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TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHESIA PATIENT

THE UNIVERSITY OF ARIZONA M.S. 1984

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TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHESIA PATIENT

by

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A Thesis Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

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STATEMENT BY AUTHOR

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APPROVAL BY THESIS DIRECTOR

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ACKNOWLEDGMENTS

I wish to express my sincere gratitude to my thesis director, Dr. Joyce Verran, for her encouragement and assistance during this study. Appreciation is also expressed to the other members of my thesis committee: Dr. Suzanne Van Ort and Professor Mary Ellen Hazzard.

A special thank you is extended to the nursing management and staff of Tucson Medical Center, and especially to the nurses of the post-anesthesia recovery room.

Acknowledgment is also given to Linear Laboratories, Inc., and Patient Technology, Inc., for their assistance with instrumentation.

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ABSTRACT

In this study, thermal perception and temperature regulation form the conceptual framework for describing the association between tactile assessment and body temperature. Man has the physiologic and behavioral ability to ascertain temperature, and to adapt to a wide range of temperature. The post-anesthetic patient's temperature regulation has been compromised. The intervention of the post-anesthetic nurse is supportive of thermal balance until temperature regulation is regained by the patient.

Five nurses assessed ten patients each in a descriptive study of the association between tactile assessment and axillary temperature. An $r = .49$ ($p \leq .001$) correlation was found between tactile assessment and forehead temperature. An $r = .36$ ($p \leq .013$) correlation was found between tactile assessment and axillary temperature. An $r = .59$ ($p \leq .001$) was found between tactile assessments by the investigator and the post-anesthesia nurse group. Implications of the findings for nursing practice are presented.

CHAPTER 1

INTRODUCTION

Man is homeothermic; that is, he will attempt to maintain his body temperature constant, regardless of the external environment (Vale, 1981). A healthy person is able to maintain an internal temperature of 37°-38°C at rest, with a variation range of .5°-1°C (Erickson, 1982). He can regulate his own temperature (Beland and Passos, 1981). Regulation is achieved by the heat exchange mechanisms of radiation, convection, evaporation, and conduction; and by behavioral adaptation, such as clothing, housing, activity increase or decrease, and changes in posture (Guyton, 1976).

Plans for surgical intervention initiate a series of events that disrupts the behavioral and biological processes of temperature stability. As the ability to regulate temperature is altered, man becomes poikilothermic (Heller, Cranshaw, and Hammel, 1978). He will attempt to equalize his body temperature to that of the environment (Neil and Joels, 1982). Such attempts can lead to hypothermia or hyperthermia.

During the peri-operative period, the patient is exposed to multiple episodes when heat loss or gain can occur, with more potential for heat loss. Sixty percent of surgical patients have been found to be hypothermic (Vaughn, 1980). Thus, temperature regulation is an important issue in the care of the peri-operative patient.

In preparation for surgery, the patient is stripped of insulating layers of clothing; garbed in a lightweight polyester/cotton, open-backed, short-sleeved, patient gown; and covered with a sheet and lightweight cotton blankets. He is given a premedication of a narcotic, sedative, and atropine. He moves from a warmed bed to a cold stretcher, and is transported to the operating room. The operating room environment is maintained at a temperature range of 19°-23°C, with a relative humidity of 45 percent (Vale, 1981). The patient has an intravenous (IV) fluid line established, with IV fluid that is maintained in the cool operating room environment. He again leaves a warmed stretcher and is placed on a cool operating room bed. Anesthesia is administered and the patient is positioned and exposed for the pre-surgical antiseptic preparation. Solutions used for the surgical site preparation are at room temperature. Overhead, surgical spotlights are turned on and surgical drapes applied. Surgery commences. The operative site is irrigated with warmed or cool sterile solutions. After surgery is completed, the incision area is cleaned and a sterile dressing applied. Warmed bath blankets are used to cover the patient, who is then transferred to a cold stretcher and transported to a post-anesthesia recovery room.

Statement of the Problem

Tactile assessment, a sensory method to estimate patient temperature, is verbally expressed in ranges from hot to cold. Tactile assessment is a gross estimate, with measurement precision questionable.

Upon admission to the recovery room, the nurse assesses the patient's airway, then vital signs, including temperature (Smith, 1978). The usual method is to touch the patient's skin with one or both hands. Often, an upper extremity or the head is the area assessed. Skin temperature and humidity are determined. The nursing assessment, then, includes visual, auditory, and tactile skills in determining the patient's condition.

Accuracy of tactile assessment is questionable. Skin temperature is a ". . . simple non-invasive technique for following temperature trends . . . perhaps in post-surgical patients" (Mosenkis, 1982, p. 6). The assessment is subjective and expressed within a limited range. An instrument (thermometer) reflects objective information, with detection of .1°C changes (Mosenkis, 1982).

In addition to accuracy, cost is another component of the problem of temperature assessment. Cost is weighted in terms of dollars, risk, time, energy expenditure, and convenience (Mosenkis, 1982; Vale, 1981).

The problem to be investigated in the research is the suitability of tactile assessment as a method of temperature measurement in the post-operative patient. Suitability encompasses the need for accuracy within the framework of a balanced cost-benefit ratio.

Significance of the Problem

The result of extremes in body temperature is a reduction of optimal function of all body systems (Beland and Passos, 1981). As extremes are reached, the reserve capacity of the body is depleted, leading to exhaustion or death. Temperature extremes in the intra-operative and post-operative periods are tolerated poorly by the sick, very young, very old, and patients with impaired cardiovascular function (Beland and Passos, 1981). Lack of knowledge of the patient's temperature can result in thermal imbalance which is not corrected. Thermal imbalance of hypothermia is defined as core temperature below 33.3°C (Guyton, 1976) or 35°C (Popovic and Popovic, 1974). Hyperthermia is core temperature exceeding 41.1°C (Shaver, 1982; Rosenberg, 1981).

Hypothermia can be segmented into mild (35.5°-32.2°C), moderate (32.2°-29.4°C), and severe (29.4°C or lower) (Vaughn, Vaughn, and Cork, 1981). Physiologic responses to mild hypothermia include decreased sensitivity to stimuli, shivering with increased metabolic rate, increase in respirations, and increased blood pressure. Reaction to pain is increased (Borchardt and Fraulini, 1982). As the temperature progresses toward severe hypothermia, electrolyte imbalances occur, risk of ventricular fibrillation increases, the neuro-endocrine system is depressed, and peripheral vasoconstriction is severe, leading to ischemia of peripheral tissues (Guyton, 1976).

Hyperthermia (temperature greater than 41.1°C) is a rare occurrence in the post-operative patient. It is usually associated with infection prior to surgery, or with a rare susceptibility to anesthetic agents (Rosenberg, 1981; Guyton, 1976). Hyperthermia leads to increased heart and respiratory rates, metabolic acidosis, and cardiac arrhythmias (Rosenberg, 1981). As the temperature is rising, the set point for temperature regulation is a higher-than-normal temperature. In this stage, the patient will attempt physiologically and behaviorally to generate heat loss -- seeking shade, removing coverings, perspiring, and decreasing movement (Shaver, 1982).

Nursing interventions in the presence of hypothermia include attempts to rewarm the patient. Rewarming, itself, can lead to an untoward physiologic consequence of "rewarming shock." Application of external heat causes peripheral vasodilatation, with a resultant shift of blood volume from the core to the periphery (Beland and Passos, 1981). External heat potentiates skin injury (Guyton, 1976). In severe hypothermia, as the patient rewarms, he is susceptible to ventricular fibrillation and cardiac arrest (Beland and Passos, 1981).

