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Neurological Outcomes in Induced Hypothermic States (Post Cardiac Arrest Resuscitation)

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by

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Abstract

International studies indicate that induced hypothermia in successful Post Cardiac Arrest Resuscitation improves cerebral perfusion resulting in improved neurological function. Patients undergoing a neurological exam prior to induction of hypothermia may indicate potential mortality prognosis in this population. Literature Review indicated the use of the Glasgow-Pittsburg Cerebral Performance Categories for evaluation of neurological status in this population, but most institutions seem to utilize Glasgow Coma Scoring (GCS) in all patient populations for neurological examination. The purpose of this study was to determine if a neurological evaluation prior to and during the Induced Hypothermia state would affect the mortality outcomes in this population. A sample size of fifty five patients (n=55) was chosen from a retrospective quantitative chart review at a hospital in the Piedmont Region of South Carolina. Each patient was successful post cardiac arrest resuscitation and had induction of hypothermia and care in the Coronary Care Unit. A descriptive study was done as a simple logistic regression analysis indicated that the sample size was too small with an alpha level of 0.1. A one-way Analysis of Acute Physiology Scoring (APS), which is a severity of illness score in critical care utilizing APACHE IV methodology, and GCS were completed. The results of this study indicate a nursing implication for this population. Nursing expertise in obtaining a GCS score may need to be increased to determine this patient population outcome.

Keywords: Glasgow Coma Scale, Acute Physiology Scoring, APACHE IV

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To God, for Your never failing love and for the passion You instilled in me to be a nurse.

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Problem Statement

The use of induced hypothermia for medical, or for therapeutic purposes, is not a new concept. Hippocrates advocated packing wounded soldiers in ice, and a surgeon in Napoleon's army kept a record showing soldiers who were kept closer to the fire had a less survival rate than the soldiers left farther away from the fire (Polderman, 2004). Cardiac arrest, outside the hospital setting, kills approximately 250,000 Americans each year, and worldwide the survival rate is 6%. Those who do survive are at risk for neurological injury, and historically about 20% of cardiac arrest patients who remained comatose have awakened with a good neurological outcome (Deckard & Ebright, 2011).

The past decade has shown that therapeutic induced hypothermia, as a standard of care in the post cardiac arrest population, has decreased mortality and improved neurological outcomes, but little has been done to show the assessment of neurological prognosis (Blondin & Greer, 2011). Often neurological evaluations include a neurologist consult, electroencephalography (EEG) and somatosensory-evoked potentials (SEEPS) to evaluate the neurological status of these patients. However, the basic Glasgow Coma Scale (GCS) is routinely the first line of the neurological exam, and is done by nursing at the bedside. A GCS is a neurological assessment that evaluates eyes, motor and verbal response, with a scoring of 15 showing full neurological response to a three indicating no response (Figure 1). This scoring is based on patient response and assessment ability of the bedside RN or physician, which often depends on neurological assessment experience, timing of the exam with sedation or paralytics, and frequency of the examination.

Glascow Coma Scale (GCS)		
Eye Opening Response	Spontaneous--open with blinking at baseline	4 points
	Opens to verbal command, speech, or shout	3 points
	Opens to pain, not applied to face	2 points
	None	1 point
Verbal Response	Oriented	5 points
	Confused conversation, but able to answer questions	4 points
	Inappropriate responses, words discernible	3 points
	Incomprehensible speech	2 points
	None	1 point
Motor Response	Obeys commands for movement	6 points
	Purposeful movement to painful stimulus	5 points
	Withdraws from pain	4 points
	Abnormal (spastic) flexion, decorticate posture	3 points
	Extensor (rigid) response, decerebrate posture	2 points
	None	1 point

Figure 1. Neurological Evaluation for Eyes, Motor, and Verbal response.

http://www.unc.edu/~rowlett/units/scales/glasgow.htm

Determination of cerebral perfusion post cardiac arrest resuscitation depends on early assessment of neurological status and continued assessments, which will determine mortality prognostication. A consistent GCS of three, without paralytics, would indicate a higher level of poor cerebral flow with an adverse outcome of high mortality. Although there has been an increase in research regarding neurological function post cardiac arrest resuscitation, the amount of information in this induced hypothermia population is limited. Standardization of neurological assessment, experience and timing has yet to be demonstrated to show a relationship between GCS and mortality.

Purpose

The purpose of this study was to evaluate if there is a correlation between the neurological exam, the severity of illness, and the mortality outcomes of these patients. If the GCS is to be counted as an indicator of neurological outcomes, then the mortality should correlate. Neurological examination occurs, generally, upon nursing admission assessment and often is not specific to timing of hypothermia induction. Examination by emergency personnel and emergency center RN's is not always consistently reflected in the patient assessment. Without a neurological assessment the determination of successful resuscitation indicates only cardiac function. Induced hypothermia improves the potential neurological outcomes but does not affect the neurological devastation that may have occurred prior to cardiac return.

