DOWNLOAD PDF MANAGEMENT OF THERMAL STABILITY PAULINE FELLOWS

Chapter 1 : ANS / Publications / Journals / Nuclear Technology

Management of Thermal Stability. By PAULINE FELLOWS. Pages Thermal control has to be initiated by the infant at birth. When born early or in poor condition, the.

The procedure uses equipment that can provide both qualitative and quantitative representations of these temperature patterns. Thermography does not entail the use of ionizing radiation, venous access, or other invasive procedures; therefore, the examination poses no harm to the patient. Clinical thermography is appropriate and germane to health care practice whenever a clinician feels a physiologic imaging test is needed for differential diagnostic purposes. Clinical thermography is a physiologic imaging technology that provides information on the normal and abnormal functioning of the sensory and sympathetic nervous systems, vascular system, musculoskeletal system, and local inflammatory processes. The procedure also provides valuable diagnostic information with regard to dermatologic, endocrine, and breast conditions. Clinical thermography may contribute to the diagnosis and management of the patient by assisting in determining the location and degree of irritation, the type of functional disorder, and treatment prognosis. The procedure may also aid the clinician in the evaluation of the case and in determining the most effective treatment. Clinical thermography is an acceptable analytical procedure that may be performed by a doctor or technician who has been adequately trained and certified by a recognized organization. However, it is strongly recommended that the interpretation of the thermal images be made only by health care providers who are licensed to diagnose and hold credentials as board certified clinical thermographers or fellows from a recognized organization. This is meant to insure that directed care and proper follow-up recommendations will be made available to the patient if warranted by the interpretation of the images. There are two currently recognized methods of clinical thermographic imaging: The following terminology is commonly used interchangeably for clinical thermographic analysis and computer interfaced infrared thermography systems: As part of image quality control, the design and environmental conditions of the room should conform to the thermodynamic attributes required in thermal image acquisition. The room itself should be of adequate size to maintain a homogenous temperature. There must be sufficient space for the placement of equipment and freedom of movement for both the technician and patient. It should also be large enough to allow for patients of all sizes to be positioned adequately for each anatomic image. Larger rooms may also be used as long as a steady ambient temperature can be maintained see Environmental Controls section below. During the examination, the patient should be able to be placed relatively equidistant and adequately spaced from each wall. The room should be carpeted. If this is not possible, a well-insulated area rug will suffice. A complete infrared survey of the room should be performed to inspect for any infrared sources and leakage i. Any significant findings need to be remedied. All windows must be covered or shielded to prevent outside infrared radiation from entering the room. Shades or blinds may be adequate for this purpose depending on the amount of direct infrared radiation. The room must be free from drafts. Windows and doors should be adequately sealed to prevent airflow in the area where the patient is positioned. Heat and air conditioning sources must be minimized in the room and kept well away from the patient. Vents should be directed away from the patient and thoroughly diffused or turned off during the examination. Incandescent lighting should not be used during the examination due to the amount of infrared radiation produced. Standard fluorescent lighting is adequate. The temperature range should be maintained between 18 and 23 degrees C. Room temperature changes during the course of an examination must be gradual so that steady state physiology is maintained and all parts of the body can adjust uniformly. The temperature of the room should not vary more than one degree Celsius during the course of a study. The humidity of the room must also be controlled such that there is no air moisture build up on the skin, perspiration, or vapor levels that can interact with radiant infrared energy. The examining room must have an ambient temperature thermometer to accurately monitor the temperature of the room. There are two currently recognized types ofthermographic imaging equipment: LCT utilizes a range of interchangeable

