

ACNP IDENTIFY TD

IDENTIFYING ACUTE CARE NURSE PRACTITIONERS'
KNOWLEDGE, ATTITUDES, BEHAVIORS AND PRACTICE ON CURRENT
THYROID DYSFUNCTION MANAGEMENT IN ACUTE CARE

by

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DEDICATION

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ABSTRACT

Thyroid disease is one of the most common endocrine disorders in clinical practice. Critical illness is often associated with alterations in thyroid hormone functions. Thyroid dysfunction is a serious matter if managed inaccurately; it may increase morbidity and mortality. The purpose of this Doctor of Nursing Practice project is to identify the knowledge, attitudes, behaviors and practice of advanced practice nurses (acute care nurse practitioners (ACNP) and adult gerontology acute care nurse practitioners (AGACNP)) on current thyroid dysfunction management in the acute care setting.

The DNP project demonstrated that most acute care nurse practitioners believe that TD screening, diagnosis and management is important in the acute care setting. The survey results also indicated that most of the AGACNP/ACNPs would initiate treatment while managing patient in an acute care setting and will likely collaborate with endocrinology for overall management or follow ups to ensure quality and comprehensive care in management of TD.

Keywords: thyroid disease, thyroid dysfunction, identify, knowledge, attitudes, behaviors, acute care

INTRODUCTION

Background Knowledge

The two most common endocrine disorders in clinical practice are thyroid disorders and diabetes mellitus (DM) (Hage & et al., 2011). Thyroid hormones play an important role in the body's adaptation of metabolic function to stress and critical illness such as life threatening conditions requiring the support of failing vital organ functions (Angelousi, Karagcorgopoulos, Kapaskelis, & Falagas, 2011). Alterations in thyroid hormone concentrations are often related to critical illness in patients with no previous intrinsic thyroid disease (Economidou, Douka, Tzanela, Nanas & Kotanidou, 2011). The causes of thyroid dysfunction (TD) are largely unknown and clinical presentation is often nonspecific and accurate diagnosis is dependent on laboratory findings (Garber & et al., 2012). However, autoimmune thyroid diseases (AITDs), such as Grave's disease and Hashimoto's thyroiditis, are typical examples of having an important genetic component (Davies, Latif & Yin, 2012).

TD is most commonly manifested from autoimmune problems at the level of the thyroid gland and results in primary thyroid disease. Primary TD occurs at the thyroid; secondary dysfunction is associated with problems with the pituitary; and tertiary dysfunction results from issues with the hypothalamus (Holcomb, 2002). Sub-clinical hypothyroidism which is characterized with a low normal free T4 and high TSH. Primary hypothyroidism consists of high thyroid stimulating hormone (TSH) serum levels and low free thyroxine (T4) serum levels and secondary is characterized as a combination of low TSH and low free T4 (Sehgal, Vishal, Bajwa, Sehgal, & Bajaj, 2014). Subclinical hyperthyroidism is much less common than subclinical hypothyroidism (Garber et al., 2005). However, hyperthyroidism can cause serious adverse effects on glycemic control in DM patients and may worsen pre-existing symptoms of coronary

artery disease (CAD). Accurate diagnosis and the consideration of definitive treatment with radioactive iodine therapy will guide appropriate disease management of hyperthyroidism (Wu, 2000). Undiagnosed TD may put patients at higher risk for certain life threatening conditions such as cardiovascular disease, osteoporosis and infertility (American Thyroid Association, 2015).

Why is Thyroid Disease a Problem?

Thyroid disease is common in the general population and hypothyroidism is the most common thyroid disorder in the adult population (Wu, 2000). Hypothyroidism has multiple etiologies and manifestations. An estimated 4.6 percent of the U.S. population age 12 and older is diagnosed with hypothyroidism (National Institute of Diabetes and Digestive and Kidney diseases, 2015). As mentioned above, hypothyroidism may be subclinical, characterized by the combination of a normal free thyroxine (T4) and a serum TSH above the upper reference limit when thyroid function has been stable for weeks, with no signs of recent or ongoing illness and the hypothalamic-pituitary thyroid axis is normal (Garber & et al., 2012). Studies have demonstrated that asymptomatic individuals should be screened regularly to help early recognition of TD, especially in subclinical patients who may not exhibit apparent signs and symptoms of hypothyroidism (ATA, 2015, Garber & et al., 2012 & Sehgal & et al., 2014).