Significance of the Study to Nursing

Post cardiac arrest resuscitation patients, who are a potential for induced hypothermia, often come from outside of the hospital setting, and frequently a history is unknown. Neurological damage begins when the circulatory collapse impairs oxygen flow to the brain, disrupts the blood brain barrier, and worsens cerebral edema (Deckard & Ebright, 2011). The American Academy of Neurology (AAN) practice parameters do not take into consideration the potential influence of induced hypothermia. The American Heart Association (AHA) (Peberdy, Callaway & Neumar, 2010), acknowledged that traditional data used to determine a poor neurological prognosis was less reliable in patients treated with therapeutic hypothermia. As therapeutic hypothermia is now widespread in practice there will need to be new guidelines to address accurate assessment in this population (Blondin & Greer, 2011).

Research Question

In this study the underlying question investigated is "Does a neurological evaluation prior to or during induced hypothermia state affect the mortality outcomes of post cardiac arrest resuscitated patients?"

Conceptual Framework

Nursing theory has become a major theme to nursing practice over the past 50 years because of the phenomenal growth in nursing education and literature. Application of theory to research utilizes those conceptual frameworks and gives credence to the process. According to Alligood (2004):

> Nursing practice settings are complex and the amount of data confronting nurses is virtually endless. Nurses must analyze a vast amount of information about each patient and decide what to do. A theoretical approach helps practicing nurses not to be overwhelmed by the mass of information, and to progress through the nursing process in an orderly manner (p. 247).

Faye Abdellah is known for her work in the public health system, as well as her leadership in nursing research development. Her views of nursing indicate that nursing is an art, as well as a science, and that, the technical skills along with the intellectual competencies of the individual nurse is molded in to the ability to help an individual to cope with their health needs (Alligood & Tomey, 2010). Abdellah created 21 nursing problems based on research studies, in which she included Henderson's 14 needs to classify nursing problems (Figure 2). While other theorists focused on nursing care, Abdellah formulated more towards nursing centered services. Abdellah's work is a reflection of a problem-centered approach or as a philosophy of nursing (Alligood &

Tomey, 2010). The grand theory of Abdellah's work focused on the concept that nursing actions are indeed often dictated by medical direction, but that nursing function should be comprehensive towards patient centered care. The 21 Nursing Problems typology was first formulated in 1960, but continued to evolve focusing on patient problems and outcomes. This focus evolution was a change from the previous focus of nursing problems and outcomes. Abdellah's work, in essence, promotes the increasing knowledge base as technology and interventions increase.

TYPOLOGY of 21 Nursing Problems

1. To promote good hygiene and physical comfort
2. To promote optimal activity, exercise, rest, and sleep
3. To promote safety through prevention of accidents, injury, or other trauma and through the prevention of the spread of infection
4. To maintain good body mechanics and prevent and correct deformities
5. To facilitate the maintenance of a supply of oxygen to all body cells
6. To facilitate the maintenance of nutrition of all body cells
7. To facilitate the maintenance of elimination
8. To facilitate the maintenance of fluid and electrolyte balance
9. To recognize the physiologic responses of the body to disease conditions
10. To facilitate the maintenance of regulatory mechanisms and functions
11. To facilitate the maintenance of sensory function
12. To identify and accept positive and negative expressions, feelings, and reactions
13. To identify and accept the interrelatedness of emotions and organic illness
14. To facilitate the maintenance of effective verbal and nonverbal communication
15. To promote the development of productive interpersonal relationships
16. To facilitate progress toward achievement of personal spiritual goals
17. To create and maintain a therapeutic environment
18. To facilitate awareness of self as an individual with varying physical, emotional, and developmental needs
19. To accept the optimum possible goals in light of physical and emotional limitations
20. To use community resources as an aid in resolving problems arising from illness
21. To understand the role of social problems as influencing factors in the cause of illness

Alligood & Toomey, 2010, p.58

Figure 2. Abdellah's Typology of 21 Nursing Problems

Of the 21 Nursing problems, the two that specifically apply to the induced hypothermic patient and neurological evaluation in this study are numbers five and nine (Figure 3). To facilitate the maintenance of a supply of oxygen to all body cells is imperative in the induced hypothermic patient, as cerebral perfusion is dependent on adequate tissue oxygenation. Critical care nurses trained in induced hypothermia protocols are aware of indicators of decreased perfusion, such as vital signs and oxygenation delivery, and maintenance. Without adequate cerebral perfusion the result will be adverse neurological outcomes, therefore identification of oxygenation is essential and is congruent with number nine. Adbellah's ninth problem, "to recognize the physiological responses of the body to disease or conditions, pathologic, physiologic and compensatory" (Alligood & Tomey, 2010, p. 58), works well with neurological assessment utilizing GCS. Changes in eye and motor response are indicators of cerebral injury, as all induced hypothermic patients are on ventilator support and unable to verbalize. With the use of sedation and paralytics, during the cooling phase with shivering (Blondin & Greer, 2011), monitoring motor function may be inhibited, although pupillary response would remain intact. In this study, the physiological derangements demonstrated in APS and the assessment of GCS are parts of Abdellah's conceptual framework of these two nursing problems that are part of the nurses technical skills as well as intellectual competencies.