"screens" or "pillows" impregnated with cholesteric methyl-ester derivatives that change color as a function of their temperature. The "screens" or "pillows" are touched to the anatomic surface for development. A 35mm or Polaroid picture of the image is taken for later analysis and archive. The thermal precision and resolution of the equipment is well within accepted limits for clinical interpretation. IRT equipment incorporates single or multiple infrared detectors that sample the field-of-view in two directions simultaneously. The process does not involve contact with the surface of the skin. A current review of the literature suggests that in order to produce accurate and reproducible diagnostic images the following minimum specifications should be incorporated in the design of clinical IRT hardware and software systems: Detector s response greater than 5 microns and less than 15 microns with the spectral bandwidth encompassing the micron region. Repeatability and precision of 0. Spatial resolution of 1 sq. Limiting temperature windows of 5 and 10 degrees C. Significantly variable contrast level settings. A maximum scanning time of 4 seconds or less with real-time capture preferred. Ability to perform accurate quantitative differential temperature analysis with a precision of 0. Ability to capture images in hi-resolution grayscale. High-resolution image display for interpretation. Ability to archive images for future reference and image comparison. Software manipulation of the images should be maintained within strict parameters to insure that the diagnostic qualities of the images are not compromised. There are many different types of thermal detection devices available that may be used for specific purposes i. A brief summary is given below regarding some of these devices. Dual Sensor Paraspinal Devices: These devices are designed to be hand-held and moved by the operator up or down the spine over the paraspinal surfaces. The equipment is composed of a linear array of two spot radiometers infrared sensors spaced adequately to straddle the spine and interfaced to a hard-copy readout device or computer. This creates a system best defined as surface thermometry or computerized surface thermometry if a computer interface is used. If enough plotted data is displayed for analysis i. Earlier contact devices using thermocouples or thermistors have been replaced with infrared sensors to avoid the inherent errors produced when instruments of this type are used. These current infrared devices are limited in their use to the evaluation of conditions arising from the area of the spine and paraspinal tissues. If the device is manufactured to the strict minimum standards imposed on all quality clinical infrared devices i. A current review of the literature concerning infrared sensor instruments of this type suggests that in order to produce accurate, reproducible, and clinically relevant thermal data the followingminimum specifications should be incorporated in their design: An infrared detector response greater than 5 microns and less than 15 microns with the spectral bandwidth encompassing the micron region. Accurate data repeatability in temperature value and location. A direct linear correspondence between the distance traveled, anatomic location and the displayed temperature values. Controlled infrared beam collimation to prevent sensor cross-talk. Within a reasonable range of distance from the skin, the recorded temperature, and the spot size being measured, should not vary. The skin surface covered by the sensor must be controlled within a small enough area to yield data with which a sufficiently detailed graph can be produced. A sufficient number of infrared samples must be taken in order to maintain an adequately detailed graph resolution. The number of samples taken should be equivalent to the minimum standards of acceptable camera systems. Ability to perform accurate quantitative differential temperature analysis. Past research has determined that microwave thermography has some limited value in the evaluation of the breast. Studies have demonstrated that certain inherent problems exist with this technology. Research on this technology suggests that infrared telethermography or liquid crystal thermography is better suited for clinical use Single Sensor Devices: The devices in this category are usually designed to be hand-held and moved by the operator over a particular area of the skin or to areas of the body where single spot temperature readings are taken i. Thermal detection devices that fall into this category are best described as surface thermometry. Most of these devices are designed using a single spot radiometer infrared sensor. If the device incorporates the need for surface contact i. Incorporation of a computer interface to the sensor creates a system best defined as computer enhanced surface thermometry. There is no available research in the body of literature to support the use of this type of equipment for full body or breast analysis. It is not considered

suitable as it suffers from many data acquisition problems, notably of which is an extreme lack of absolute and spatial resolution. Thermal detection devices that fall into this category are usually composed of 3 or more spot radiometers infrared sensors interfaced to a hard-copy readout device or computer. This creates a system best defined as surface thermometry or computer enhanced surface thermometry if a computer interface is used. These devices may be mounted on a movable stand or hand-held by the operator and passed over the surface of the skin. There is no available research to support the use of this type of equipment for breast analysis. It is not considered suitable as it suffers from many data acquisition problems, notably of which is a lack of absolute and spatial resolution. Depending on its design, many other inherent problems may also prevent its use for anything other than simple surface temperature analysis. Equipment of this type usually incorporates the same type of spot radiometers infrared sensors as those used in similar surface scanning devices. As such, the same minimum design specifications are recommended in order to produce accurate, reproducible, and clinically relevant thermal data. The skin surface covered by the sensor must be controlled within a small enough area to yield data with which a sufficiently detailed graph or image can be produced. A sufficient number of infrared samples must be taken in order to maintain an adequately detailed graph or image resolution. Pre-examination preparation instructions are of great importance in decreasing thermal artifacts. The following is a minimal list of instructions that should be given to the patient prior to the examination: No sun bathing of the area to be imaged 5 days prior to the exam. No use of lotions, creams, powders, or makeup on the body area to be imaged the day of the exam. If any body areas included in the images are to be shaved, this should be done the evening before the exam or at least 4 hours prior to examination.