Tactile assessment, as a routine measure of patient temperature, may not provide the accuracy required to initiate nursing interventions that address thermal imbalances. Its value may be that of a screening method upon which to base use of an instrument measurement of temperature. Should tactile assessment prove useful to decide which patients receive temperature measurement by instrument, then it could be used as an inexpensive, safe, and rational method.

Statement of the Purpose

The purpose of this study is to evaluate tactile assessment of temperature in the post-anesthetic patient. The following questions are to be explored:

1. Are tactile assessment and axillary temperature associated?
2. Are tactile assessments by two persons associated?

Summary

Nursing intervention in temperature balance of the post-operative patient should be scientific, rational, and cost-effective. All surgical patients are challenged, in the thermal sense, by the events of surgery. Sixty percent will be clinically hypothermic on admission to the recovery room (Vaughn, 1980).

There is a wide selection of sites and methods to utilize to assess temperature. Some are less accurate than others; some are complex and expensive. Tactile assessment provides an inexpensive, subjective screening method; therefore, an evaluation of its accuracy is valuable for nursing practice.

Select patients who are most at risk of thermal imbalance need accurate and frequent assessment of body temperature. Patients subjected to active rewarming interventions must have accurate and quantifiable temperature measurement. It is within the responsibility of the professional nurse to participate in the selection of temperature assessment methods.

CHAPTER 2

CONCEPTUAL MODEL

The conceptual framework for exploration of tactile assessment in the post-operative period is illustrated in Figure 1. The model illustrates the relationships between tactile assessment, site of assessment, and terminology of assessment. In addition, the model illustrates the relationships between body temperature, skin temperature

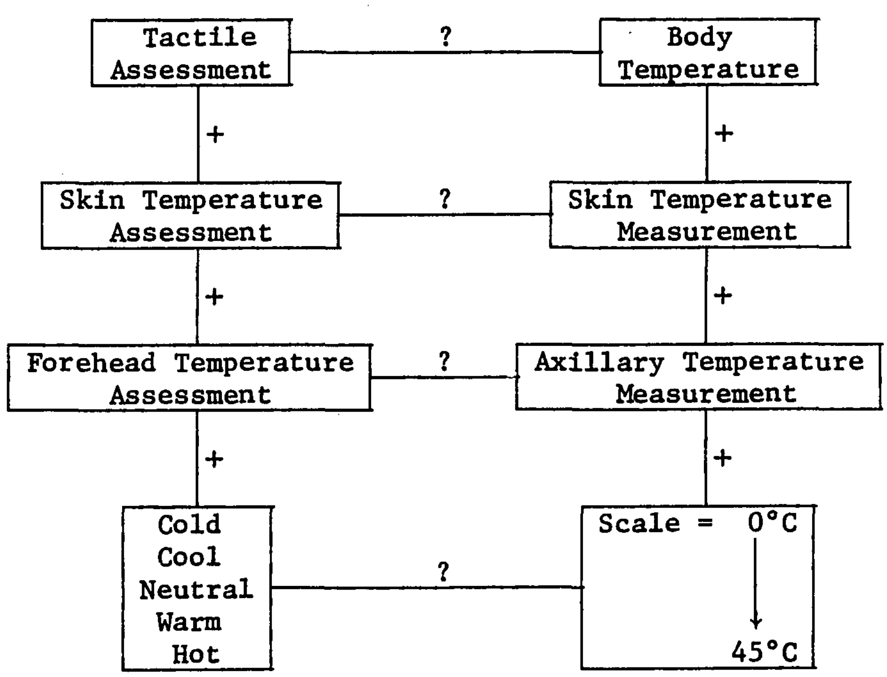

Figure 1. Model for exploration of tactile assessment.

measurement, axillary temperature, and the scale used to quantify the measurement. Specifically, the model suggests:

1. Subjective terminology (cold, cool, neutral, warm, hot) represents an assessment parameter of tactile assessment.
2. The Centigrade temperature scale represents temperature of the body.
3. There is some systematic relationship between tactile assessment and body temperature.

Tactile Assessment

Touch to ascertain temperature is, perhaps, a primitive behavior; yet, touch is a basic function (Dossey, 1983). Patient temperature is one assessment parameter of the post-anesthetic patient (Croushore, 1979; Smith, 1978; McConnell, 1977). Touching the skin surface of the patient provides temperature information used to guide nursing intervention. "There is no way to practice nursing without touching" (Blondis and Jackson, 1982, p. 21).

The skin is the oldest and most sensitive of man's organ systems (Blondis and Jackson, 1982). Skin receptors include touch-pressure, warmth, cold, and pain. Cutaneous sensory receptors are not histologically specific, yet they are physiologically specific (Ganong, 1981, p. 82). There are two types of sense organs responding to temperature. The first type, cold-sensitive, responds to temperatures below body temperature; maximal response is in the temperature range of 25°-30°C (Barlow and Mollon, 1982). Cold receptors are myelinated, 1-2 μm fibers (Guyton, 1976). There are 4-10 times more of these naked nerve endings over the body, with highest concentrations in the skin of the fingers, face, and chest (Geldard, 1972).

The second temperature receptors fibers are warm-sensitive, non-myelinated, and 1.3-0.24 μm in size. Maximum response is to temperature ranges of 40°-42°C (Barlow and Mollon, 1982). The greater concentration of warmth receptors is on the nose and hands (Geldard, 1972).

Both fibers lead from the sub-epithelium to the post-central gyrus via the lateral spinothalamic tract and thalamic radiation (Ganong, 1981, pp. 97-98). Sensory input activates the reticular activating system, which, in turn, maintains the cortex in an alert state (Ganong, 1981). The alert state is a part of the modulating response to sensory input. Physiologic and behavioral adaptations occur.

Temperature regulatory mechanisms are responses to modulated sensory input of warm or cold. Adjustments include local and general reflexive responses, and autonomic, somatic endocrine, and behavioral changes (Ganong, 1981).

Tactile sensitivity to temperature change has been measured in both clinical and laboratory settings. Scientists agree that sensations of warmth and coldness are rational experiences and an emotional phenomenon (Hensel, 1982; Guyton, 1976). Hensel (1982) concludes that how much temperature is sensed is related to the quantity of the stimulus. Hensel (1982) found that subjects were able to make a temperature estimate at "any" temperature. Toward colder temperatures, discriminant ability flattens, but there is good discriminability in the range from 25°-38°C.

Thermal comfort has been defined as an appraisal aspect of behavioral adaptation. This ability implies that the human has the ability, through sensory input, to determine whether the environment is favorable or harmful (Erickson, 1982). The conscious perception of the patient's skin temperature by the recovery room nurse can lead to direct practical assistance to the patient (Erickson, 1982).

Guyton (1976, p. 623) states that "the human can perceive different gradations of cold and heat, progressing from freezing cold to cold to cool to indifferent to warm to hot to burning hot." He further states that the thermal senses respond to changes in temperature.

Geldard argues that the phenomenon of thermal adaptation prevents tactile assessment from being a good thermometer. He supports the use of mechanical or electronic thermometers as opposed to "trusting the evidence of one's cutaneous senses" (Geldard, 1972, p. 355). However, he also suggests that the "wise mother tests the baby's bath with her elbow . . ." (Geldard, 1972, p. 355). It is suggested that recorded temperature is only a rough estimate of body temperature ". . . looking for marked deviations from normal" (Eoff and Joyce, 1981, p. 1011). Tactile assessment, then, provides information regarding the external environment.

Skin Temperature Assessment

"Skin is the major organ for communication -- it is a pathway for communication with the world, both internal and external" (Dossey, 1983, p. 2). The temperature of the skin reflects the interface between temperature of the internal organs and environmental temperature (Ganong, 1981).