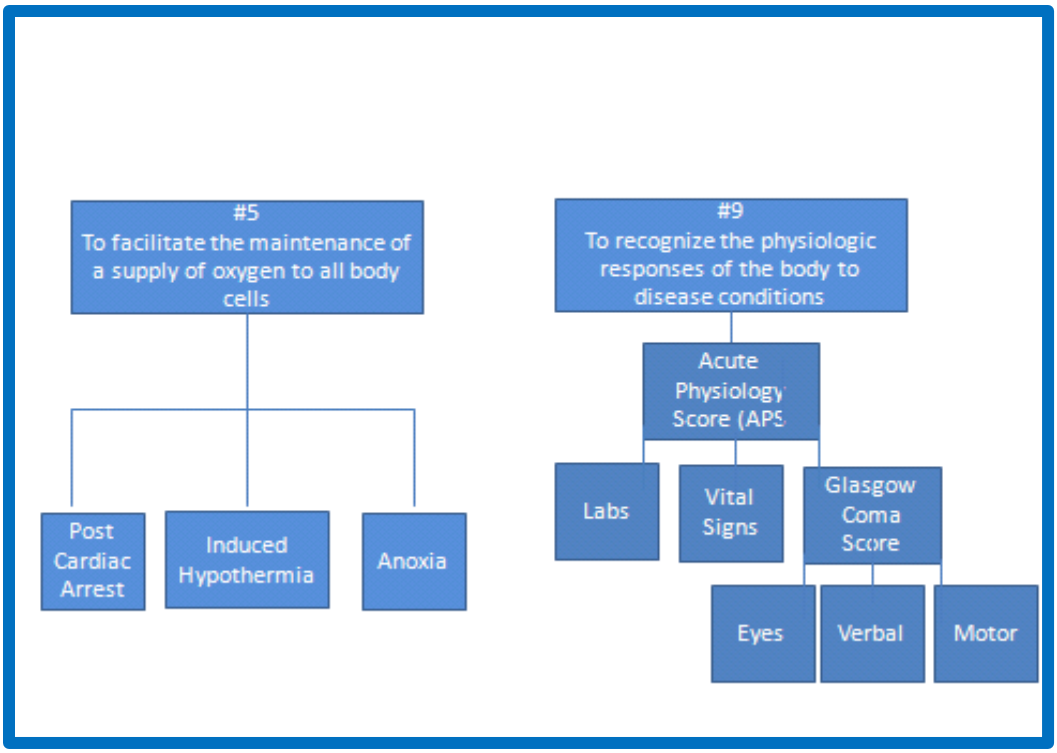

Figure 3. Nursing Problems Model for Induced Hypothermic Patient and Neurological Evaluation (Adapted from Abdellah, 2010)

Definition of Terms

APACHE is a critical care software program that looks at Acute Physiology, Age, and Chronic Health Evaluation to determine an APACHE score, or severity of illness score. Data points needed for this scoring are basic demographics of age, race, sex, select comorbidities, as well as physiological derangements, such as labs and vital signs, including GCS. When using just the Acute Physiology Score (APS), the focus is entirely on the physiological derangements that each patient has. The national average for an APS is set at 42, and an increase or decrease in 5-10 points indicates significance in physiological change. The total score can range from 0-252. (Manganero & Stark, 2010). Patients were obtained from the hospital database, MIDAS. MIDAS was first developed

in 1987 as a quality management solution in the acute care setting, but has expanded to strategic performance management (MIDAS Xerox, 2012). Therapeutic hypothermia is a deliberate reduction of the core body temperature to a range of 32-34 degrees Celsius (or 89.6-93.2 degrees Fahrenheit) in patients who do not regain consciousness post cardiac resuscitation (Deckard & Ebright, 2011).

Summary

Induced hypothermia, post successful cardiac arrest resuscitation, is becoming a widespread practice for those patients who do not regain consciousness post arrest. Nursing is vital to the care of these patients with assessment and delivery of critical care. Neurological evaluation prior to and during induced hypothermia would impact the outcomes in the induced hypothermia patient population, where few prognostic studies have been utilized.

Chapter II

Literature Review

Although much has been written about cardiac arrest outcomes, and even induced hypothermia outcomes, little has been found to demonstrate a prognosis for neurological outcomes and to include mortality outcomes. A search of Cumulative Index to Nursing and Allied Health Literature (1999-2012) and Pub Med (1999-2012), as well as other resources, such as Internet Scientific Publications, The New England Journal of Medicine, and Critical Care Medicine, were used to review induced hypothermia and neurological outcomes.

The first studies in Europe, in which induction of hypothermia within 105 minutes post return of spontaneous circulation (ROSC), demonstrated 55% of 137 patients experienced favorable outcomes. This is comparative to only 39% in standard care post resuscitation (Holzer, 2002). Fewer than 10% of the 300, 000 Americans who suffer a cardiac arrest survive long enough to leave the hospital, even in light of increased public awareness, emergency measures, and CPR techniques. Out of the 140 patients in 2006 treated at the Minneapolis Heart Institute, 52% have survived using this process (Winslow, 2009). With heart disease continuing to be the leading cause of death among men and women in the United States, and an estimated eight million people suffering a myocardial infarction each year, saving lives is paramount. Continuing to compound the severity of this issue is that only 11-48% has a favorable neurological outcome; the rest die or remain in a persistent vegetative state (Laird, 2009).