Chapter 2 : Thermography Guidelines. Standards and protocols.

Contents: Evidence based practice / Fiona Hutchinson -- Developmentally focussed nursing care / Tilly Reid & Yvonne Freer -- Families in NICU / Sue Turrill & Liz Crathern -- Resuscitation of the newborn / Glenys Connolly (nee Boxwell) -- Management of thermal stability / Pauline Fellows -- Management of respiratory disorders / Simone Jollye & David Summers -- Management of cardiovascular.

Modeling and Simulation of Complex Systems Institution: Mississippi State University Goals: The major focus of this RII Track-1 project is the merging of biology and chemistry through computational investigation and simulation. The project seeks to do this by 1 linking molecular modeling to macroscale physiology, 2 deploying high-level data mining, and 3 modeling nanoscale structures to understand binding interactions and catalytic processes. The biological simulation efforts are broad, ranging from whole body physiological modeling methods to specific modeling of problems such as particle deposition in upper lung airways. The computational biology effort centers on developing new methods for integrating functional genomics information from high-throughput sources such as microarrays and next generation gene sequencers. The computational chemistry effort is geared towards theoretical characterization of nanomaterials for sensor technologies, and the development of models to predict the effects of nanomaterials on health and the environment. This project seeks to capitalize on previous Research Infrastructure Improvement RII investments by strengthening the quality of research in each of the research foci, increasing the statewide collaborations in each area, and establishing meaningful collaborations in the emerging research areas. Underpinning all of the research components are the establishment of needed cyberinfrastructure and the integration of education at all levels. As such the projects focus on problems of practical significance simulation of inhalation exposure to nanoparticles and the resulting deleterious effects on respiratory and cardiovascular function ; propose new models for learning biological networks that combine Bayesian learning and numerical optimization and can lead to novel approaches for explaining model response; and explore new theoretical characterization of nanoscale materials with particular emphasis on using quantum mechanics QM to predict changes in structure and electronic properties of nanomaterials for sensors, and use Quantitative Structure-Property Relationship QSPR and Quantitative Structure-Activity Relationship QSAR models to predict nanotoxicity. Broader Impacts This project will impact the diversity of the computational sciences community of faculty and students in Mississippi and contribute to the development of a skilled workforce that will assist Mississippi in transitioning to a knowledge-based economy. It will also contribute to the broader computational sciences community by investigating specific complex biological systems and processes with significant societal impact. When clicking on a Digital Object Identifier DOI number, you will be taken to an external site maintained by the publisher. Some full text articles may not yet be available without a charge during the embargo administrative interval. Some links on this page may take you to non-federal websites. Their policies may differ from this site. Structural, Thermodynamic, and Spectroscopic Studies. Munroe, Katherine; s, David; Hammer, Nathan;. Sivakumar, Sujatha; Meghanathan, Natarajan;. Application of Analytic Gradients for the 2-body: A Superstable Plasmonic Liu, Sheng; Chen, Yixin; , Dawn;. Effects of Selection, Recombination, and Gene Conversion. Sun, Chengjun; Ritchie, Jason E. Teng, Fei; en, Yixin; Dang, Xin;. Yu, Xiaozhen; Sigler, Sara C. Gadogbe, Manuel; Ansar , Siyam M. Kusic, Hrvoje; Leszczynska, Danuta. Liu, Sheng; Patel, R. Zhang, Dongmao; Shi, Sheldon Q. Tools for research and evaluation. Saha, Soumen ; Dinadayalane, Tandabany C. Saha, Soumen; Dinadayalane, Tandabany C. Crasto, David Dass, Amal. Eyiler, Ersan Walters, Keisha B. Leszczynska, Danuta Leszczynski, Jerzy R.. Leszczynska, Danuta Leszczynski, Jerzy. Gorb, Leonid Hovorun, Dmytro M. Karabulut, Sedat Leszczynski, Jerzy. Nguyen, Huyen Thi Majumdar, D. Leszczynski, Jerzy Nguyen, Minh Tho. Comparative Study of C? Zhang, Song Pruett, William A. Bogatu, Corneliu Leszczynska, Danuta. Zou, Shengli Pittman, Charles U. Gorb, Leonid Hill, Frances C. Leszczynski, Jerzy Rozhenk, Alexander B.. Sun, Chengjun Ritchie, Jason E.

