophical view of man, appreciates man as having a physical body, soul body, spirit body and ego formation. In addition to this four fold process

the physical body is seen to have a nerve-sense system, the rhythmic system (heart and lungs) and the digestive-metabolic-limb system. Each of these areas develop in seven year cycles and stay closely bound together during man's earthly life. Different developmental stages focus on various elements. With the young child the focus is on the development of the physical body. It is understood that the physical body becomes ill when other areas, the emotional level and spiritual level are already ill, or imbalanced (Evans, 1992).

Disease is seen to occur when these three systems of functioning are not in balance. Man's physical body is observed to have similar properties with the plant kingdom; the head being related to a plant's root; the stalk or leafy portion related to the rhythmic system and the flower and fruit related to the digestive –metabolic system. The primary function of the digestive – metabolic system is with digestions and energy production, hence, it concerns itself with warmth. In the feverish state we observe this increased metabolic activity in another area, typically coming downward from the head. Even if there is an infectious or inflammatory process in the toe, the fever will proceed from the head downward.

These three and four fold views of man can then be applied to the four humors. Celsius described the main symptoms of inflammation as: Calor, dolor, tumor, and rubor (Husemann, 1982, p. 164).

Calor was seen to be an expression of the Ego. Fever and sensation

Dolor – too intense stimulation of consciousness or pain – Astral

Tumor – swelling or edema is an expression of the Etheric body.

Rubor – or hyperemia, is a stimulation of the blood that can be seen on the physical plane (Husemann and Wolf, 1982, p. 163).

The etheric body is what gives the physical body its' life force. It generates the life force beginning with conception. In Chinese medicine this force is called the Chi, Paracelsus called it Archaeus, Hanemann labels it life energy. It can be understood to support organic life forces through the medium of water, or fluid. Man is about 65% fluid and through the etheric body he organizes the minerals and solvents to permeate every cell with life.

Beyond the physical and etheric bodies man is given the ability to think, feel and will. The unfolding of these processes uses up energy from the etheric life forces. These forces are the astral body permeating the entire body through the gaseous element. It affects the physical body, the mineral and fluid processes through this gaseous medium. One can see the effect of the astral body on the respiratory system where emotions and feelings can change the pattern of breathing and the brain without oxygen ceases to function (Steiner, 1989).

Fever is seen as a reaction – a healing process that is aimed at eliminating foreign substances. In a disease process all four symptoms of inflammation work in all areas or levels of the organism, bringing about fever (Bott, 1984).

When warmth is seen as an expression of the ego, one can see that in the presence of a fever the ego interacts and engages more intensely with the whole organism, particularly in the metabolic system. The increased metabolism is misplaced and acting in other less appropriate places, such as the head. Observations

have been offered, that is why children are more prone to childhood diseases and easily get high fevers, and the ego needs to penetrate the organism. Anecdotal reports of developmental leaps following a febrile illness have been reported (Husemann and Wolf, 1982).

On the highest level, a disturbance can begin with the creative human spirit, if it is not given enough room to unfold in its' life roles. The spirit can become stunted and no longer be the master over its own form. This disharmony may relate to "unresolved problems in previous lifetimes" (Trevelyan, 1997, p. 152). Disturbances can also occur in the life of the soul, in complexes, fears and obsessions. These disturbances influence the harmonious function of our feeling life, the basis of which is the rhythmic system of heart and lung. Finally, there can be disturbances in the body's metabolism and in the hormonal system, which can be seen with fever.

The view of the patient is therefore holistic in nature, looking beyond the physical body into other realms, whether emotional, spiritual, or energetic, that may support or enhance the disease and/or healing process. Through viewing fever as an overactive ego needing to penetrate the organism one can try to work with the fever in a positive way. By attending to the sick patient with a fever, one can make sure they obtain rest, a light diet with no dairy or protein and increased liquids. One will watch the rhythm of the fever and when there is the beginning of the cooling process utilize the lemon wraps to the calves to attempt to redistribute the fever, helping to cool the body down.

Diseases in anthroposophical medicine can also be seen as being wither “hot” or “cold” as in the Latin American countries. One can look to see if there is more of an inflammatory process to the disease or if it is more sclerotic or cool. A cool disease would be like multiple sclerosis or cancer. Feverish processes are seen as hot diseases and the balancing remedy would be a cool one. Elevated temperatures, fevers, and infectious diseases are all seen as hot diseases.

In addition to realizing the supersensible elements of man, observations of the physical body have been described as belonging to one of three systems; the nerve-sense system, the metabolic system; and in the middle sphere, moderating the other two extremes is the rhythmical system. An analogy is made to that of the plant, whose root system corresponds to the human head, i.e. nervous system; the flower and fruit to the metabolic system; and the leaves of the plant correspond to the rhythmical system (Bott, 1984). These observations are important in choosing which part of a plant or mineral to choose for medical therapy.

Review of the Literature

Literature regarding fever can be grouped into three distinct categories; groups' attitudes and perceptions of fever, the testing or accuracy of various temperature taking devices, and fever management guidelines.

Groups that have been studied regarding their perceptions on fever include physicians, nurses, parents and mothers. A study done regarding Saudi Arabian physicians' knowledge and attitude regarding fever showed there was a wide variation among what constituted a fever, what was a dangerous temperature and what the purpose of antipyretic therapy was (Al-Eissa, et al., 2001). In an American study of emergency department nurses again a wide variation was found regarding what temperature constituted a fever, what temperature would be dangerous to a child, what the primary complications of fever were and what first or second line treatment should be (Poirer, 2000). Interestingly, the American study only sampled 88 emergency department nurses in different geographic areas of America and yet results showed similar variation among attitudes, knowledge and perceptions regarding treatment of fevers.