The American Thyroid Association (ATA) estimates that more than 12 percent of the US population will develop a thyroid condition during their lifetime. Currently, an estimated 20 million Americans have some form of thyroid dysfunction and of that, 60 percent with thyroid problems are unaware of the condition (Garber & et. al., 2012). Hypothyroidism has been shown to be a significant cause of higher morbidity and mortality rates in the geriatric population. Studies have demonstrated that hypothyroidism is five to eight times more common in women;

one out of eight women will develop a thyroid disorder and individuals who have a genetic predisposition are at higher risk (Sehgal & et. al., 2014 & ATA, 2015). Women who are pregnant with undiagnosed or inadequately treated hypothyroidism have an increased risk of miscarriage, early pre-term delivery, and severe developmental problems in their children (ATA, 2015). Uncontrolled TD during pregnancy increases the chance of miscarriage, preterm delivery, and preeclampsia, and may also affect the baby's growth and brain development (Garber & et al., 2012).

Thyroid function alterations are very common in hospitalized patients, especially in those of increased age, critical illness and complications of comorbidities (Angelousi et al., 2011). Increasing challenges for clinicians managing symptoms of thyroid dysfunction come from atypical clinical presentation of hypothyroidism (Sehgal, Vishal, Bajwa, & Bajaj, 2014). The most common abnormality to occur within the thyroid axis during the acute phase of critical illness is the decreased conversion of thyroxine (T4) and triiodothyronine (T3) (Bello, Ceaichisciuc & Silva, 2010). With increasing severity of illness, low total and free T4 and occasional decreased levels of TSH may be present (Angelousi et al., 2011).

The current guidelines by the ATA regarding screening of asymptomatic adults for TD apply to individuals 35 years of age and older and recommend screening once every 5 years (Garber & et al., 2012). While there is not a specific agreement on population screening for hypothyroidism, there are recommended guidelines for individuals with autoimmune disease such as diabetes mellitus Type I (T1DM), pernicious anemia, first degree relative with autoimmune thyroid disease, abnormal thyroid examination, psychiatric disorders and patients taking amiodarone or lithium (Garber & et al., 2012). Although screening of TD is traditionally implemented in outpatient settings, advanced practice nurses working with patients in acute care

settings, such as acute care nurse practitioners (ACNP) and adult-gerontology acute care Nurse Practitioners (AGACNP), should be cognizant of current TD testing guidelines to better understand and manage symptoms of long-term comorbidities and early management of acute symptoms of TD.

The primary focus of care when a patient is admitted into acute care setting is the management of acute medical problems and resuscitative needs. Chronic health issues may be of less importance in the acute phase and sometimes may be overlooked or simply unidentified. For chronic conditions, it is possible that inadequate management may result in less readily identifiable threats such as prolonging the length of hospital stay or an increased risk of morbidity or mortality (Barrett et al., 2012). TD may put patients at risk of atrial fibrillation and as a resultant of reduced cardiac output; it may contribute to decreased functional cardio-respiratory reserve. Additionally, patients with underlying disorders of angina and heart failure may worsen during acute onset of hypothyroidism and pre-existing coronary artery disease (CAD) (Sehgal, V., et al., 2014). Accordingly, appropriate identification and management of long-term medical comorbidities is important in the acute care setting. Patients who experience TD such as hypothyroidism are physiologically dependent on exogenous thyroid replacement therapy. Therefore, inadequate replacement or omission of TD therapy in the acute care setting will result in acute hypothyroidism, with the potential for adverse patient outcomes including cardiac arrhythmias, loss of consciousness and life threatening conditions such as myxedema coma (Barrett et al., 2012). Hyperthyroidism is a condition characterized by an overproduction of thyroid hormone. The most common cause of hyperthyroidism is diffuse toxic goiter (Graves disease), toxic multinodular goiter and toxic adenoma (Giannelli, F., 2015). In addition, thyrotoxicosis or thyroid storm is a common endocrine disorder and is often secondary to

underlying conditions such as an infection or myocardial infarction which requires immediate medical management (Carroll & Matfin, 2010). Thyroid storm is characterized by compromised organ dysfunction such as cardiac decompensation, respiratory dysfunction, delirium or psychosis and liver dysfunction due to presence of cardiac failure with hepatic hypo-perfusion or congestion. Treatment is based on immediate blockade of thyroid hormone synthesis, prevention of further thyroid hormone release and management of underlying effects of excessive hormone levels (Carroll & Matfin, 2010).