Induced hypothermia recommendations based on the International Liaison Committee on Resuscitation (ILCOR), the unconscious adult patients with spontaneous

circulation following an out of hospital cardiac arrest, should be cooled to 32-34 degrees Celsius for 12-24 hours. Therapeutic hypothermia should be implemented when an initial rhythm of ventricular fibrillation has been noted (Nolan, Morley, Vanden Hoek, & Hickey, 2003). During cardiac arrest, the brain loses oxygen stores within 20 seconds, which leads to loss of consciousness. In five minutes of the arrest, the brain's source of energy, glucose, and adenosine triphosphate are lost. During this time of loss of blood flow, membranes polarize, calcium influxes, glutamate is released, and acidosis ensues, as well as the lipases, proteases, and nucleases are activated. The effect of therapeutic (induced) hypothermia on cerebral tissue is not yet known, although it is speculated that the action decreases harmful chemical release during hypoxia/anoxia (Zeitzer, 2004).

Understanding the neurological outcomes is very important in this population, but little is still known as to how to accurately assess the outcomes. The most commonly used Glasgow-Pittsburgh Cerebral Performance Categories (CPC) Scale, (Figure 4), is the only outcomes measure that has been published for this population. The scale uses a 1-5 scoring system with one demonstrating a full recovery and five demonstrating death. Based on literature review a, "good outcome" was indicated with a score of 1-2, and a "poor outcome" reflected in a score of 4-5. These findings only indicate that a consciousness has been obtained, and does not reflect a neurological outcome (Blondin & Greer, 2011). Although GCS has been the standard for neurological assessment, in this population the literature has not been large in numbers. Schefold, Storm, Kruger, Ploner, and Hapser (2009) demonstrated a correlation between the CPC scale and GCS scale, using day forur of the patient stay. Their results indicated that monitoring of GCS is a simple and reliable method for clinical outcomes assessment in patients with

induced hypothermia post arrest, although this study used post sedation assessment (Schefold et al., 2009). A study conducted by Sendelbach, Hearst, Johnson, Unger, and Mooney (2011) viewed the CPC scoring in comparison to induction of hypothermia in relation to minutes of target temperature and time post cardiac arrest. The outcome of this study was able to demonstrate that the odds of poor neurological outcomes increased with each five minute delay of induced hypothermia initiation. Although delayed induction, again supports the theory of decreased cerebral perfusion, there was not an indication of prognostication with severity of illness scoring or mortality predictions (Sendelbach et al., 2011). The weight of GCS in APACHE scoring has a range of 0-48 and the scoring was found to predict well to the validation sample. According to Knauss et al. (1991), APS scoring relates to GCS scoring with indication of the lower the GCS scoring the higher the APS range should be (Figure 5). (Knauss et al., 1991).

Cerebral Performance Category (CPC) Scale	Indicators
CPC 1	Full recovery
CPC 2	Moderate disability
CPC 3	Severe Neurological Ability
CPC 4	Comatose or persistent vegetative state
CPC 5	Death

Figure 4. Glasgow-Pittsburgh Cerebral Performance Categories (CPC) Scale

Eyes do not open spontaneously or to painful/verbal stimulation

verbal / motor	oriented converses	confused conversation	inappropriate words and incomprehensible sounds	no response
obeys verbal command				16
localizes pain				16
flexion withdrawal/ decorticate rigidity			24	33
decerebrate rigidity/ no response			29	48

Eyes open spontaneously or to painful/verbal stimulation

verbal / motor	oriented converses	confused conversation	inappropriate words and incomprehensible sounds	no response
obeys verbal command	0	3	10	15
localizes pain	3	8	13	15
flexion withdrawal/ decorticate rigidity	3	13	24	24
decerebrate rigidity/ no response	3	13	29	29

Figure 5. APS related to GCS scoring

Summary of Literature

Literature regarding the topics of induced hypothermia, post cardiac arrest resuscitation, and neurological outcomes in decreased cerebral perfusion is abundant, in that much has been written on each of these topics. If each topic is taken separately, the literature supports that induced hypothermia in post cardiac resuscitation promotes cerebral perfusion, and provides a higher potential for successful mortality, and even neurological outcomes. With the high incidence of cardiac arrest in the United States,

and with the increasing number of medical centers utilizing induced hypothermia, as recommended by the AHA, the literature will continue to increase. Success in this patient population is still under evaluation and researchers are beginning to look at prognostication of neurological outcomes. The tools available to nursing are dependent on nursing assessment using GCS, and if available, GCS-CPC. The evidence of successful cooling, rewarming, and the benefits of induced hypothermia, is well documented in literature. Looking at the precision of neurological assessment in this population and determining the mortality outcomes is limited. Very little was found in this literature review regarding neurological prognostication, although very recent articles demonstrated that research is beginning to focus on the neurological aspect. As to date of this study, a correlation to neurological assessment to mortality was not found.