Parents and mothers groups studied showed that often parents will treat fevers when their child's temperature was actually within a normal range (Kilmon, C., 1987). Some parents will even waken a sleeping child to administer antipyretics, and Crocetti (2001) reported that "fever phobia" persists among parents. Twenty years prior Schmitt reported that parents had numerous misconceptions about fever (Crocetti, 2001). Over 20 years time in a repeated and expanded study, Crocetti found that these

misconceptions persist (2001). In fact, today more parents gave antipyretics for normal temperatures and more gave these medications at too frequent intervals. In this study 46% of parents listed doctors as their primary resource for information regarding fever (Crocetti, 2001). No study has attempted to prove this correlation to be true, however it appears that both lay and professional groups share similar misconceptions.

Several different modalities are available for measurement of fever. Core temperature has been set as the gold standard, with the rectal temperature being the easiest, least invasive, and most reliable form for parents and nursing staff. Oral temperatures are not reliable in the young infant and child. Axillary temperatures have been shown to be equivalent to rectal temperatures with the downfall being the length of time needed for an accurate reading (Morley, 1998, and Wilshaw, 1999). New chemical temp-a-dot devices may be an improvement on this method. Skin temperature scanning strips, while not giving a degree specific temperature can be a effective screening tool for presence or absence of a febrile state. Several articles mention the ability of parents to detect the febrile state through feeling of the skin especially at the forehead, neck and chest along with observation of the child's behavior. No study has attempted to evaluate all the methods of temperature taking devices in one study; indeed Hooker questions the need for temperature to be taken prior to treatment with antipyretics (1996). In an important observational study, Whybrew noted that when mothers and medical students assessed a child for fever using touch and embodied methods they rarely missed a child with fever, but may

overestimate and include some whose temperatures were normal (1998, p.317). See Appendix A. Table 1. for a review of various Temperature comparison studies.

Physical cooling measures include sponging, undressing, bathing, lemon calf compresses, hypothermia blankets or ice packs. Such measures may be instituted with or without a physicians' order depending upon methods chosen and institutional policies. Controversies surround these applications of nursing care and not just medical treatment. Most studies done utilizing external physical methods have been done on children (Agbolosu, 1997, Axelrod, 2000, Aksoylar, 1997, Friedman, 1990, and Newman, 1985). Two studies done on adults involved intensive care treatment (Grossman, 1995 and Poblete, 1997) and only one German article addressed the use of lemon calf wraps (Faschingbauer, 1995).

Friedman and Barton (1990) studied seventy-three children with fever. There were three treatment groups of acetaminophen alone, sponging alone and acetaminophen and sponging. The combination group of acetaminophen and sponging demonstrated the greatest fever reduction at sixty minutes time. However, the researchers did not recommend the combined therapy due to "discomfort and agitation that sponging can induce in the child" (Friedman and Barton, 1990, 7). Both of the researchers were physicians with a study group of nurses being recognized, but not as primary investigators. Discomfort and agitation were not parameters being measured, nor were they reported in the results.

Agbolosu, et. al. (1997) conducted a study of eighty children with fever in Malawi. While this study acknowledged the literature supporting combined therapy of

antipyretics and sponging they only compared either paracetamol or sponging alone. Their results showed that in a tropical climate paracetamol had greater effectiveness than sponging alone. Their results showed that in a tropical climate paracetamol had greater effectiveness than sponging alone. They did measure temperature and 30, 60, 90 and two hours after each intervention. With sponging the greatest drop in temperature being in the first 30-60 minutes, but thereafter paracetamol had more sustained fever-lowering capability.

Axelrod poses that there are two lingering questions regarding physical cooling measures; “whether the discomfort associated with physical cooling in your children is justified by a concomitant reduction in complications of fever, and whether external cooling is associated with lower morbidity”(Axelrod, 2000, p.224). His review of literature is unable to answer these questions, but did suggest that other clinical “illness outcome” endpoints be included in the evaluations rather than just reduction of temperature alone.

There is an assumption throughout studies that sponging is uncomfortable and can produce unwanted side effects such as shivering or piloerection. Newman (1985) not only did not demonstrate a difference with sponging, but 7 of 80 children treated with sponging had to be discontinued due to the shivering. The method of sponging described was performed by nurses by placing the child in a basin of water that “felt neutral” to the nurses elbow for 20 minutes (Newman, 1985, p. 641).

Grossman, Keen, Singer, and Asher (1995) noted that nurses chose to treat adult patients aggressively when the mean temperature was 101.6 or greater. Methods

of treatment included notifying the MD, antipyretics, as well as obtaining blood cultures. Other independent nursing functions included adding or removing linens, ice packs, tepid water sponging and/or the use of hypothermia blankets. Their conclusion was that antipyretic therapy was more effective in combination with physical cooling measures, but only speculated reasons for their lack of use. Lack of knowledge of efficacy, concern regarding shivering and vasoconstriction and lack of staff time were listed as possible reasons for the decreased use of combined therapies. The study did not demonstrate patients' responses to fever reduction measures other than a decrease in temperature. Commentary was made that "little was documented in the nurses' notes on the physical signs and symptoms accompanying fever" but did not give a specific data for charting frequency (Grossman, 1995, p.195). Of those signs and symptoms noted skin temperature, chills, flushed appearance, sweating, disorientation and increased blood pressure and heart rate were the ones most frequently documented. It is unknown whether such measurements were made before or after the intervention with blood cultures, antipyretics, or physical cooling measures.