Keith; Valente, Edward J. Implication to Chemical Enhancement,".

Chapter 3 : Neonatal intensive care nursing /

A comprehensive text for experienced nurses and midwives caring for sick newborn babies. It should enable nurses to recognise, rationalize and remedy problems using both a multi-systems and an evidence-based approach.

She is course leader to the ENB A19 programme. Her special interests are management issues within the neonatal unit and neonatal nursing policy and practice. He has written on paediatric day surgery, postoperative nausea and vomiting in children and paediatric resuscitation. Her interests include pain in neonates, teaching and research, and audit. Her interests include paediatric anaesthesia including sedation for paediatric procedures and paediatric day surgery. Her interests are neonatal family care issues. Her research interests include family dynamics and developmental care. She has developed modules on both topics within the SA19 curriculum. She has also developed a model of care which is implemented in the curriculum and in several local units. Her interests include pain management, ethics and professional development for neonatal nurses. She is a founding member of the Australian Neonatal Nurses Association and was awarded the Member of the Order of Australia in for services to neonatal nursing. Not only do newborn infants, potentially, get sicker quicker than any other category of patient, they are also becoming increasingly premature. Within this context there has arisen an expectation by both the public and professionals that the survival of extremely sick or premature infants is the norm. Neonatal intensive care nurses play a key role in ensuring that the best possible care is delivered to this vulnerable population. Working in conjunction with other professional groups, they are primary care givers and are pivotal to the successful outcome of treatment. The focus of this textbook is upon intensive care as it relates to common occurrences in everyday neonatal nursing situations incorporating the information and evidence currently available. Whilst, without doubt, rare cases are fascinating, they are encountered so infrequently in everyday practice that each time they occur specialist advice should must be taken, which usually results in the infant being transferred to a specialist centre. Unfortunately, these unexpected and infrequently encountered situations are often the impetus for practitioners to undertake further investigation and research to discover more about the unusual condition and its management. In addition, there can be a tendency of not questioning the rationale as to why situations are managed in a particular way. The consequence of this is that events occurring in everyday practice are often not looked at analytically as to why they have occurred, the focus being on how they are going to be managed. It is for this reason that this book takes a rather different approach from most neonatal textbooks, in that the contributors have not attempted to cover every aspect of care and management of infants within the neonatal unit setting. Its focus is upon intensive care and the common occurrences that are present within everyday neonatal nursing situations. Many nurses reading this book will encounter much of what it contains every working day, and all readers will encounter the clinical situations described at some point The aim of the text is to highlight why situations and conditions may have occurred incorporating embryological and developmental contributory factors, as well as a physiological perspective, so that nursing actions and interventions can be based on the information gained. The nursing management of any particular situation is not presented in a detailed prescriptive fashion, neither are protocols for practice included as these will vary from unit to unit and between individual nurses assessing specific individual infant needs. Rather, it is intended that each chapter should present information that will enable the nurse practitioner to make rational decisions in order to initiate and implement nursing interventions more effectively. Each chapter contains a wealth of referenced material that can be applied in everyday clinical practice. Chapters contain one or more brief case scenarios or activities in which a critical thinking process can be exercised with regard to a particular situation. As infants do not exist in isolation, the family unit within the intensive care situation is a major consideration and consequently all of the chapters should be read in conjunction with the chapter specific to family care, which focuses on supporting families through their experiences. Likewise, developmental care and ethical issues need specific consideration in the context of each of the systemspecific chapters. Glenys Boxwell and Routledge would like to thank the