Chapter III

Methodology

As the purpose of this research is to determine if a neurological evaluation prior to and during induced hypothermia would affect outcomes in the induced hypothermia population, a study was initiated to determine the outcomes. Does a neurological evaluation prior to or during induced hypothermia state affect the mortality outcomes of post cardiac arrest resuscitated patients?

Implementation

A quantitative retrospective chart review was initiated after IRB approval was obtained at Gardner-Webb University and the site facility. The patients were enrolled in the induced hypothermia program at site facility from the time period of January 01, 2010 through February 10, 2012. No consent for this research was required to participate and no risk was posed to the original participants. Only those patients who were identified as induced hypothermia participants at the site facility were selected. A total of 55 patients were obtained from the MIDAS database indicating that these patients were enrolled in the induced hypothermia protocol. The patients were reviewed based on date of admission. There were no exclusion criteria as each patient participated in the protocol. All were post cardiac resuscitation and each patient received induced hypothermia in the Coronary Care Unit. Utilizing the patient account number to access the medical record all charts were reviewed. Each patient was entered into the APACHE OUTCOMES (AO) database system under a virtual ICU MOCK environment, to protect production patient outcomes.

Protection of Human Subjects

Each patient was identified using the code IHP with a chronological number to identify them for data reporting purposes. All data was collected by password-protected access. All data was kept in a locked office with password protected computer access and software password specific protection.

Data Collection Procedure

Day one data was collected, retrospectively by chart electronic chart audit, on each patient and entered into AO. The data points collected were: date of birth, race, and gender, admit source, admit diagnosis, and admit MD. Chronic health identified was diabetes, Chronic Obstructive Pulmonary Disease (COPD), dialysis, immune suppression, solid tumor with metastasis, and liver failure including cirrhosis. Day one vital signs were entered into AO. The software in APACHE identified the midpoint number, and all worst or farthest from the midpoint, numbers were then manually entered into AO. These data points included: temperature, mean arterial pressure (MAP), pulse, respiratory rate, urine output, and GCS. Lab values were also entered using a midpoint supplied by AO with data points being: white blood count (WBC), hematocrit (HCT), sodium, potassium, blood urea nitrogen, creatinine, glucose, and arterial blood gases.

Data Analysis

When all n=55 patients were entered into AO, a business objects report was written and data collected. The report writing included: Identifier (IHP), worst APS, worst GCS, and actual to expected ICU and Hospital Mortality percentages. The business object report provided data to show day one information including APS, GCS, expected mortality, as well as ICU/Hospital discharge status. The discharge status was

reflected as Survivor or Death. AO is software that is utilized at the facility in three of the five critical care units, and has had inter rater reliability testing to determine interface reliability. This data was manually abstracted using the data points provided. The researcher is the AO coordinator, and has responsibility of maintaining the data and verifying the data collection.

Chapter IV

Results

Neurological outcomes, prior to and during the induced hypothermia protocol, affect outcomes in the induced hypothermia population utilizing the GCS assessment, severity of illness (APS), and mortality outcomes are indicators of successful outcomes.

Sample Characteristics

Fifty-five patients were identified as having been enrolled in the Induced Hypothermia protocol by using the MIDAS system at the Upstate Coronary Care Unit to identify enrollees. The mean age was 58.45 with a Median of 58 with a range of 38-81 years of age (Figure 6). Gender was noted to be 17 female and 38 males (Figure 7). No patients were excluded from this study, as mortality outcomes needed to be ascertained as hospital survivors and non-survivors. The mortality outcomes were analyzed using percentages of survived versus non- survivors (Figure 8). Of the non survivors, 22 (40%) died in the ICU, and 9 (16%) died in the hospital, showing a total of 56% of the induced hypothermia patients died in the hospital setting. The 33 survivors were identified as to survival location. There were 15 (45%) who were identified as to hospital discharged to home, four (12%) discharged to Hospice and five (15%) discharged to a skilled facility or Long Term Acute Care Hospital (LTACH).