Poblete, Romand, Pickard, König and Suter evaluated the energy expenditure in critically ill febrile adults (1997). Their study group compared antipyretic drugs, propacetamol and metamizol, with physical cooling measures. The physical cooling method was to cover the body surface with wet iced water cloths, changing them every fifteen to thirty minutes until desired temperature is achieved. They did not note clinical signs of shivering but did state that may have been suppressed by sedative medications such as morphine or midazolam. The decrease in energy expenditure was

measured by physiological measures including temperature heart rate, mean arterial pressure, kilocalories used, tidal volume and expired CO₂. The variables were not controlled by the researcher, but ordered by the patient's physician and this was stated as a limitation. The findings supported the use of external cooling methods not only as a valuable means of decreasing temperature but also in decreasing oxygen consumption and energy expenditure.

The only study utilizing lemon calf compresses is found in the German literature. The reporting article fails to cite supporting literature or references. Thirty three patients were treated for fever, most were subarachnoid bleeds. A data collection tool is given, stating that a pilot study had been conducted prior to this study (Fashingbauer, 1995). The small pilot study mentioned that compresses were done with water but that no temperature difference was observed and therefore discontinued. The lemon study claims that with the lemon calf compresses a decrease of 0.18°C per hour was achieved as opposed to 0.14°C per hour with paracetamol alone. No statistical tests or parameters were given to determine if this difference is statistically significant. Values were also measured for fluid balance and oxygen consumption based on paO₂ measurements. Here again, the data and statistical tests are missing, but the conclusion that lemon calf compresses can support the decrease of temperature. Patients were observed for sweating but no difference in treatment groups was identified. The conclusion was that paracetamol and lemon calf wraps had a greater decrease of temperature than the paracetamol or calf wrap groups alone.

Methods

Design

A quasi-experimental study was used to determine whether or not a lemon calf compress reduced temperature and symptoms in patients with a febrile illness. A quasi-experimental design was chosen, as it was not possible to control patients arriving in the hospital in order to randomize them.

This study received approval from the Institutional Review Board for the Protection of Human Subjects at Dominican University of California in the fall of 2002 as well as the Medical Executive Committee at the community hospital in the fall of 2002.

Nurses on all units were introduced to the study by in-services given at their staff meetings, posters placed on the units, inquiries from the researcher as well as incentives provided for the nurses. Lemon drops were available in bowls on the unit with a reminder to call for patients experiencing a fever that might be interested.

Recruitment for participation was done via a flyer on all nursing units to call the researcher for all patients with fevers > 101.5 . Staff nurses contacted the researcher when appropriate patients were located and who agreed to participate in the study. A brochure explaining the study and need for consent to participate was presented to the patient with a description of the study by the researcher (See Appendix B.). The consent stated that the questionnaires and answers were kept anonymous, confidential and not affect patients' hospital care in any way. Each

consent and data collection sheet was coded with sequential numbers and then kept in separate files. Consent was obtained at the time of the enrollment in the study (see Appendix C.).

A convenience sample of 10 patients with fever on a Medical/Surgical unit, or Emergency Department, who gave notice to their nurse that they would be interested in receiving a lemon wrap in addition to their routine medical therapy, were enrolled in the study. Patients were limited to those who could participate in the study by answering questions in English. Septic shock patients, those being transferred to the ICU, dementia or Alzheimer's patients were not included. Potential risks were minimized by inquiring about allergies and excluding those who could be allergic to citrus products.

Setting

The study was conducted on a medical/surgical unit and emergency department of a community based hospital.

Variables

The independent variable was the application of a lemon calf wrap. The dependent variables are the responses of the patient. Oral temperature, skin signs which were identified as upper body warmth, piloerection, facial color, skin moisture, foot temperature, level of orientation, presence of headache, as well as the patients subjective rating of their feeling of restfulness, and sense of well being, were all measured.

Operational Definition

Fever – is defined for the purposes of this study as a temperature of greater than or equal to 101.5 ° F., or 38.8 ° C. Temperatures at this facility were routinely measured in degrees Fahrenheit. For ease of continuity, the measurement of temperature was continued in the same scale.

Lemon calf compress – the procedure of applying the natural substance of lemon, both the etheric oils and juices, and tepid water as compresses on to the lower extremities.

Instrumentation

The instrument used to measure temperature was the standard hospital thermometer, IVAC brand. Bio-medical support provided regular prevention and maintenance for the equipment. The researcher developed a tool for data gathering of the variables (see Appendix D). Content validity of items is covered in the literature, and covered by pathophysiologic processes. Reliability has been confirmed by the company who produces the IVAC thermometers.

Procedure

The research was designed to ask the questions: What are the experiences of adult patients during a febrile illness of greater than 101.5°F with the addition of a lemon calf compress to current antipyretic treatment? Are the treatments tolerated well by patients? Do lemon calf compresses assist in lowering oral temperatures?

The researcher is a nurse with 30 years experience in critical care and emergency medicine. Her training in compresses comes from the Anthroposophical Nurses Association, Art of Nursing I course, as well as conferences on Anthroposophical Nursing in Switzerland. She has been an active member of this national organization as a Past President and member-at-large. She is also a member of American Association of Critical Care Nurses, Emergency Nurses Association and Sigma Theta Tau nursing organizations.

The researcher did all lemon wraps to control for uniform treatment and application. Nurses in this country are unfamiliar with the use of external therapies such as compresses and poultices, and they are not commonly used in the hospital setting. The researcher followed a standard procedure as described below (Fingado, M. 2001, p. 159-163).