Pathophysiology

The thyroid gland is located in the front of the neck and comprised of two lobes connected by a piece of tissue called the isthmus. The thyroid gland is stimulated to produce thyroid hormones by pituitary TSH, low serum iodide levels, or by medications interfering with the gland's uptake of iodide from blood. The gland is responsible for producing two hormones: thyroxine (T4) and triiodothyronine (T3). The hypothalamus secretes thyroid-releasing-hormone (TRH) to activate the secretion of thyroid stimulating hormone by the anterior pituitary, which increases the production of both T4 and T3 (Holcomb, 2002). An estimated 90% of the hormones secreted by the thyroid gland are T4 and the other 10% are T3. The inverse relationship with TSH is described as an increase in TSH levels as the result of insufficient thyroid hormones. In cases of excessive thyroid hormone, TSH output is decreased, leading to decreased TSH level (Holcomb, 2002).

Stimulation of the pituitary-adrenal axis is by the body's neuroendocrine response to stress, promoting survival. Activation of this axis contributes to hypothalamic secretion of corticotrophin-releasing factor (CRF) which stimulates the pituitary to adrenocorticotropin (ACTH), 8-lipotropin and 3-endorphin. Thyroid function is usually down-regulated during

stressful conditions with decrease levels of T3 and T4 levels. Stress inhibits TSH secretion through the action of glucocorticoids on the central nervous system (CNS). As the body responds to stress, there is a change in the serum level of various hormones including thyroid hormone, CRH, cortisol, and catecholamines. Long-term exposure to stress may potentially lead to many damaging consequences leading to various endocrine disorders and stress leads to alteration in the clinical course of many endocrine conditions (Ranabir, S., & Reetu, K. (2011).

Intended Improvement: Purpose

The purpose of my project is to describe AGACNP/ACNPs' knowledge, attitudes, behaviors and practice in current thyroid dysfunction management. This topic is relevant in acute care such as when managing myxedema coma, a severe life-threatening form of decompensated hypothyroidism which is associated with high mortality rate in critically ill patients (Mathew & et al., 2011). In addition, thyroid storm also known as thyrotoxicosis is a clinical syndrome with high mortality rates; which results when tissues are exposed to high levels of circulating thyroid hormone with manifestations of organ decompensation (Carroll, R. & Matfin, G., 2010). Symptoms of hypothyroidism are often masked by co-morbidities such as type 2 diabetes and complications of metabolic syndrome. Another disorder known as thyrotoxicosis (thyroid storm) is a life-threatening health condition that is associated with untreated or undertreated hyperthyroidism with or without precipitating events such as current illness, discontinuation of thyroid dysfunction drug therapy, or development of an adverse drug reaction (Warnock, Cooper, & Burch, 2015). Symptoms of thyroid storm include increased heart rate, alterations in blood pressure, and increased body temperature. These symptoms may soar to dangerously high levels and may be fatal without early recognition and aggressive treatment. Effective management is dependent upon early recognition of impending thyroid storm,

providers' knowledge of both the typical and atypical presentations of thyrotoxicosis, and interdisciplinary collaboration (Burch & Wartofsky, 1993). Acute onset of thyroid dysfunction may result in exacerbation of symptoms in a robust representation.

Hypothyroidism may potentially cause weakness of the respiratory muscles which will impede the body's response to hypercapnia and hypoxia. A detailed summary of common clinical presentations of hypothyroidism in acutely ill geriatric population is listed in Table 1 (Sehgal, 2014). In order to accurately interpret thyroid function tests (TFTs), the AGACNP/ACNP should be familiar with the changes that occur during critical illness to better manage the functions of thyroid hormone metabolism as well as the effects of commonly used medication for treatment of TD (ATA, 2015). Alterations in thyroid hormone levels during acute or chronic critical illness and starvation manifest in a condition known as "Non-thyroidal illness syndrome (NTIS)" characterized by changes in thyroid function tests which includes low serum free T3 with normal or inappropriately low thyrotropin (TSH) and often a normal serum free T4 (FT4) level (Tognini, S., Marchini, F., Dardano, A. Polini, A., Ferdegini, M., Castiglioni, M. & Mozani, F., 2009).