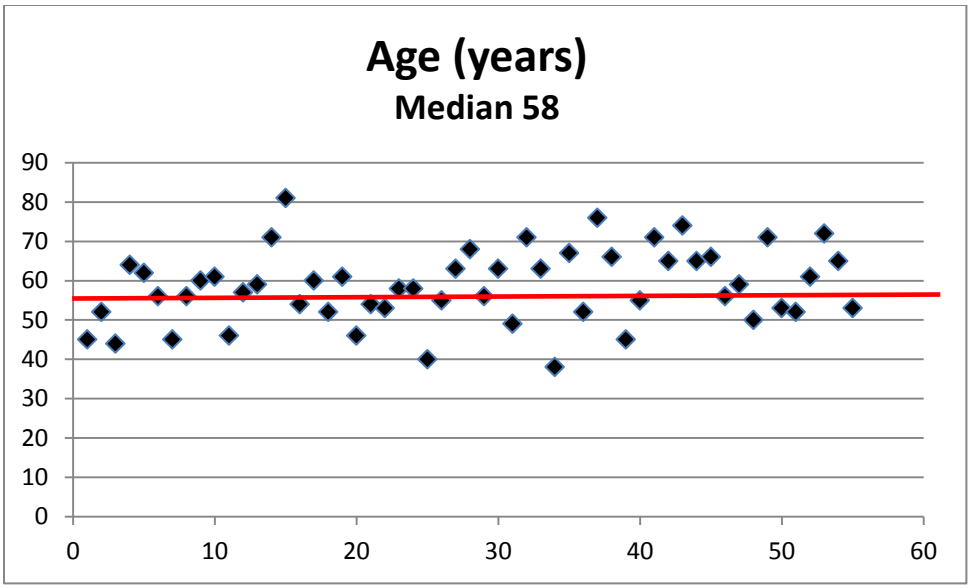

Figure 6. Demographics by Age

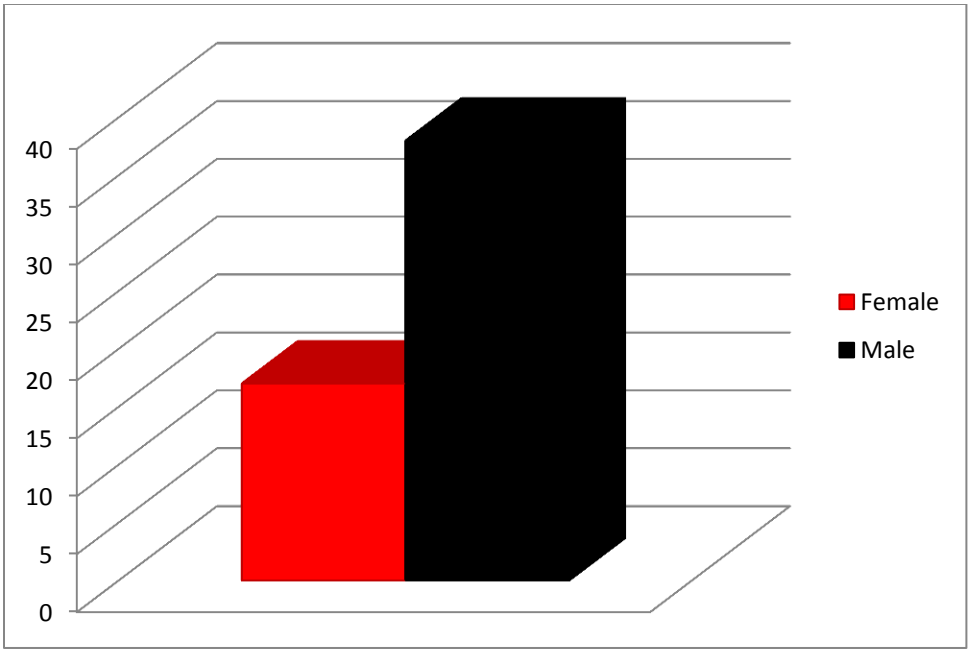

Figure 7. Demographics by Gender

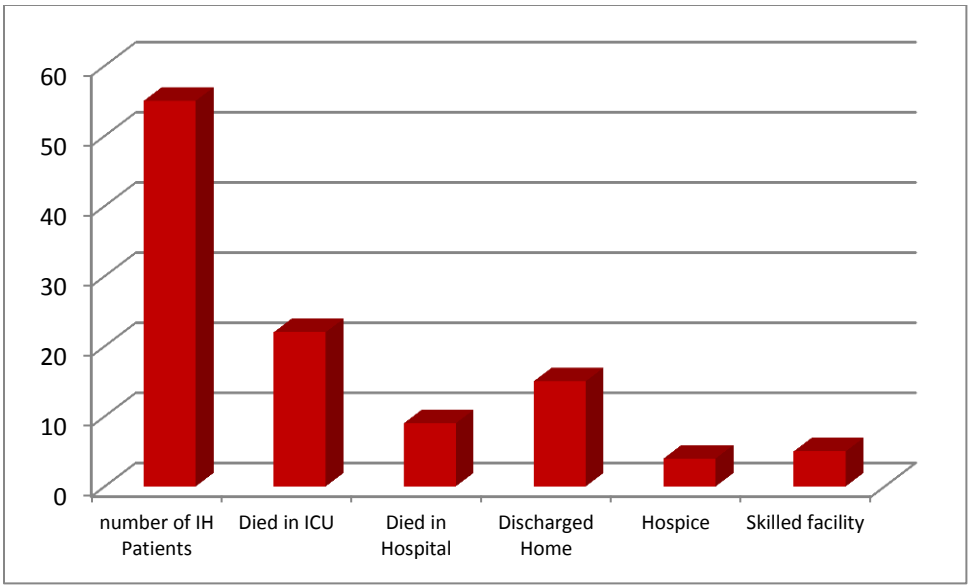

Figure 8. Demographics of Discharge Status

Major Findings

Summary descriptive statistics were used for APS distributions, as well as GCS and Hospital Discharge Status. The mean APS was found to be 86.945, with a national average APS of 42 per APACHE OUTCOMES ©. The standard deviation was found to be 30, with an upper 95% mean of 95 and a lower 95% mean of 78.89. The minimum range was noted to be 35 and a maximum of 160, with a median of 89 (Figure 9). GCS mean was 4, with a standard deviation of 1.33, upper 95% mean of 4.88, and lower 95% of 3.76 (Figure 10). Hospital discharge status was evaluated using a numeric of 1 for living and 0 for non-survivor (Figure 11). The frequencies demonstrated that 31 were hospital deaths, with a probability of 0.56 and living 24 with a probability of 0.43.