Equipment was assembled which included bed protection, two muslin bias cut rolls to fit from the ankle to the knee of the patient, one lemon, bowl and jar to crush the lemon, thermometer, hot and cold water.

Patients had been given a brochure explaining the study as well as signing the consent. The researcher assessed the patient for fever, observed their skin signs, asked the patient about their level of orientation, observed their temperature of their feet, asked the patient about presence of any headache and levels of discomfort and restfulness.

The patients were in a supine position on the bed or gurney. Care was taken to assure that the rooms were free of drafts, noise and distractions. The lower legs were exposed, and a protective pad placed on the bed under the calves.

The lemon was placed in a large bowl with small amount of hot water to cover and crushed to extract both the volatile oils and juices. Cool tap water was added to bring the water to a tepid temperature. The temperature was checked to assure that it was cooler than the patients fever.

Muslin cloths were submerged and wrung out so they were moist but not dripping. The legs were observed for any open wounds, which would have excluded the patients from this study. The legs were wrapped beginning at the ankle joint to just below the knee, taking care not to apply the wrap in a constricting fashion. The patient was covered with a light cover, sheet or bath blanket. The wraps were left on for 30 minutes.

After the 30 minute waiting period the wraps were removed, the legs were dried thoroughly, and the protective pad was removed as well.

Evaluation of the patient was repeated, vital signs repeated as well as questioning the patient about their level of restfulness and comfort using a 1-10 numerical scale. The patient was then encouraged to rest for another 30-minute period without the wraps, after which the vital signs were again measured and questionnaire interviewed.

Compresses were only applied to intact skin; any patients, who upon observation have open sores or ulcerations on their lower extremities, were not

acceptable as participants in the study. Because pain could have been experienced if acidic lemon had been applied to skin that was not intact, those patients were excluded from the study.

Water temperature was measured and recorded to ensure that patients were not scalded. No medical treatment was withheld or altered because of this study and the treatment did not interfere with any medication or medical procedure.

Temperature was measured in degrees Fahrenheit. Time intervals for measurement have been validated with the literature, as well as comparison with previous studies (Faschingbauer, 1995).

Consultation for data analysis was obtained with a statistician from Dominican University, Dr. Robert Gurney. Ordinal number analysis was used for the Friedman Test or t-test for sequential series.

Results

Ten patients were enrolled in the study from January 2003 through March 2003. Patients ranged in age from twenty to seventy four years in age. Three patients were between eighteen to thirty years of age, two patients were between thirty and forty, four patients were between forty and fifty, and one patient was between fifty and eighty.

Forty percent were male and sixty percent were female. Diagnoses were varied from tonsil abscess, respiratory, abdominal, and pyelonephritis to surgical cases such as the ruptured appendectomy (see Table 2). With the small sample size most diagnoses were only represented once. One patient received two treatments, as his temperature was still elevated upon admission to the medical-surgical unit. Three patients were from the medical-surgical units and seven were emergency department patients. Out of this patient population no allergies to citrus were reported, and no patients were excluded for this reason. No patients developed any allergic signs or symptoms.

patients diagnosis	N	Percent
Bronchitis	1	10.0
Cellulitis LLE, Diabetes, Type 2	2	20.0
HIV, cirrhosis	1	10.0
Abdominal pain	1	10.0
Pneumonia	1	10.0
Pyelonephritis	1	10.0
Post ruptured appendectomy	1	10.0
Tonsil abscess	1	10.0
Viral gastroenteritis	1	10.0
Total	10	100.0

Table 2. Patients' Diagnosis

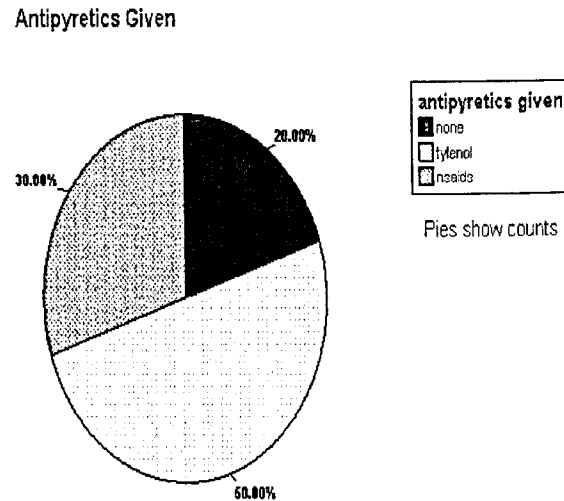


Figure 2. Antipyretics Given

Half of the patients received antibiotics, either before or during their treatment. Fifty percent received acetaminophen for their fevers during the treatment, another thirty percent received ibuprofen and twenty percent received no antipyretics during their treatment time (See Figure 2. Antipyretics Given).

Data was collected before, at thirty minutes time, and at the completion of sixty minutes. The lemon compresses were left on for the first thirty minute period, data collection obtained and then patients were encouraged to rest for another thirty minute period, at which time another set of data was collected.

Data collected included temperature, pulse, respiratory rate, and blood pressure. Skin temperature and foot temperature were evaluated by the researcher as being cool, warm or hot to the touch. Skin moisture was evaluated as dry, moist or

diaphoretic. Face color was evaluated as pale, normal or flushed to the researchers observation. Piloerection or gooseflesh and shivering were evaluated as being present or absent. Orientation to person, time and place was evaluated as either yes or no. Patients who were not oriented were not able to participate in the study, however this observation was to ascertain whether any change occurred to patients' level of orientation. Patients reported headache as being present or absent.