Heat may be gained or lost at the skin surface. Circulation of blood to the skin is the key element in heat loss of the body to the environment. Vasodilatation increases heat loss; vasoconstriction decreases heat loss (Ganong, 1981; Guyton, 1976).

The physical processes of heat exchange include radiation and conduction (70 percent), and vaporization of sweat (27 percent). Conduction is influenced by skin temperature; when skin temperature is warm, heat loss is enhanced and vice versa (Ganong, 1981).

Skin temperature provides information about the physiological activity of the subject. Skin temperature tells the assessor the vasoconstriction/vasodilatation status, and whether heat loss to the environment is increased (the body is warm) or decreased (the body is cold). From the assessment information, the assessor can then determine the status of thermal regulatory mechanisms. An intact thermal system is retaining/losing heat in order to keep core temperature stable. If the thermal regulatory system is not intact, depending upon the external environment, the organism is at risk of becoming hypothermic or hyperthermic (Scheuplein, 1979).

Contact between the skin surfaces of two individuals results in the exchange of thermal information. Skin temperature assessment is a type of tactile assessment.

Forehead Temperature Assessment

Tactile assessment of skin temperature of the post-anesthetic patient can occur at any body site. When the patient is supine, the back is not readily available. Usual sites are arms, legs, face, and trunk. Shivering, an adaptive response to cold, can influence the skin-to-skin interface of tactile assessment. Extremities and the trunk are most responsivie to temperature change (Beland and Passos, 1981; Ganong, 1981). In the post-anesthetic patient, the trunk and lower extremities are covered, and thereby insulated from the influence of the environment (Hasler and Cohen, 1982), and not readily accessible for tactile assessment.

The forehead is an accessible location, exposed to ambient air temperature. It is proximal to areas least responsive to adaptive changes (Scheuplein, 1979). The forehead is often used by both medical and non-medical persons to assess temperature.

Operational Definition of Tactile Assessment

Guyton's (1976) terminology for temperature gradients perceivable by humans is: freezing cold (5°-15°C), cold (15°-20°C), cool (20°-34°C), indifferent (34°-37°C), warm (37°-41°C), hot (41°-47°C), and burning hot (47°-60°C). Other terms associated with the thermal range are: normothermic (36.5°-39°C), hypothermic (below 35°C), and hyperthermic (above 41.1"C) (Rosenberg, 1981). Terms associated with recovery room nursing tactile assessment are: hot, warm, cool, and cold. For the purposes of this study, the terms used for tactile assessment of temperature will be: cold, cool, neutral, warm, and hot. This provides a five-point assessment scale.

Body Temperature

Body temperature is a measure of the heat content of the body. It represents a series of temperature gradients, i.e., there is no one body temperature (Vale, 1981). Body temperature is a reliable indicator of metabolic activity. Any activity that influences metabolic activity will have a direct effect on body temperature (Erickson, 1982; Beland and Passos, 1981). Factors that affect body temperature include climate, exercise, food, drugs, autonomic nervous system activity, hormonal influences, wakefulness, age, emotion, disease, time of day, energy, and anesthesia (Beland and Passos, 1981; Geldard, 1972).

Body temperature is maintained by interrelated systems. Basically, the systems can be divided into sensors, integrators, and effectors. Sensors include cutaneous nerve cells, and cells in the internal structure of the abdomen, spinal cord, and hypothalamus (Shaver, 1982). The primary integrator is believed to be in the pre-optic area of the hypothalamus. Satinoff (1978) suggests a more complex integrative system which leads to a finer control ability. Reflexive responses for cold are controlled from the posterior hypothalamus (Ganong, 1981).

Effectors are classified as physiologic or behavioral (Shaver, 1982). Erickson (1982) adds a third detector, that of social adaptation. Physiologic effectors are skeletal muscle, blood vessels, and sweat glands (Shaver, 1982); and endocrine response of increased catecholamine secretion to cold (Ganong, 1981). Behavioral effectors are environmental modification, posture changes, displacement (move away from unpleasant environment), clothing changes (Erickson, 1982), and increased motor activity (Ganong, 1981). Social adaptation, the third effector, is an extension of the behavioral mode where others assist or carry out the adaptive responses. This may take the form of direct practical assistance, moral support, architecture, laws, public policy, and custom (Erickson, 1982).

Skin Temperature Measurement

Skin temperature measurement provides more than an estimation of the temperature of the interior of the body. Skin temperature is the indicator for the status of thermal energy exchange between the organism and the environment (Scheuplein, 1979). Skin temperature provides one parameter of total body temperature (Vale, 1981). The skin has a rich blood supply, its major purpose being heat regulation (Ganong, 1981). Temperatures measured at the interface between the internal and external environments yield information regarding both environments.

Axillary Temperature Measurement

Numerous sites are available as reference points for temperature measurement. Each site has rationale for or against its selection. Sites clearly not within the nurse's prerogative for selection include tympanic, esophageal, and internal vessel (i.e., pulmonary artery catheter). Less commonly available are sites in the nasopharynx and urinary bladder (Lilly, Beland, and Zekan, 1980).

The axillary site was selected for determination of temperature for several reasons:

1. Researchers have suggested the axilla temperature is representative of body temperature (Hendolin and Länsimies, 1982; Takacs and Valenti, 1982; Vale, 1981). Some classify axillary temperature as representative of skin temperature (Hendolin and Länsimies, 1982; Vale, 1981); others classify it as representative of core temperature (Blainey, 1974; Nichols et al., 1966).
2. The axilla is readily accessible; little, if any, patient movement is required; no interference with airway management can occur; and clothing does not limit access to the site.
3. Temperature measurement of the axilla is esthetically more acceptable to both nursing staff and patient population (Smith, 1982; Eoff and Joyce, 1981).
4. Axilla temperature measurement requires no special equipment.

Operational Definition of Body Temperature

Scales to quantify temperature measurement include Farenheit and Centigrade scales. Centigrade measurement reflects the effort to utilize a universally recognized system (Beland and Passos, 1981). The common use of both scales leads to confusion in interpreting data from scientific studies.

Instrumentation utilized for temperature measurement has evolved from the 1600's, when Sanctorius modified Galen's thermometer. One hundred years later, Farenheit's mercury thermometer was used to ascertain the temperature via the urinary system. Clinical thermometry began in earnest in the 19th Century. Today, temperature measurement methods include mercury, electric, radiotelemetric, deep-body temperature, liquid-crystal, and infrared thermometry (Mosenkis, 1982).

For the purpose of this study, the operational definition of temperature measurement will be the Centigrade scale. Instruments for hand and forehead Centigrade temperature will be an infrared thermometer. An electronic predictive thermometer will provide temperature measurement of the axilla.

Relationship between Tactile Assessment and Body Temperature

The touching of skin surfaces yields an exchange of temperature information. Sensory receptors receive stimuli leading to cognition of temperature. "There is a correlation, at times, between skin surface temperature and the body (core) temperature" (Mosenkis, 1982, p. 6).

The skin participates in the heat exchange of the body with vasodilatation (heat loss) and vasoconstriction (heat conservation). As heat is conserved, body temperature at the core is increased or maintained; at the periphery, body temperature is decreased. Heat loss creates the opposite effect.

Body temperature represents a measure of heat content. It is expressed as one quality (numerical or verbal), but actually represents a sampling of temperature gradients of the body (Vale, 1981).

Exploration of the relationship between tactile assessment and body temperature should provide knowledge in regard to the use of tactile assessment of the post-operative patient. The conceptual framework represents the use of the nurse as an assessment tool versus the use of an instrument as a measurement tool. Knowledge gained by such an exploration may influence patient care and, consequently, hospitalization costs. The knowledge may add to the efforts of nursing to define its practice and to define quality in nursing care.