following people for their helpful advice during the development process: Expressed in number of completed weeks or days gluconeogenesis formation of glucose from a non-carbohydrate source, e. Within the specialty of neonatal intensive care, technological improvements have resulted in decreased neonatal mortality but increased neonatal morbidity Williams As neonatal nursing becomes more technical, neonatal nurses have had to adapt their care provision accordingly. The first part of this chapter examines some of the key factors influencing the development of the role of the neonatal nurse. This includes the introduction of the Advanced Neonatal Nurse Practitioner ANNP into the skill mix as one potential means of strengthening the professional development of the neonatal nurse whilst remaining in clinical practice. Some of the legal considerations surrounding the introduction of ANNPs into the skill mix will be explored. As the health service moves more and more towards the notion of evidence-based practice, it is imperative that neonatal nurses are educationally prepared to develop their skills in providing evidence-based care. Being active and critical consumers of research is one important way of ensuring this NHS Executive, The final part of this chapter analyses the broader concept of evidence-based practice and explores the contributions that neonatal nurses and parents can make to the provision of evidence-based neonatal care. Factors influencing the development of the neonatal nurse role Nursing has evolved through several philosophical eras. These courses tended to be task-orientated, were not transferable and had no academic recognition Scott The development of the nursing process, with its philosophy of humanistic existentialism, in the s aimed to replace the task-orientated, traditional model of care and foster the ethos of individual rights and informed choice Elliot In neonatal nursing practice this was manifested by the introduction of family-centred care nursing models Casey During the s and s more attention was focused on the provision of post-registration courses such as the ENB , , , and courses, these educational programmes being considered as the basic requirements for nurses wishing to develop clinical and theoretical expertise in neonatal care. One of the driving forces for this initiative was the identification of a lack of nurses qualified in specialty NHS Management Board Most universities are now offering the ENB course at degree level in keeping with consumer demand, as more and more nurses enter the specialty as a diplomate. They recognised that there is confusion surrounding titles, roles and responsibilities and state that advanced practice is not about tasks but a broader concept of nursing, midwifery and health visiting practice and is particularly concerned with advancing the practice of others. The latter statement would suggest that advanced practitioners are also to play a major role in teaching in the clinical area UKCC In order to provide an advanced level of nursing practice, it is essential for nurses to have the appropriate theoretical knowledge to underpin their practice, but what is an appropriate level of theoretical knowledge? It must be remembered that this is not only an educational debate, but also an ethical one, because nurses have a duty to provide a standard of care commensurate with their knowledge base UKCC Oldnall warns that if nursing wishes to be recognised as an academic, practice-based profession it should establish what is unique to nursing and not depend entirely on other disciplines such as medicine and physiology to generate knowledge. Castledine sums up the debate succinctly by reinforcing the point that nursing is not second-class medicine but first-class health care. The introduction of ANNPs into the skill mix has caused controversy, as some authors e. Yeo view the role as medical and task-orientated. However, Casselden , whilst acknowledging that her role is medically-orientated, describes how she is able to draw on her nursing skills and experience to provide a holistic approach to care. Walsh , in a study comparing nurses and nurse practitioners, found that nurses rated the technical aspects of their work higher than the nurse practitioners. The preparation for the role of ANNP appears to be an important factor in determining to what extent nurses retain their nursing identity. It is essential that nurses do not lose their identity and undermine the values of the nursing profession in their eagerness to expand areas of practice. The developmental history of the Advanced Neonatal Nurse Practitioner role The nurse practitioner role originated in the USA in the s in response to increased awareness of inequalities in access to health care. The aim of the first demonstration project was to determine the safety and efficacy of nursing practice specifically designed to improve the health care of children and their families Snyder and Mirr They had undergone 24 months of training to improve their knowledge and skills relating to child care. Over the next 30