Each data item was evaluated using SPSS analysis comparing before, after thirty minutes and after sixty minutes. Analysis included descriptive statistics for demographic and anecdotal observations. Non-parametric evaluations included the Friedman test and Cochran test as well as the paired t-test for the comparison of temperature. All of these tests are appropriate for the test retest design used.

Patients were asked to rate Restfulness and Feeling of Comfort on 1-10 Likert type scales that were devised by the researcher. With restfulness patients were to report feeling tired or refreshed. With feeling of comfort, patients were to rate their feeling of uncomfortable or comfortable on a one to ten scale. The use of such scales proved impractical as patients were confused with the pain scale, and had difficulty separating pain from comfort or restful feelings. These scales were not analyzed statistically as information from patients was incomplete.

The researcher did make observations about patient behavior before and after the treatments that are summarized in the following tables. (See Table 3.)

Before treatment observation	Frequency	Percent
No observation	3	30.0
Crying, shaking	1	10.0
Curled up	2	20.0
Ice to forehead	1	10.0
Resting comfortably	1	10.0
Sitting upright	1	10.0
Writhing, restless	1	10.0
Total	10	100.0
Observation after 30 min	Frequency	Percent
No observation	5	50.0
quieter	1	10.0
sitting up	1	10.0
sleeping	2	20.0
states feels	1	10.0
good/		
Total	10	100.0
Observation after 60 min	Frequency	Percent
No observation	2	20.0
ambulatory	1	10.0
h/a returning	1	10.0
sitting upright	1	10.0
sleeping	3	30.0
states feels	2	20.0
better		
Total	10	100.0

Table 3. Treatment observations

Temperature was evaluated using a paired samples t test statistic. Mean temperature before treatment was 102.95°F, with a standard deviation of 1.11. Mean temperature after 60 minutes was 101.51°F, with a standard deviation of 1.22 (See Table 4.) Temperature before was compared with after 30 minutes and again after 60 min. Mean temperature decreased from before treatment to 60 minutes after with a mean temperature decrease of 1.44 °F. and standard deviation of 1.28°F. and $p=.006$. Comparison between pretreatment temperatures and 30 min. post treatment temperatures were statistically significant at $p=.027$. Comparisons between pretreatment temperatures and 60 min post-treatment were significant at $p=0.006$, indicating a continuous drop in temperatures. The differences between temperatures at 30 min. and 60 min. were not statistically different. (See Table 5.)

		Mean temp	N	Std. Deviation
Pair 1	temperature before tx.	102.95	10	1.11
	temp after 60 min	101.51	10	1.22
Pair 2	temperature before tx.	102.95	10	1.11
	temp. after 30 min	101.82	10	1.10
Pair 3	temp. after 30 min	101.82	10	1.10
	temp after 60 min	101.51	10	1.22

Table 4. Paired Samples Statistics

Paired Samples Correlations		N	Correlation	Sig.	Mean Difference	Std. Deviation	Sig. (2-tailed)
Pair 1	temperature before tx. & temp after 60 min	10	.399	.254	1.44	1.28	.006
Pair 2	temperature before tx. & temp. after 30 min	10	.250	.486	1.13	1.35	.027
Pair 3	temp. after 30 min & temp after 60 min	10	.840	.002	.310	.67	.175

Table 5. Paired Samples Test

Other parameters that showed significant changes were in skin temperature, face color and presence of headache. Skin temperature, as measured by the investigators touch to the forehead and upper chest decreased significantly after treatment at $p=.004$ using the Friedman test. Face color decreased from being flushed at $p=.022$ and headache subsided at $p=.05$. Headache was evaluated using the Cochran test.

Pulse, respiratory rate, systolic blood pressure, diastolic blood pressure did not have significant changes when before, during and after treatment values were compared. Skin moisture and foot temperature also did not change significantly.

Level of consciousness did not change at a statistically level. One person was shivering at the beginning of the treatment, but this abated within the first 30 minute period. No others had any shivering during their treatment to evaluate for any statistical significance. Piloerection was also not present in any individuals. No rashes, allergies or anaphylactic reactions were observed in any participants.

Discussion

Obtaining consent from the hospital Medical Executive Committee took longer than anticipated. Concerns from the medical staff were that patients could have allergic reactions to the topical application of the diluted citrus juice and oils. Patients who have known citrus allergies were excluded from participation in the study.

Unexpected untoward reactions can be categorized into either a true allergy or topical dermatitis. Anaphylactic symptoms would have included urticaria in areas not contacted with the allergen, shortness of breath, wheezing or respiratory stridor. Dermatitis includes localized rash, redness and itching in areas contacted with the lemon product. Production toxins were limited by using unsprayed, or organic lemons. Most citrus allergies are to the ingestion of citrus compounds or the essential oil coming in contact with the skin. The lemon juice and oil used in the calf wraps were diluted with water and are therefore less likely to produce skin irritation. Had any of the above symptoms should appeared, the treatment would have been discontinued and the primary care physician notified. Patients were treated in the hospitalized setting where resuscitation equipment and support staff was readily available.

Literature makes mention of citrus allergies, however are most often associated with ingestion and introduction of citrus products in a diet. Infants are most often mentioned with bowel irritability, diarrhea being mentioned. Citrus allergies in older individuals include symptoms of stomatitis or canker sores (Speer, 1976). Most of these were due to ingestion of the citrus product. Contact dermatitis was reported by Audicana as a problem among perfumers or people who handle concentrated

essential oils directly on the skin (Audicana, Bernaola, 1994). In this study lemons were not used in concentrated form, and were diluted with water as described in the methods. In addition the researcher asked about allergies to citrus products in addition to reviewing the chart for listed allergies. In the course of the study, no patients had an adverse reaction, nor were any citrus allergies reported.