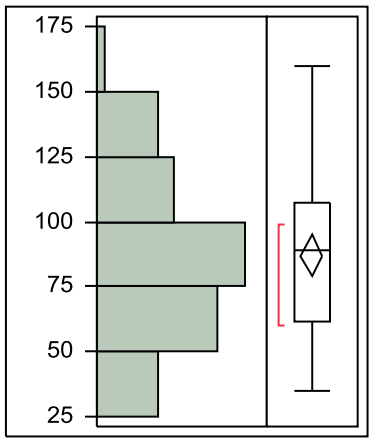

Figure 9. Distributions APS

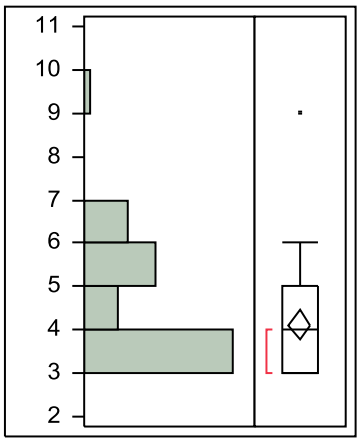

Figure 10. Total GCS

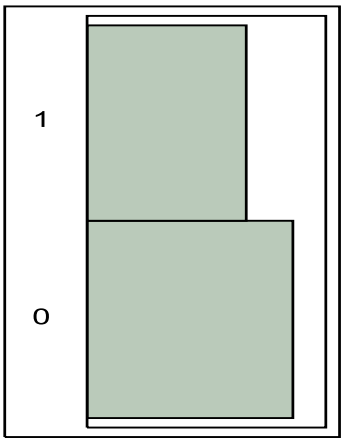

Figure 11. Hospital Discharge Status

A one-way analysis of APS by total GCS was completed using the Wilcoxon/Kruskal-Wallis Test, which demonstrated a probability Chi-Square of 0.8946 (Figure 12). An alpha level of 0.1 was selected due to the small sample size. As this is a pilot study, a higher level of risk is acceptable. A logistic fit of APS by the discharge status was conducted on the data, with a Chi Square probability of 0.0787 was also demonstrated (Figure 13).