Summary

Chapter 2 related the conceptual framework for the research study. The concepts of tactile assessment and body temperature were developed to the operational level. Terms of cold, cool, neutral, warm, and hot were identified as the operational level of tactile assessment. The Centigrade temperature scale represents the concept of body temperature. Physiologic responses to touch and temperature were identified, as were behavioral and social responses to temperature. The evolution of measurement techniques was described. Sites for measurement were delineated. The relationship between tactile assessment and body temperature was discussed, and the potential significance of the relationship to nursing cost and quality expressed.

CHAPTER 3

METHOD

Design

A descriptive design was chosen to answer the research questions of the study. The questions asked were:

1. Are tactile assessment and axillary temperature associated?

2. Are tactile assessment by two persons associated?

Setting

The setting was a 16-unit, open ward, post-anesthesia recovery room. The setting is located in a 600-bed, acute care, community hospital. The post-anesthesia recovery room has an average daily census of thirty patients.

Sample

The sample consisted of two groups: post-anesthesia patients and post-anesthesia recovery room nurses. Both groups were voluntary participants in the study. Criteria for selection were developed for both groups.

The convenience sample of post-anesthesia recovery room nurses had the following as criteria for participants:

1. Licensed registered nurses.

2. Permanent employee of the post-anesthesia recovery room.

3. Minimum of one year's experience as a post-anesthesia recovery room nurse.
4. No known peripheral vascular or neurologic disease involving the hands.

The patients involved in the study were adults who had received general or regional anesthesia, who had been admitted to the post-anesthesia recovery room, and who did not have temperature monitoring equipment in place upon admission. Excluded from the study were:

1. Induced hypothermia patients. Induced hypothermia is uncommon and, when done, the patient's temperature is monitored constantly in the peri-operative period. Tactile assessment could be prejudiced.
2. Local anesthesia patients. These patients are not routinely admitted to the post-anesthesia recovery room.
3. Open-heart surgery patients, who are admitted directly to the intensive care unit from surgery.
4. Children under the age of fourteen. These patients are routinely monitored, and tactile assessment could be prejudiced.

Five post-anesthesia recovery room nurses assessed forehead temperature of ten patients each, for a total sample of 50 subjects. The investigator also did tactile forehead assessments, and axillary temperature measurements, for all 50 subjects.

Definitions

The operational definition for body temperature was the Centigrade scale, as measured by electronic thermometer for axillary temperature, and infrared thermometer for forehead and hand temperatures. The operational definition for tactile assessment of temperature was a scale of hot, warm, neutral, cool, and cold.

Data Collection

For convenience, data collection was accomplished at various times during the period between seven o'clock in the morning and eight o'clock in the evening. An effort was made to collect the data so that each nurse did not assess more than two patients in sequence. Nurse selection at each collection interval was determined by who was available at the time of collection, or collection was planned when the participants were available.

Prior to the collection of data, the study and method were explained to the patients and nurses who chose to participate. A disclaimer was given to each nurse participant (Appendix A). Written consent of the patient, a requirement of the facility, was obtained from all patients (Appendix A).

Procedure

Eligibility

As a patient participant was admitted to the post-anesthesia recovery room, the nurse participant was asked if she was available to make an assessment. Immediately prior to admission to the post-anesthesia recovery room, the investigator confirmed that the patient and the nurse met the criteria for selection.

Post-Anesthesia Nurse and Room Temperature Measurement

Before the patient's skin temperature was assessed, the investigator measured and recorded the hand temperature of the nurse and of the investigator:

1. Hands were observed for dryness.
2. An infrared thermometer probe was placed 2 inches above the center of the palm of the hand to be used for assessment and the thermometer was turned on.
3. The immediate reading obtained was recorded (Linear Laboratories, Inc., 1984).

Room temperature was determined and recorded:

1. The room's central thermostat was read and recorded.
2. The thermostat closest to the patient cubicle was read and recorded.
3. The two temperatures were averaged.
4. The average was recorded.

Tactile Assessment

Within ten minutes of the patient's admission, the investigator assessed and recorded her tactile findings:

1. The palmar aspect of the hand was placed on the forehead of the patient.

2. The finding was recorded silently, and not stated to the post-anesthesia recovery room nurse participant.

After the tactile assessment by the investigator, the post-anesthesia recovery room nurse made her assessment:

1. The palmar aspect of the hand was placed on the patient's forehead.
2. The nurse stated the word choice (hot, warm, neutral, cool, or cold) for her assessment.
3. The word choice was recorded.

Temperature Measurement

Utilizing the infrared thermometer, forehead temperature was obtained:

1. The thermometer was turned on.
2. The probe was held 2 inches away from and above the approximate center of the forehead.
3. The immediate temperature displayed was recorded (Linear Laboratories, Inc., 1984).

Utilizing the electronic thermometer, axillary temperature was obtained:

1. The location of the axillary artery was approximated by palpation.
2. The area was gently dried with a gauze sponge.
3. The probe was placed in proximity to the artery (Wolff-Lewis, 1984).

4. The thermometer was activated, and the reading displayed was recorded (Patient Technology, Inc., 1983).

4. The probe was removed.

Demographic Information

Collection of demographic information concluded the collection period. Age, sex, height, weight, and anesthesia type, along with hospital number, were collected to describe the patient population. The nurse sample demographic information was collected at the time of consent to participate. Information included age, sex, educational preparation, general and post-anesthesia nursing experience, and palm width. Appendix B shows the data collection tools used in this study.

Data Collection Instruments

Thermometers

An intermittent-use, electronic thermometer with predictive ability was used to measure patient axillary temperature. Disposable probe covers provided for safety and cleanliness. Specifications of the thermometer included a temperature range ability of 21°C to 60°C, with stated clinical accuracy of ±.1°C. The timing cycle for display of temperature reading was 30 seconds. The thermometer was factory-calibrated prior to the study (Patient Technology, Inc., 1983). Prior to the beginning of the study, the thermometer was compared to another brand of thermometer with a stated accuracy of .5°C. Readings obtained were within .5°C. Comparison was done by taking six sets of ten readings of the electronic thermometer and a control thermometer. Results of comparisons are shown in Table 1.

The infrared thermometer specifications included a temperature range of 10°C to 50°C, with a sensitivity of .1°C and accuracy of .5°C. Infrared thermometry is based on the principle of emittance. Emittance is the ability of a surface to radiate energy. Skin emittance approaches the ideal radiating surface. The thermometer had been preset to measure organic material (Linear Laboratories, Inc., 1984). The infrared thermometer was compared with the control electronic thermometer, using the same method as for the study thermometer. The difference between the infrared and the control thermometer averaged .20°C. Table 1 displays the comparisons.

Room temperature was obtained from the facility's thermostats. The post-anesthesia room has several thermostats, located at various areas in the room. The thermostats are set at 21°C and are controlled centrally through the Plant Services department.

Hands

The hands of the investigator and the post-anesthesia recovery room nurses provided the instruments for tactile assessment. Reliability and validity of the hand (tactile) assessment were explored in the study. The assumption was made that, in a stable room environment, hand temperature would be stable.

Pilot Study

Prior to the implementation of the larger study, a pilot of the study was conducted. Three patients and one nurse comprised the pilot

Table 1. Comparison of study and control thermometers.