Patients are frequently not asked about the presence of a headache with fever. None of the literature reviewed mentioned the presence or absence of headaches with fevers and yet most of the patients in this study admitted to having a headache upon questioning. While the lemon calf wrap did not significantly change the presence of the headache, this would be a subject for further study.

The shunting of blood from the lower extremities to the core with cool feet was another unexpected finding that although was not present in a significant level, may be important factors for future studies. Keeping the patient lightly covered and attempting to keep the lower legs warm would be important factors to prevent shivering and consequent elevation of temperature.

Friedman and Barton (1990) discussed the efficacy of sponging versus Tylenol in a large study, but at the end closed with a comment that sponging is too difficult due to the “discomfort and agitation that sponging can induce in the child” (p.7). They concluded that sponging is not tolerated well by children and may lead to shivering. In short, the study does not endorse external therapies, in particular sponging, in spite of finding them effective in lowering temperature. In this study of 10 adult patients there were no signs of shivering or further chilling demonstrated. The procedure was easily

performed within a few minutes, and the greatest portion of time was spent by the patient resting. Placing the wraps only on the lower legs or calves specifically did not expose the entire skin surface to cooling measures and may have prevented overall chilling.

Limitations of the Study

A weakness of this study was the small sample size. Ten subjects does not give these results great power, nor can the results be generalized with a quasi-experimental design. A recommendation would be to study this application in a larger setting and over a longer period of time.

In addition, it would be helpful to train other nurses in this technique, and standardize the data collection. The researcher did all treatment applications, while this controls for inter-rater reliability, it also allowed greater room for a Type 1 error, or conclusion that a change occurred when it may not. It would also be helpful to study this technique with other age groups, particularly children.

Temperatures also have a regular cycle or rhythm. With this quasi-experimental design it is not possible to demonstrate that the drop in temperatures are solely due to the lemon calf compresses and not to the natural progression of the fever cycle, or the action of the antipyretics. Another limitation could be the variability of the compress water temperature. It would be important to continue measurements over a longer time interval, such as four or six hours. Repeated applications could be evaluated with each febrile spike in temperature. A control group in a randomized

study with a larger sample size and multiple nurses administering the wraps would eliminate maturation, selection, and bias.

Implications for Future Research

Changing the data collection tool to include other measures of patient comfort and restfulness would be helpful. From the nursing observations made, most patients stated that they felt comforted and described a relaxed state at the end of the treatment. This could be due to the extra comfort measures provided by the lemon wraps, attention from being a participant in a study, or other factors including exhaustion, sleep deprivation, and or increased energy expenditure.

Using too many scales that were similar to other ones in use for pain evaluation proved confusing for patients. Encouraging patients to describe their feelings, sensations in a descriptive or even qualitative way would be less confusing to patients than trying to use scales with which they are not familiar.

In conclusion, this study was helpful in presenting another modality for nurses to use with patients experiencing fevers. Patients received relief from their high fevers, headache and showed improvement in face color and skin temperature, without complications from chilling. The lemon calf compresses were well tolerated by all participants. No adverse events occurred to any of the participants. Further studies are needed to determine whether this method is significant in providing patient comfort, and effective in lowering temperature, reducing headache and other symptoms of fever, while not inducing fever promoting activities such as shaking and chills or

altering mental status. External therapies, such as these lemon calf compresses are an area for exploration and future research in nursing.

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Appendix A

Author	Year	No.	Temp. Measurement	Type of Thermometers	Results
Erickson, R.	1980	180	Oral	Electronic (Diatek 400, Filac F-520, IVAC 811) vs. mercury-in-glass (Becton & Dickinson + Co.)	Using posterior sublingual pocket more important than type of thermometer used.
Hoffmann, C. et.al.	1999	304	Infrared tympanic, rectal, pulmonary artery	Infrared tympanic-IVAC Core check, First temp Genius; Rectal -IVAC temp plus; PA – Baxter 7 Fr. Swan-Ganz with Hewlett Packard Cardiac Output	Adequate specificity but unacceptable sensitivity in ED and ICU. T. Could vary by more than 2 ° C.
Giuffre, M.	1990	30	Axillary (mercury and electronic), Core	Mercury-in-glass, Temcon; Electronic, Filac Opticath fiberoptic PA	Axillary temp. accurately reflected core temp Mercury more accurate than electronic.
Heidenreich, T., Giuffre, M.	1990	18	Rectal, Axillary, Core	Opticath, fiberoptic PA; Mercury-in-glass, Temcon; Electronic, Filac	Mercury axillary more accurate than digital axillary
Whybrew, K	1998	1090	Feeling/touch, axillary	None; Used touch on abdomen, forehead, neck	Mothers and med students rarely missed a child with fever but over estimated the number who had fever.

Loveys, et al	1999	140	Ear temp, rectal temp	Rectal- Filac digital Ear- Ligtouch Pedi- Q, Exgen Co.	Rectal and ear temp not different \pm 2 S.D.
Morely, et. al.	1998	1090	Axillary, Skin	Mercury Thermometer Temp-a-Dot, Pyman, USA Fever-Scan, Robison, UK	Temp-a-dot had better predictive value for detecting fever.
Lanham, et. al.	1999	241	Ear, Rectal	Ear- First temp Genius Rectal- Diatek 600 Digital	Does not support tympanic thermometers for < 6 years age Sensitivity/specificity, positive predictive value, negative predictive value were unacceptably low.
Hooker, et. al.	1996	180	Parents subjective, Ear, Rectal	Ear – Thermoscan Pro-LT Rectal – Temcon Rectal Glass Mercury Clinical Thermometer	Parental assessment of fever should not be ignored. Ear temp is more specific than subjective assessment.