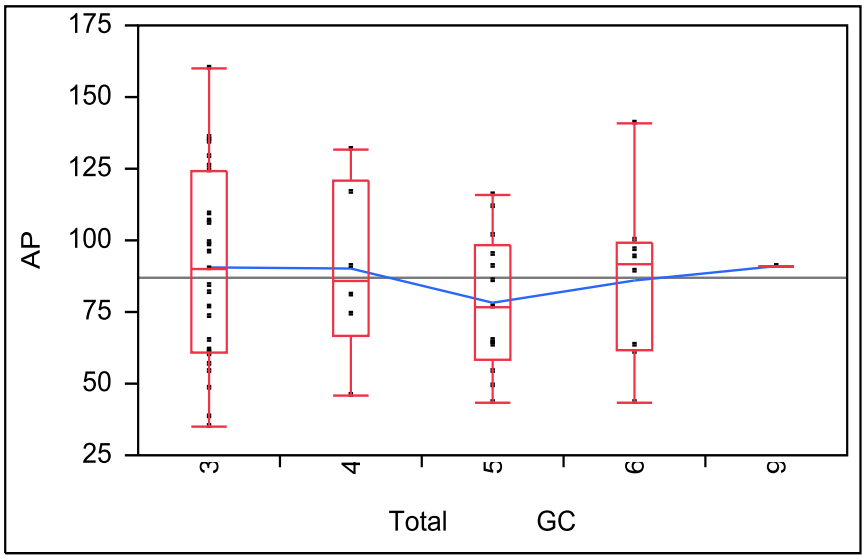

Figure 12. One Way Analysis of APS by Total GCS

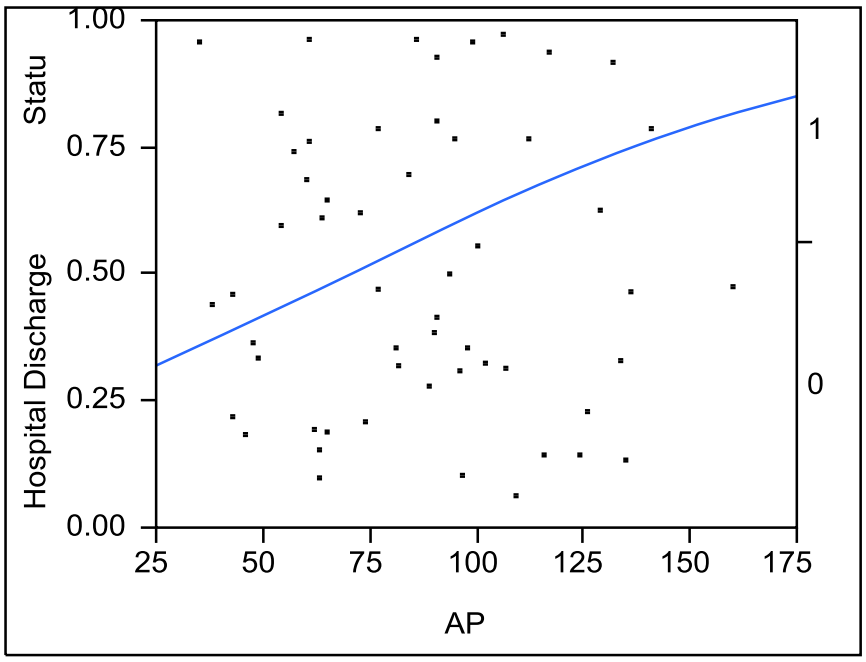

Figure 13. Logistic Fit of Hospital Discharge Status by APS

Chapter V

Discussion

Neurological assessment of the induced hypothermia patient, as an indicator of outcomes, is reflected in the findings represented in this paper, although the sample size proved to be a disadvantage in verification. The wide variances in APS and GCS give indication of neurological assessment accuracy, which impacts the expected mortality outcomes. The expectation would be that the higher the APS and the lower the GCS, the higher the mortality outcomes would be reflected. This study did not indicate those findings sufficiently, which leads to the determination of accuracy of the GCS collection.

Implications of Findings

The implication of this is that there are areas of opportunity to evaluate the neurological assessment expertise of the bedside RN's that are instrumental in the care of the post cardiac arrest patient. In this pilot study the induced hypothermia patients did not have a consistent reflection of GCS assessment prior to hypothermia induction, and the timing of the GCS appeared to be varied as to GCS and cooling. The experience level of the RN's collecting the neurological assessment, in years of experience or education level, is unknown. Nurses are trained to collect GCS and to understand the methods of the scoring system, yet the focus of specialized nursing would indicate that there could be limitations to obtaining the assessment accurately. The nuances of neurological injury demonstration, such as posturing and seizure activity, may not be as intricately assessed by a specialty in coronary care as it would be in a neurologically focused environment.

The literature available seems to support that neurological prognostication would infer to outcomes, and this study's results indicate the same with limitations. The APS

scores that were lower, indicating less severity of illness, with the congruent low GCS, demonstrated inconsistency. Whereas, APS is a methodology of vital signs and laboratory results, it does reflect the neurological assessment of the GCS, which is based on assessment ability. The sample size also brought limitations into the logistic fit of hospital discharge status, as those discharged alive were not as expected. The limited information is the unknown assessment experience of the bedside RN and the timing of the neurological exam.

Relationship of Findings to the Theoretical Framework

Abdellah's conceptual framework was consistent to this study with an emphasis found on the 9th typology. Recognition of the physiological response was found to be inconsistent with the physiological derangements, indicating severity of illness and high mortality as reflected by the GCS results. Although more information is needed, the concept of patient focused outcomes and desired mortality is in alignment with this study.

Implications for Nursing and Recommendations

Intense neurological assessment intervention for the coronary care nurses, as well as the entry level RN's and first responders, could give validity to the premise that neurological evaluation is an indicator of outcomes in the induced hypothermic population. The potential use of GCS-CPC could assist in more streamlined neurological assessment, as in other studies, but there is limited information as to the accuracy of this method. The purpose of induced hypothermia is to increase cerebral perfusion and decrease cerebral injury, yet the neurological assessment appears to be limited not only in this study but in literature review.

Recommendations would be that all nurses caring for this population be given intense neurological assessment training, or to have a neurologically focused nursing staff to evaluate pre-hypothermia induction with a replication of this study. The sample size of pre-neurological assessment focus and then a post sample size of equal value should be able to demonstrate accuracy of outcomes.

Conclusion

As the advance care of the post cardiac arrest resuscitated patient continues to be a topic of need, the focus of neurological outcomes will continue to rise to the forefront. The ability to accurately assess on a consistent scale is imperative to the prognostication of the desired outcomes. This study found that there were discrepancies in GCS assessment, as well as severity of illness and mortality outcomes, which gives thought to experience, placement of the induced hypothermia patient in coronary care focused areas, or with aligned neurological focus. Neurological evaluation of the induced hypothermia patient post cardiac arrest resuscitation is vital to the continued use of this therapy. Cerebral perfusion and decrease of injury is known to be a result of induced hypothermia, but determining outcomes is still not clearly documented. This leads to the expectation that replication of this study and further investigation to neurological assessments could very well impact this population.

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