Set[a]	Electronic (°C) Mean Study (S.D.)[b]	Electronic (°C) Mean Control (S.D.)	Electronic (°C) Difference	Infrared (°C) Mean Study (S.D.)	Infrared (°C) Mean Control (S.D.)	Infrared (°C) Difference
1	36.4 (.371)	36.9 (.624)	.5	29.7 (1.740)	29.9 (1.650)	.2
2	36.7 (.470)	37.0 (.260)	.3	35.9 (.623)	36.0 (.634)	.1
3	36.1 (.597)	36.3 (.820)	.2	41.0 (1.180)	40.5 (2.700)	-.5
4	36.2 (1.110)	36.8 (.820)	.6	34.0 (1.150)	34.0 (.863)	.0
5	36.5 (.259)	36.8 (.753)	.3	34.4 (.643)	34.2 (.689)	-.2
6	36.4 (.462)	36.4 (.429)	.0	34.4 (1.930)	34.2 (1.560)	-.2

[a]A set contains ten readings of each thermometer.

[b]S.D. = standard deviation.

study. The same procedure as for the larger study was followed. The pilot study nurse was then excluded from participation in the larger study. The purpose of the pilot study was to detect problems with technique, and to provide an estimate of time requirements.

Human Subjects Review

Participation in the study by both recovery room nurses and patients was voluntary. Cáre or job status was not influenced by participation or refusal to participate. Confidentiality of participants was assured by coding of all data. There was no known risk to either nurse or patient. The study was submitted for review by the College of Nursing Human Subjects Committee, and the Human Research Committee of the facility used (Appendix C).

Data Analysis

The data were analyzed using descriptive and inferential techniques. Data analysis was computerized. A Pearson correlation matrix was done among the variables. Level of significance was set at .05.

Summary

Chapter 3 described the method of the study. Volunteer participants, consisting of five post-anesthesia recovery room nurses and 50 post-anesthesia patients, were utilized to obtain information about tactile assessment, and skin and axillary temperatures. The research questions explored were:

1. Are tactile assessment and axillary temperature associated?
2. Are tactile assessments by two persons associated?

The setting and sample were described. The procedure of the study was explained in detail. Instrumentation and its testing were discussed. The study was submitted for review by the College of Nursing Human Subjects Committee, and the facility's Human Research Committee. The data analysis plan using descriptive and inferential techniques was described.

CHAPTER 4

RESULTS

This chapter presents the findings and statistical analysis of data collected about temperature measurement by assessment and by instrumentation. Data were derived from a sample consisting of five post-anesthesia recovery room nurses, who assessed ten patients each. The investigator measured forehead temperature and the axillary temperature of each patient, assessed by touch the forehead temperature of the patients, and also measured the hand temperature of the nurses and the investigator. The research questions of the study were:

1. Are tactile assessment and axillary temperature associated?
2. Are tactile assessments by two persons associated?

The statistical analysis included descriptive and inferential methods. A correlation matrix was done among the variables. Pearson correlation coefficients comprised the inferential statistics.

Description of the Sample

Post-Anesthesia Recovery Room Nurses

Five volunteer, post-anesthesia recovery room nurses participated in the study. Data collected from the post-anesthesia recovery room nurse sample included age, sex, educational preparation, registered nurse and post-anesthesia recovery room nursing experience, and palm width. At each collection, the hand temperature of the nurse was measured.

The nurse sample was comprised of females with a mean age of 32. They had been registered nurses an average of 9.70 years, with 4.30 mean years' experience in post-anesthesia nursing. All had received their post-anesthesia training at the facility. Hand size averaged 7.85 cm (right) and 7.65 cm (left). The sample is further described in Table 2. Two of the nurses were associate degree graduates, two were baccalaureate graduates, and one was a diploma graduate (Table 3).

The post-anesthesia recovery room nurses were similar in sex and hand size, but somewhat dissimilar for education, age, and nursing experience. The investigator was dissimilar to the post-anesthesia nurses for age, education, and experience in post-anesthesia recovery room nursing experience. The investigator was similar to the group in sex and hand size.

Patient Sample

Fifty patients consented to participate in the study. No patients asked to participate refused. Data collected about the patient sample included hospital number, age, sex, height, weight, anesthesia type, and forehead and axillary temperatures.

The mean age of the sample was 53.86 years, mean weight was 70.45 kg, and height was 1.67 meters. Body mass index (BMI) was calculated from the height and weight data by using the formula (Bray, 1980):

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Table 2. Post-anesthesia recovery room nurse/investigator descriptive data.

Variable	Minimum-Maximum	Mean	S.D.[c]
Age (years):			
PAR[a]	29-38	32.200	3.700
INV[b]	40	-	-
Nursing experience (years):			
PAR	8-14	9.700	2.540
INV	19	-	-
Post-anesthesia nursing experience (years):			
PAR	2.500-6	4.300	1.640
INV	-	-	-
Palm width (cm):			
PAR:			
Right	7.000-8.500	7.850	.550
Left	6.750-8.500	7.650	.520
INV:			
Right	8.500	-	-
Left	8.500	-	-

[a]Post-anesthesia recovery room nurse.

[b]Investigator.

[c]Standard deviation.

Table 3. Level of nursing education of post-anesthesia recovery room nurses and the investigator.

Level	PAR[a]		INV[b]	
	Frequency	%	Frequency	%
Associate degree	2	40	-	-
Diploma	1	20	-	-
Baccalaureate	1	20	-	-
Graduate college	1	20	1	100
Totals	5	100	1	100

[a]Post-anesthesia recovery room nurse.

[b]Investigator.

The patient sample showed a normal distribution for height, weight, BMI, and age. According to Bray (1980), a BMI of 25 is borderline normal and overweight (see Tables 4 and 5).

Temperature Variables

Five temperature measurements were obtained. They were: 1) room temperature, 2) patient forehead temperature, 3) patient axillary temperature, 4) nurse hand temperature, and 5) investigator hand temperature.

Room temperature mean was 23.5°C. The lowest temperature measured was 22.2°C; the highest was 27.8°C. Standard deviation for room temperature was 1.003.

Patient forehead temperature was measured with an infrared thermometer. Mean forehead temperature was 32.0°C, with a standard deviation of .911. Forehead temperature minimum reading was 30.1°C; maximum reading was 34.0°C.

Axillary temperatures were measured by an electronic, predictive thermometer. Temperatures ranged from 30.8° to 35.9°C, with the mean at 34.0°C, and standard deviation of 1.200.

Nurses' hand temperatures were determined by infrared thermometry. The mean temperature was 32.4°C; the standard deviation was .960. The investigator's hand temperature mean was 32.4°C, with a standard deviation of .711. The temperature data are summarized in Table 6.

Tactile Assessments

Tactile assessments by the investigator and the post-anesthesia recovery room nurses were done. The post-anesthesia recovery room

Table 4. Age, weight, height, and body mass index of patient sample.

Variable	Minimum-Maximum	Mean	S.D.[a]
Age (years)	26-80	53.860	15.840
Height (m)	1.470-1.880	1.670	4.190
Weight (kg)	44.600-96.800	70.450	12.920
Body mass index	17.420-39.400	25.040	4.190

[a]Standard deviation.

Table 5. Sex and type of anesthesia for patient sample.

Variable		Frequency	%
Sex:	Female	30	60
	Male	20	40
	Totals	50	100
Anesthesia:	General	48	96
	Regional	2	4
	Totals	50	100

Table 6. Description of temperature readings.

Temperature (°C)	Minimum-Maximum	Mean	S.D.[a]
Subject:			
Axillary	30.8-35.9	34.0	1.200
Forehead	30.1-34.0	32.0	.911
Hand:			
PAR[b]	30.0-34.4	32.4	.960
INV[c]	30.7-33.8	32.4	.711
Room	22.2-27.8	23.5	1.003

[a]Standard deviation.

[b]Post-anesthesia recovery room nurse.

[c]Investigator.

nurses utilized all five of the terms in the tactile assessment scale. The investigator used all the terms, except "cold." The most frequent response of the investigator was "neutral." The most frequent response of the post-anesthesia recovery nurse group was "warm." Tactile assessment responses are displayed in Table 7.