Table 1. Fever Measurement Studies

Appendix B

Brochure Example

APPROVAL PROCESS

This study has received the approval from the Institutional Review Board for the Protection of Human Subjects at Dominican University of California and Medical Executive Committee.

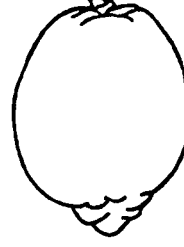
ABOUT THE RESEARCHER

Eira I. Klich-Heartt is an RN experienced in Emergency and Anthroposophical Nursing. She has been a nurse for 28 years. She graduated from Mt. St. Mary's College with a BSN, and is currently a MSN student in Integrative Nursing at Dominican University of California, San Rafael, CA.

FOR QUESTIONS ABOUT THIS STUDY

Please contact Dr. Luanne Linnard-Palmer, faculty advisor at (415) 257-1364

EXTERNAL COMPRESSES WITH LEMON AS A NURSING ADJUNCT FOR FEVER TREATMENT



Eira I. Klich-Heartt, RN, BSN
Dominican University of California
San Rafael, CA
Phone (415) 257-1328
Fax (707) 576-4060

Eira I. Klich-Heartt, RN, BSN

WHAT IS A LEMON CALF COMPRESS?

Patients that are hospitalized can have fevers for various reasons.

Sponging or other physical methods can be helpful in reducing a fever.

Lemons have been used as a calf compress in a similar fashion to help reduce fevers in other countries.

THE LEMON CALF COMPRESS STUDY

This study is looking to see what the effect of lemon calf compresses are to patients who are experiencing a fever of $> 101.5^{\circ}\text{F}$.

Patients will need to sign consent, indicating their willingness to participate.

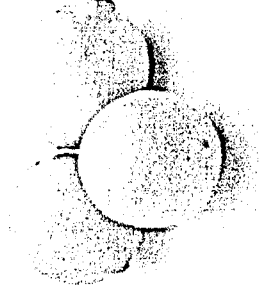
Patients allergic to lemon or citrus products or oils are not eligible to participate.

Patients with open wounds or sores on their lower legs will not be able to participate.

WHAT IS A FEVER?

- A state where the body has an increased temperature about 101.5°F
- A fever may have helpful benefits including:
 - Immune system stimulation
 - Toxicity to certain bacteria and viruses

Lemons can bring about a refreshing and reharmonizing state.



SYMPTOMS OF FEVER

- Temperature $> 101.5^{\circ}\text{F}$
- Chills
- Sweats
- Increased thirst
- Increased heart rate and respiratory rate
- Lethargy or restlessness
- Aches and discomfort

HOW TO PARTICIPATE

If you are interested in experiencing a lemon calf compress, please sign and return this for m to your nurse. In the event that you have a fever, they will contact the researcher for inclusion into the study, and receiving a lemon calf compress.

Call (415) 257-1328

Appendix C

Consent Letter

DOMINICAN UNIVERSITY OF CALIFORNIA

CONSENT TO BE A RESEARCH SUBJECT

Study Title: External Compresses with Lemon as a Nursing Adjunct for Fever Treatment.

Investigator: Eira I. Klich-Heartt, RN, BSN, MSNc

A. PURPOSE AND BACKGROUND

Ms. Klich-Heartt is a registered nurse studying the use of compresses with lemon as a nursing therapy in addition to regular medical care for patients with a fever of $> 101.5^{\circ}\text{F}$. This study is looking to see what the effects of lemon calf compresses are to patients' who are experiencing a fever of $> 101.5^{\circ}\text{F}$. You are being asked to participate in this study because you have a fever. This study has been approved by the Institutional Review Board for the Protection of Human Subjects at Dominican University of California and Medical Executive Committee.

B. PROCEDURES

If you agree to be in this study, the following will happen:

- Your temperature, pulse, respirations, blood pressure will be taken. You will be asked to answer a few questions from a standard questionnaire
- You will receive a lemon compress to your lower legs for $\frac{1}{2}$ hour and another $\frac{1}{2}$ hour rest period
- The questionnaire and vital signs will be repeated after the treatment and at the end of the rest period.
- The total time for the procedure is estimated to be about 1 $\frac{1}{2}$ hours.
- This treatment will be done at your bedside during your hospitalization.

C. RISKS/DISCOMFORTS

The study procedures involve no foreseeable risks or harm to you. Your medical treatment will not be altered in any way. All medical or diagnostic tests will continue as prescribed by your physician.

Patients with known allergies to citrus products or open sores on the lower legs will not be able to participate. Should an unidentified allergy appear the treatment will be immediately stopped and your physician will be contacted for further orders.

Confidentiality: Participation in research will involve a loss of privacy, but information about you will be handled as confidentially as possible. Your name will not be used in any published reports about this study.

All individual data will be collected by Ms. Klich-Heartt, stored in a secure place for 5 years and then destroyed. No individual data will be shared with any other person without your permission.

D. BENEFITS

Sponging as well as the use of lemon calf compresses have been reported in the literature to help lower a fever and also to help with patient comfort and rest.