years the role expanded to include care of other client groups. Neonatal Nurse Practitioners became popular in America during the s and s. Their popularity was prompted by the increased use of technology in neonatal care in conjunction with a recognised shortage of appropriately qualified medical personnel. It must be mentioned that the motivation was also financially driven to reduce medical costs Modica et al. Initial studies undertaken at this time for example Martin et al. Wessex Regional Health Authority was the first to propose a regional training programme for neonatal nurses. Since the Wessex initiative, several more institutions in the UK have developed formal programmes for either advanced neonatal practice, specialist practice or enhanced neonatal practice and it is here that the confusion exists. Salussolia provides an interesting dialogue about the confusion with differing titles used to describe levels of nursing practice and Frost suggests that the issue is not about what titles professionals use but what frameworks are established to differentiate between roles and competencies. Whatever the decision made, it is essential to take cognisance of the legal implications of advanced practice. Legal aspects of advanced neonatal nursing practice Inevitably, advancing neonatal nursing practice involves undertaking work previously done by doctors, such as task-orientated work see Chapter 13 , clinical decision-making and communicating with parents. Such an increase in professional responsibility also leads to a commensurate increase in legal responsibility Tingle Whilst The Scope of Professional Practice UKCC clearly states that nurses should not undertake any skill they have not been adequately prepared to carry out, Dimond warns that the inexperienced do not always know their limitations, and suggests that the Scope of Professional Practice document is not prescriptive enough, as the determination of competence is left very much to the individual practitioner. The GMC and BMA are in agreement that the doctor must be the delegator and manager of care and it is the doctor who decides whether the nurse practitioner can undertake medical procedures. This is in direct contrast with the UKCC document which seems to assume a degree of nursing autonomy and power which is not, as stated previously, reflected in medical guidelines. To date, this dilemma has not been resolved, but there is every indication that a rewrite of guidelines for practice for both nursing and medical staff is imminent. On a more optimistic note, there are several ways in which neonatal nurses can advance their practice, as the following section illustrates. Potential areas in neonatal care for advancing neonatal nursing practice In intensive care and high dependency care areas, some ANNPs are currently working on rotas with Senior House Officers. Critics of this model have suggested that it is impossible to provide holistic care as the ANNP may be called to insert intravenous lines or attend the delivery suite to resuscitate a baby at any time, therefore holistic care is not possible. There is also debate about how much nurse practitioners are able to advance their role in an intensive care area without losing sight of their nursing background. Casselden , as mentioned previously, describes an eclectic role for the ANNP working on the SHO rota as well as being unrostered to take part in midwifery, nursing and medical staff training. Care after discharge from hospital is also a potential area for role development, especially as more and more babies are being discharged into the community earlier, some still requiring oxygen. In the USA, there is evidence to suggest a shift to community-based neonatal care. They emphasise the importance of preparation for such practice such as the ability to provide research-based, quality care. Whilst acknowledging the differences between the two countries with regards to health care provision and nurse education, this is certainly an area which the UK nurse practitioners could move towards as an alternative to the hospital setting. For example, ANNPs could be at the forefront in setting up high-risk follow-up clinics and establishing regular resuscitationtraining sessions for parents and other interested parties. This innovation would complement the role of the community liaison neonatal nurse. As the role of 6.

Chapter 4 : High Resolution Thermal Imaging of Waste Packages

By PAULINE FELLOWS. View abstract. chapter 5 Management of thermal stability. By PAULINE FELLOWS. View abstract. chapter 5 | 33 pages. Management of respiratory.

DOWNLOAD PDF MANAGEMENT OF THERMAL STABILITY PAULINE FELLOWS

Chapter 5 : Neonatal intensive care nursing - ECU Libraries Catalog

Contents: Evidence based practice / Fiona Hutchinson -- Developmentally focussed nursing care / Tilly Reid & Yvonne Freer -- Families in NICU / Sue Turrill & Liz Crathern -- Resuscitation of the newborn / Glenys Connolly (nee Boxwell) -- Management of thermal stability / Pauline Fellows -- Management of respiratory disorders / Simone Jollye.

Chapter 6 : NICU Nursing - calendrierdelascience.com

Exploring evidence-based practice (EBP) in neonatal care / Fiona Hutchinson -- Developmentally focussed nursing care / Tilly Reid and Yvonne Freer -- Families in NICU / Sue Turrill and Liz Crathern -- Resuscitation of the newborn / Glenys Connolly -- Management of thermal stability / Pauline Fellows -- Management of respiratory disorders / Simone Jollye and David Summers -- Management of.

Chapter 7 : Bulletin of Materials Science | Indian Academy of Sciences

advanced neonatal nursing practice â€¢ developmentally focused nursing care â€¢ resuscitation of the newborn â€¢ management of thermal stability â€¢ management of respiratory disorders â€¢ cardiovascular management â€¢ brain injury in the premature infant â€¢ haematological problems â€¢ pain and comfort in neonatal intensive care â€¢ fluid and.

Chapter 8 : - NLM Catalog Result

Thermal management of the heat produced in ever smaller electronic components is a significant challenge and often limits the performance of CPU's and other high-performance electronics.

Chapter 9 : Quality Management | calendrierdelascience.com

Definition of Clinical Thermography. Thermography, when used in a clinical setting, is a diagnostic imaging procedure that detects, records, and produces an image (thermogram) of a patient's skin surface temperatures and/or thermal patterns.