Conclusions

The first question to be studied was: Are tactile assessment and axillary temperatures associated? Both post-anesthesia recovery room nurses and the investigator had positive correlations with axillary temperature. The investigator correlation was .50 ($p \leq .001$). The post-anesthesia recovery room nurse correlation was .36 ($p \leq .01$). This correlation was the lowest statistically significant correlation of the study. Temperature correlations are displayed in Table 8.

The second research question asked was: Are tactile assessments by two persons associated? Tactile assessments of the investigator and the post-anesthesia recovery room nurse group had a positive correlation of .59 ($p \leq .001$). This was the highest correlation of the study. A coefficient of .59 may be considered a moderately strong correlation.

Associated Variables

Positive correlations occurred between tactile assessments of the investigator and post-anesthesia recovery room nurses, and with patient forehead temperature. The correlation was .50 ($p \leq .001$) for the investigator, and .49 ($p \leq .001$) for the post-anesthesia recovery room nurse group.

Table 7. Frequencies of tactile assessments.

Term	PAR[a]		INV[b]	
	Frequency	%	Frequency	%
Hot	2	4	4	8
Warm	24	48	13	26
Neutral	13	26	25	50
Cool	10	20	8	16
Cold	1	2	0	0
Totals	50	100	50	100

[a]Post-anesthesia recovery room nurse.
[b]Investigator.

Table 8. Temperature measurement and tactile assessment correlations.

	Temperature Measurements		Tactile Assessments	
	Forehead	Axillary	INV[a]	PAR[b]
Temperature measurements:				
Forehead	1.0	-	-	-
Axillary	.49 ($p \leq .001$)	1.0	-	-
Tactile assessments:				
INV	.50 ($p \leq .001$)	.50 ($p \leq .001$)	1.0	-
PAR	.49 ($p \leq .001$)	.36 ($p \leq .01$)	.59 ($p \leq .001$)	1.0

[a]Investigator.

[b]Post-anesthesia recovery room nurse.

There was a negative correlation, .28 ($p \leq .05$), between the tactile assessment of the post-anesthesia recovery room nurse group and hand temperature of the nurse group. The correlation between tactile assessment and hand temperature of the investigator was negative in direction, but not statistically significant.

There were no other significant correlations between tactile assessments and the remaining variables. There were no other positive correlations associated with temperature. Room temperature did not correlate with patient or nurse temperature measurements.

Summary

Chapter 4 presented the results of the study. Descriptive and inferential analyses were discussed. Those facts that did not correlate with temperature were discussed.

Five post-anesthesia recovery room nurses assessed temperatures of ten patients each. There was a positive correlation between their tactile assessments of patient forehead and the axillary temperature. Hand temperature of the post-anesthesia recovery room nurse correlated with the hand temperature of the investigator. There was a negative correlation between hand temperature and tactile assessment response. The correlations were statistically significant.

The investigator had a correlation between tactile assessment, and forehead and axillary temperature of the patient. There was a negative direction, but not a statistically significant correlation, between the investigator's hand temperature and tactile assessment.

Forehead temperature and the axillary temperature also correlated. Room temperature did not correlate with any of the study variables.

CHAPTER 5

DISCUSSION OF THE RESULTS

Chapter 5 presents discussion of the results, conclusions, and implications for nursing practice. Limitations of the study are presented, and recommendations for further research are stated.

Body Temperature of the Post-Anesthetic Patient

Extremes of body temperature of the post-anesthetic patient can result in additional stress to the patient (Beland and Passos, 1981). The rigors associated with the surgical course lead to the potential for compromise in thermal regulation ability. Hypothermia or hyperthermia may be a result (Vaughn et al., 1981; Holdcroft, 1980).

Hypothermia is a prevalent condition of the post-anesthetic patient. Sixty percent of patients in the post-anesthesia recovery room have been found to be hypothermic (Vaughn, 1980). Hypothermia leads to bodily responses of peripheral vasoconstriction, shivering, increased metabolic rate, increased oxygen consumption, and increased reaction to pain (Borchardt and Fraulini, 1982; Guyton, 1976). Behavioral changes such as posturing and increased movement also occur (Shaver, 1982). The events of rewarming by the nursing staff can lead to a shift of blood volume to the periphery, a state that is known as "rewarming shock" (Beland and Passos, 1981). Potential tissue injury can occur when heat is applied to poorly perfused peripheral tissue (Orkin and Shapiro, 1981). Because of the demands placed upon the patient during rewarming, knowledge of the temperature of the post-anesthetic patient is important.

Body temperature is a measure of the heat content of the body. It represents a series of gradients of temperature, i.e., there is no one body temperature (Vale, 1981; Scheuplein, 1979). Measurement at any one site, then, provides an estimate of the total body temperature. There is, however, an association between the temperatures measured at various sites of the body (Scheuplein, 1979).

Skin temperature provides a measure of the status of thermal energy exchange (Scheuplein, 1979). Cool skin equates with efforts of the body to conserve heat. Warm skin equates with an internal environment that is warmer than the external environment (Ganong, 1981). Axillary temperature has been said to be a measure of skin temperature (Hendolin and Länsimies, 1982) and a measure of core temperature (Blainey, 1974; Nichols et al., 1966). Forehead temperature is skin temperature. Axillary temperature and skin temperature of the forehead, then, should be associated.

Measurement and assessment of temperature are a function of the care of the nursing staff in the post-anesthesia recovery room. Interventions in regard to thermal balance are based on the information obtained from the patient's temperature. Nursing care is directed to minimize thermal stress to the patient. The nurse can provide physiologic and behavioral support to the patient while he regains control of thermal regulation. The support can include such things as warm blankets, heating and cooling blankets, heating lights, and medications to suppress shivering (Vaughn et al., 1981).

Information about the thermal status of the patient can be obtained by touch and by instrument measurement. Touching is quick, non-invasive, minimal-risk, and low-cost. Instrumentation takes more time and effort on the part of the nurse, involves some expense to the patient, can be invasive, and can incur some degree of risk to the patient. It is also believed to be more accurate (Mosenkis, 1982; Geldard, 1972).

This study utilized a nominal scale for temperature assessment. Five words were used to denote temperature. They were: hot, warm, neutral, cool, and cold. There was no assumption that intervals within the range were equal, or that a term represented a distinct temperature. All of the terms used, with the exception of "neutral," were used in the nursing practice of the facility's post-anesthesia recovery room. The data reflect that the term "neutral" was utilized on 13 occasions (26 percent) by the post-anesthesia recovery room nurse group, and on 25 occasions (50 percent) by the investigator. The difference in utilization might be attributed to inaccurate assessment, by one group over the other, by more familiarity and acceptance of the term by the investigator, by a response set bias, or due to the term not being an appropriate assessment term. The investigator had a higher correlation between temperature assessment and axillary temperature ($r = .50$, $p \leq .001$) than the post-anesthesia recovery room nurses ($r = .36$, $p \leq .01$). The higher correlation may support that the "neutral" assessment on the part of the investigator was more accurate.

Instrumentation, utilizing the Centigrade scale, reflected a correlation between temperatures of forehead and axillary. The association is consistent with the literature. The correlation, .49 ($p \leq .001$), was lower than expected. It has been suggested that a .70 correlation would be weak for temperatures of two body parts (Polit and Hungler, 1983). The moderate level of correlation might be explained by differences in the instruments used, by measurement error, by differences in levels of insulation between the two body parts, or by the presence of temperature gradients. The forehead is more exposed to the ambient air temperature, while the axilla is covered and protected. Axillary temperature has been associated with core temperature, but .6°-1°C lower (King, Wieck, and Dyer, 1981). Skin of the face has been associated with core temperature, but 4°-5°C lower (Noble and Somerville, 1974). Correcting for this temperature gradient might have resulted in a higher correlation.