E. ALTERNATIVES

If you choose not to participate in this study, you would receive the standard therapy for your condition, without having to receive the lemon compresses.

F. COSTS

The researcher will cover the costs for the lemon compresses. No additional medical costs are anticipated.

G. PAYMENT

You will not be paid to be in this study.

H. QUESTIONS

Eira I. Klich-Heartt who signed below has explained this study to you and your questions were answered. To ask further questions about the study or about being a study subject please call Eira

I. Klich-Heartt at [REDACTED] You may also contact my faculty advisor Dr. Luanne Linnard-Palmer at [REDACTED] for any questions regarding this study.

I. CONSENT

You will be given a copy of this consent form to keep.

Participation in research is voluntary; you are under no obligation to participate. You have the right to withdraw at any time during the study. Your care and the relationship with the health care team will in no way be affected.

I have read this consent form and voluntarily consent to participate in the Lemon Calf Wrap/Fever Study. I have received a copy of the signed and dated consent form.

Signature: _____ Date: _____

I have explained this study to the above subject and have sought his/her understanding for informed consent.

Investigator: _____ Date: _____

Appendix D

Data Collection Tool

External Compresses with Lemon as a Nursing Adjunct for Fever Treatment

Age _____ Sex: M F

Primary Diagnosis: _____

Antipyretic Medications: Tylenol _____ ASA _____ NSAID _____ Time given: _____

Antibiotics: _____ Cultures done: Y__ N__ If yes, which _____

BEFORE: TX AFTER 30' REST AFTER 60'

Temp _____ Temp. _____ Temp. _____

Skin temp: Cool, warm, hot Cool, warm, hot Cool, warm, hot

Foot temp: Cool, warm, hot Cool, warm, hot Cool, warm, hot

Skin moisture: dry, moist, diaph. Dry, moist, diaphoretic Dry, moist, diaphoretic

Face Color: Pale, normal, flushed Pale, normal, flushed Pale, normal, flushed

Piloerection: Y__ N__ Y__ N__ Y__ N__

Shivering: Y__ N__ Y__ N__ Y__ N__

B/P: _____ B/P: _____ B/P: _____

HR: _____ HR: _____ HR: _____

RR: _____ RR: _____ RR: _____

Orientation X3: Y__ N__ Y__ N__ Y__ N__

Headache: Y__ N__ Headache: Y__ N__ Headache: Y__ N__

Restfulness: (Likert) Before

Tired _____ Refreshed
0 1 2 3 4 5 6 7 8 9 10

Restfulness: (visual analog scale) After 30 min

Tired _____ Refreshed
0 1 2 3 4 5 6 7 8 9 10

Restfulness: (visual analog scale) After 60 min

Tired _____ Refreshed
0 1 2 3 4 5 6 7 8 9 10

Feeling of Comfort: (visual analog scale) Before

Uncomfortable _____ Comfortable
0 1 2 3 4 5 6 7 8 9 10

Feeling of Comfort: (visual analog scale) After 30 min.

Uncomfortable _____ Comfortable
0 1 2 3 4 5 6 7 8 9 10

Feeling of Comfort: (visual analog scale) After 60 min.

Uncomfortable _____ Comfortable
0 1 2 3 4 5 6 7 8 9 10

Lemon Compresses and Fever Treatment- 53 -

Appendix E

Thesis Schedule Planner

Expense Budget

Thesis Schedule Planner

Project/Event Name: Lemon Compresses...
Organizer's Name: Eira I. Klich-Heartt

Project/Phase	Starting	Ending
Phase 1- to Dominican IRBC	10/21/02	10/30/02
Phase 2- obtain Hosp approval	11/01/02	11/30/02
Hospital Medical Exec Committee	12/12/02	
Phase 3 – Begin collecting data	12/12/02	01/31/03
Checkpoint	02/01/03	
Data analysis & statistics eval	02/03/03	03/01/03
To advisor	5/1/03	
To library	5/7/03	
Poster presentation	5/13/03	
Graduation!!	5/16/03	5/17/03

2002-2003

January-03 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February-03 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	March-03 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
April-03 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	May-03 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21 22 23 24 25 26 27 28 29 30 31	June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Budget for Lemon compresses Study

Expenses

	Estimated	Actual
Total Expenses	\$1,156.00	\$207.00

Site	Estimated	Actual
Equipment		
Totals	\$0.00	\$0.00
Supplies		
Lemons	\$50.00	\$0.00
Compress Muslin	\$100.00	\$10.79
H2O Heater	\$50.00	
Thermometer covers	\$40.00	
Poster Supplies		\$25.00
Totals	\$240.00	\$35.79

Refreshments		
Food	\$50.00	\$13.93
Drinks - coffee for staff	\$36.00	\$12.00
Totals	\$86.00	\$25.93
Gratuities		
Gifts		
Totals	\$0.00	\$0.00

Publicity		
Brochures - 150	\$50.00	\$125.78
Data collection forms xerox	\$20.00	\$9.75
Consents - xerox	\$20.00	\$9.75
Totals	\$90.00	\$145.28

Miscellaneous		
Telephone	\$90.00	\$0.00
Transportation	\$650.00	\$0.00
Totals	\$740.00	\$0.00

Income

	Estimated	Actual
Total Income	\$0.00	\$250.00
		250

scholarship - Sigma Theta Tau

Budget for Lemon Compress Study

Profit - Loss Summary

	Estimated	Actual
Total income	\$0.00	\$250.00
Total expenses	\$1,156.00	\$207.00
Total profit (or loss)	(\$1,156.00)	\$43.00