The temperatures obtained supported that the post-anesthetic patient enters the recovery area with a lower-than-normal axillary or forehead temperature. Axillary temperatures obtained showed that all of the patient sample were below what King et al. (1981) expressed as the normal axillary temperature of 36.4°C. Fifty-six percent of the patient sample had forehead temperatures that were lower than the normal determined by Noble and Somerville (1974). Tactile assessments of cool or cold, as done by the post-anesthesia recovery room nurses, amounted to 22 percent of the tactile assessments. Tactile assessments of the investigator for cool or cold amounted to 16 percent of the assessments. The data reflect the limited accuracy of tactile assessment when related to degrees of temperature. With correlations of .50 ($p \leq .001$) for both groups' tactile assessment association with forehead temperature, the data support that both the post-anesthesia recovery room nurses and the investigator could assess, with a moderate level of accuracy, the trend of coolness of the patient.

Conclusions

The study asked two questions:

1. Are tactile assessment and axillary temperature associated?
2. Are tactile assessments by two persons associated?

Using 50 patients and five post-anesthesia recovery room nurses as the sample, the study supports an association between tactile assessment and axillary temperature ($r = .36$, $p \leq .01$). The correlation between post-anesthesia recovery room nurse group tactile assessment and forehead temperature is stronger ($r = .49$, $p \leq .001$) than that for tactile assessment and axillary temperature ($r = .36$, $p \leq .01$). The second question is answered by the $r = .59$ ($p \leq .001$) correlation between tactile assessments of the investigator and the post-anesthesia recovery room nurses. There is support for an association between tactile assessments by two persons.

Associated Variables

Other results of the study indicate no correlation of outside influences, and temperature or tactile assessments. Age, sex, body mass index of the patient, room temperature, or hand temperature of the investigator did not correlate at a statistically significant level with tactile assessments or temperature measurements of the patient. Patient age, sex, or body mass index might have influenced tactile assessment and temperature. Older patients have less ability to withstand thermal stress (Vaughn, 1980). Experience on the part of the investigator or the post-anesthesia recovery room nurse might have led to the assumption of coldness and, hence, the assessment of coldness, regardless of the feel of the temperature of the patient. Conversely, body mass index toward obesity, which the data reflect, might lead to the assumption of more insulation, and a more normothermic patient. The lack of correlation with these conditions and tactile assessment supports that the nurses or the investigator were not making assumptions based on patient age or body mass index.

The effect of anesthesia type on temperature and tactile assessment is not clear in this study. Vaughn et al. (1981) indicated that regional anesthesia patients were more likely to be hypothermic. The study had only two regional anesthesia patients. The small sample of regional anesthetic patients did not allow for clarification of the influence of anesthesia type on tactile assessments or temperature measurements.

Room temperature is stated to be associated with body temperature. The body attempts to adapt to ambient air (Guyton, 1976). Room temperature might have affected skin and hand temperature, and this affected tactile assessment. There was no correlation between hand, forehead, and axillary temperatures and the room temperature.

An interesting correlation occurred between tactile assessment by post-anesthesia recovery room nurses and their hand temperature. A weak, negative correlation ($r = -.28$, $p \leq .05$) was found.

Interpretation would suggest that, as hand temperature was colder, the skin of the patient would feel warmer. Explanation of the finding might be in the nature of degree of difference of temperature between the two surfaces. As the difference between two temperatures widens, perception of temperature is influenced. The finding is consistent with the theories of adaptation (Erickson, 1982) and of the physiology of thermal regulation (Ganong, 1981). The same negative direction was seen in the investigator hand temperature and tactile assessment, but it was not statistically significant.

Limitations and Sources of Error

Two limitations of the study were recognized. Data were collected in a single facility. The patient and nurse samples were not randomly selected. Because of the limitations, generalizability of the study is limited.

Four categories of sources of potential error were identified. They were: situational, response set biases, transitory personal factors, and administration variation.

Situational

Air currents and patient placement in the open ward of the recovery room may have influenced temperature assessments. The oxygen masks, immediately applied to the patient, are not tight-fitting. Some escape of cool oxygen might have influenced the forehead temperature assessment. The public nature of participation in the study might have had an influence on the assessment.

Assessment time and axillary temperature time varied somewhat, but were within the ten-minute time frame of the study design. The correlation between tactile assessment and axillary temperature might have been affected.

Another situational source of error might have occurred due to the presence of intravenous fluids in the arm where axillary temperature was obtained. This situation occurred only five times in the study.

Response Set Biases

One term may have been chosen over others in describing tactile assessments. Review of past post-anesthesia recovery room records indicated large use of the term "warm." The investigator could also have been biased in choice of terms, especially the "neutral" term. The scale was of the author's design; "neutral" was not a term in use prior to the study. Expectations of temperature might have influenced both the post-anesthesia recovery room nurses and the investigator. Both the post-anesthesia nurse group and the investigator knew that many patients were cold when admitted to the post-anesthesia room. Explanation of the scale and its use, at the beginning of the study, was used to attempt to minimize response set biases.

Transitory Personal Factors

The mood state of the nurse and the investigator prior to assessments might have influenced the results. The amount of attention given the study by others in the post-anesthesia recovery room, such as surgeons and anesthesiologists, might have influenced the study. Activities immediately prior to the study might have had an influence.

Resting or working efforts change the metabolic rate and influence internal temperature. Hand washing might have influenced hand temperature.

Administrative Variation

The anatomy of the axilla is individual; therefore, placement of the probe near the axillary artery may have varied. The time of assessment varied from subject to subject.

Nursing Implications

Upon admission of the patient to the post-anesthesia recovery room, multiple assessments must be accomplished. Visual, auditory, and tactile skills are used to guide nursing interventions. Speed and economy of effort are required. Use of tactile assessment of temperature provides for rapid and economical screening of the thermal state of the patient. While not as accurate as instrumentation, tactile assessment is supported by this study as a method to determine initial temperature of the patient. The study suggests that the inexperienced nurse, with knowledge of temperature, can apply the skill of tactile assessment.

The study supports that patients admitted to the post-anesthesia recovery room are likely to have skin and axillary temperatures below the normal. The implication of this finding is in planning of nursing interventions. These interventions are directed toward support of the thermally imbalanced patient, and restoration of thermal balance. The ability to anticipate needs provides for more efficient meeting of the needs. Control of the post-anesthesia recovery room temperature, accessibility to warm blankets, and anticipation of shivering allows the nurse to enhance the thermal environment of the patient, reduce stress to the patient, and minimize the potential for injury due to physiologic and behavioral attempts on the part of the patient to restore thermal balance.

Recommendations

There are three recommendations for further study. Replication of the study would clarify and strengthen the findings. Through additional study, the use of tactile assessment as a method to determine thermal status might be validated.

A second recommendation is to explore the relationship between tactile assessment and consequent nursing interventions. Vaughn et al. (1981) have suggested that rewarming efforts on the part of the post-anesthesia recovery room nurse do not significantly affect the speed of rewarming. In the facility used in the study, patients are held in the post-anesthesia recovery room until their temperature approaches the normal range.

A third recommendation is to explore the role of learning of the skill of tactile assessment on the tactile assessment action. Can tactile assessment correlation with skin or axillary temperature be strengthened?

Summary

Chapter 5 discussed the results, conclusions, and nursing practice implications of the study. A positive correlation was found between tactile assessment, and forehead and axillary temperatures. A positive correlation was found between the tactile assessments of the post-anesthesia recovery room nurses and the investigator. A positive correlation occurred between forehead and axillary temperature. There was no correlation found among the other variables and axillary temperature. A weak, negative correlation occurred between post-anesthesia recovery room nurses' hand temperature and tactile assessments.

Nursing implications of the study support the use of tactile assessment as a screening method. Care of the patient can be influenced by knowledge about the post-anesthetic patient's temperature in general, and by the specific temperature of the patient upon arrival to the post-anesthesia recovery room.

Study limitations and potential sources of error were identified. Generalizability of the study is limited, due to the use of a single facility, and the lack of random selection of the sample. Sources of error included situational, response set biases, transitory personal factors, and administration variation.

Recommendations for further study conclude the chapter. Further study of the use of touch in temperature assessment is suggested. The relationship between tactile assessment and nursing interventions is an area for study. The role of learning of the skill and increasing accuracy are also suggested for further study.

APPENDIX A

DISCLAIMER AND CONSENT FORMS

TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHETIC PATIENT

Post-Anesthesia Recovery Room Nurse Disclaimer

You are being asked to voluntarily participate in the study of tactile assessment of temperature of the post-anesthetic patient. The purpose of the study is to answer the research questions of:

1. Are tactile assessment of temperature and axillary temperature of the patient associated?

2. Are tactile assessments of temperature done by two persons associated?

The objectives of the study are:

1. To assess patient temperature, using touch.

2. To measure patient temperature using the axillary site.

3. To assess nurse temperature at the time of tactile assessment of patient temperature.

Your name is not on the data collection instrument. A code will identify all information. There is no known risk or benefit to participation. You may withdraw from the study at any time. Whatever you decide, your job will not be affected in any way. Your questions will be answered. A copy of the disclaimer is available to you upon request. The disclaimer will be filed, with access restricted to the principal investigator. There is no cost to participation, and the study will require less than ten minutes of your time.

I have read the above information. The nature, demands, risks, and possible benefits of the study have been explained to me. I agree to participate in the study.

____________________________ Signature

____________________________ Date

TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHETIC PATIENT

Patient Consent

You are being asked to take part in a study of temperature-taking methods in the recovery room, after your surgery. The purpose of the study is to describe the relationship between temperature measured by touching your skin surface, and by taking your temperature with a thermometer under your arm (axillary temperature), and by taking the temperature of your forehead. You will be awakening from anesthesia, and probably will not realize that the activities are taking place. Your body will not be exposed. The study will take about five minutes. Other nursing care will not be interrupted by the study. There will not be any cost to you.

Your name is not recorded. All information about you will be seen in coded form. Information about you includes your age, sex, height, weight, and anesthesia type. I will be the only person that has access to the information gathered.

You may chose not to participate, or to withdraw from the study at any time. Regardless of your decision, your care will not be affected in any way. Your questions will be answered. There is no known risk or benefit to participation.

I have read the above information. The nature, demands, risks, and benefits of the study have been explained. A copy of this form is available to me upon request.

______________________________	______________________________
Signature	Date

APPENDIX B

DATA COLLECTION TOOLS

TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHETIC PATIENT

Post-Anesthesia Recovery Room Nurse
Demographic Information

Code #___________

Initials:_________

Age (years):	___________
Sex (M = male; F = female):	___________
Highest level of nursing education (years):	___________
Nursing experience (years):	___________
Post-anesthetic recovery room experience (years):	___________
This facility PAR experience (years):	___________
Palm width (widest point in cm):	___________Right ___________Left

TACTILE ASSESSMENT OF TEMPERATURE OF THE POST-ANESTHETIC PATIENT

Data Collection Record

Patient Data	1	2	3	4	5	6	7	8	9	10
Hospital #										
Age (years)										
Sex (M = male; F = female)										
Height (cm)										
Weight (kg)										
Anesthetic (G = general; R = regional)										
Temperature Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Patient (forehead, °C)										
PAR RN (hand, °C)										
Investigator (°C)										
Tactile (H = hot; W = warm; N = neutral; CL = cool; CD = cold): PAR RN										
Investigator										
Patient Axillary (°C)										
Room Temperature (°C)										

PAR Nurse Code #______

APPENDIX C

HUMAN SUBJECTS COMMITTEE APPROVAL

THE UNIVERSITY OF ARIZONA COLLEGE OF NURSING

MEMORANDUM

TO: Susan Thornton
2955 E. Chula Vista Drive
Tucson, AZ 85716

FROM: Ada Sue Hinshaw, PhD, RN ASH
Director of Research

Katherine J. Young, PhD, RN
Chairman, Research Committee

DATE: June 18, 1984

RE: Human Subjects Review: Tactile Assessment of Temperature of the Post Anesthetic Patient

Your project has been reviewed and approved as exempt from University review by the College of Nursing Ethical Review Subcommittee of the Research Committee and the Director of Research. A consent form with subject signature is not required for projects exempt from full University review. Please use only a disclaimer format for subjects to read before giving their oral consent to the research. The Human Subjects Project Approval form is filed in the office of the Director of Research if you need access to it.

We wish you a valuable and stimulating experience with your research.

ASH/fp

TUCSON MEDICAL CENTER
YOUR COMMUNITY OWNED HOSPITAL

June 27, 1984

Sue Thornton, RN, BSN
c/o Lupe Olivas, Research & Development Coordinator
Patient Care Resources
TMC

Re: Tactile Assessment of Temperature of the Post-Anesthetic Patient

Dear Sue:

As chairman of the TMC Human Research Committee, I have reviewed the protocol and consent form submitted in connection with the above-named research study and am pleased to grant interim approval, allowing you to begin your project at this time.

This approval is limited and temporary pending review of your study by the full committee at its regular meeting, scheduled for Tuesday, August 7, 1984 at 7:30 a.m. in the Ocotillo Room, directly across from the Cafeteria. Please plan to attend this meeting to present your study and respond to any questions the committee may have. We also request that you have the following information available:

How many TMC patients do you anticipate will be involved in your research in 3 months? in 6 months?

What method of subject recruitment do you plan to use?

~~Which investigator is a member of the TMC medical staff?~~

Kindly call Julie Sandoval, committee secretary, at extension 1985 to verify your receipt of this letter and plans to attend the meeting. Should you have questions in the interim, please feel free to contact me at extension 5332.

Sincerely,

Ronald P. Spark, MD
Chairman
TMC Human Research Committee

jrs

TUCSON MEDICAL CENTER
YOUR COMMUNITY OWNED HOSPITAL

July 2, 1984

Mrs. Susan Thornton, RN, BSN
2955 E. Chula Vista Dr.
Tucson, AZ 85716

Dear Mrs. Thornton:

Your educational project entitled, "Tactile Assessment of Temperature of the Post-anesthetic Patient," has been reviewed and approved by Patient Care Resources and the Nursing Education and Research Department for student affiliation, research subject informed consent and confidentiality and institutional impact. The Human Research Committee has also given you interim approval (see attached letter).

Mary Hughes, Patient Care Manager, PAR, and Lorraine Ryan, Director, Surgery Services, have been designated as your clinical liaison contact persons.

Please review the attached data collection policy and procedure materials, which you are expected to follow. If you have any questions, please contact Guadalupe Olivas at ext. 5512.

We wish you a valuable and stimulating research experience.

Sincerely,

Guadalupe S. Olivas
Guadalupe S. Olivas, RN, MS
Coordinator, Publications & Research
Nursing Education & Research

Nancy K. Underly
Nancy K. Underly, RN, MHCM
Administrator
Patient Care Resources

Linda J. Perlich
Linda Perlich, RN, MS
Assistant Director
Nursing Education & Research

Lois Hopkin
Lois Hopkin, RN, BSN
Director
Nursing Education & Research

GO:ke
cc: L. Ryan
M. Hughes

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