TABLE 1. Common clinical presentation of hypothyroidism in acutely ill geriatric population

<u>Systems</u>	<u>Clinical Manifestations</u>
Cardiac	Congestive heart failure Pericardial effusion Hypertension Decreased cardiac output Angina
Pulmonary	Decrease response to hypercapnia and hypoxia Macroglossia
Gastrointestinal	Constipation Non-alcoholic fatty liver

Hematologic	Pernicious anemia Anemia of chronic disease
Neurologic	Complex mental status changes
Metabolic	Hyperlipidemia Hyponatremia Metabolic syndrome

(Sehgal, V., et al., 2014 & Economidou, F., et al., 2011)

Identification of AGACNP/ACNPs' knowledge, attitudes and behaviors towards management of TD will provide a better understanding of current practice and the overall management of this potentially life-threatening but preventable condition.

Project Aims

- 1.) Describe ACNP/AGACNPs' knowledge of signs and symptoms of TD and current diagnostic testing guidelines for TD.
- 2.) Identify ACNP/AGACNPs' attitudes and behaviors towards current diagnostic testing guidelines and current management for TD.
- 3.) Identify current practice in management of TD in the acute care setting.

Theoretical Framework

The theoretical framework to guide this project is Theory of Planned Behavior (TPB) to explain ACNP/AGACNPs' knowledge, attitudes and behaviors towards thyroid dysfunction management in an acute care setting. TPB was first developed to explore the underlying relationship between human attitudes, intentions, and behaviors (Montano & Kasprzyk, 2008). TPB includes the concept of perceived control over performance of behavior (Montano & Kasprzyk, 2008). Perceived behavioral control shows that a person's motivation is mainly influenced by how the individual perceives how successful the individual is able to perform the task and how difficult the behaviors are perceived to be (Ajzen, 2012). The theory provides a

framework to study attitudes towards behaviors, subjective norms and perceived behavioral control and that personal intentions and perceived control are predictors of actual behavior (Ajzen, 2012). Fishbein and Ajzen have shown that it is crucial to have a mutual relationship between measures of attitude, norm, perceived control, intention and behavior in regards to action, target, context and time because a change in any of the components results in different behavior (Montano & Kasprzyk, 2008).

TPB model is appropriate for this study because it will help identify AGACNP/ACNP's knowledge towards current recommendations for TD screening, attitudes on the need for TD screening while in acute care and behavior of TD screening. For example, attitude derives from the ACNP's positive or negative belief about performing a specific behavior and is determined by the individual's belief about the consequences of performing the behavior. Subjective norms are another example that the AGACNP/ACNP will propose to perform a certain behavior when the individual perceives that they should perform the task. Perceived behavioral control can influence a person's behavior either direct or indirect through behavioral intentions (Ajzen, 2012). TBP will help guide this study to explore the nature of human behavior and attitudes that affects their perceptions and knowledge from a holistic perspective.

Literature Synthesis

In this literature search, PubMed, CINAHL and Cochrane were used with search terms "clinician", "advanced practice practitioners", "practitioners", "providers", "nurse practitioners", "critical care", "critically ill", "acute care", "acutely ill", "emergency services", "intensive care", "thyroid dysfunction", "myxedema coma", "thyroid function", "thyroid disease", "attitudes", "knowledge", "management" and "sepsis" adding filters limited to articles within 20 years (as early as 1985) and English language, 379 articles were identified. Currently, there are few

articles specific to acute care nurse practitioners in acute care, APRNs current practice in TD management and limited research in the specialty area. Of the 379 articles found, 19 articles were carefully selected and 10 were utilized in the literature synthesis [APPENDIX D].

Providers' Knowledge, Behaviors and Attitudes

One study examined General Practitioners' (GP) knowledge, behaviors, attitudes and management of thyroid disease. The study consisted of a survey with 11 questions submitted to 622 GP members of the Medical Doctors Association located in Southern Italy. The questionnaire explored the GPs' behavior, knowledge and current management with questions such as "You find out that a patient of yours is hypothyroid, what is your behavior?", "You ask for thyroid function test just as a clinical suspicion?" and "Can amiodarone induce hyperthyroidism?" A total of 122 GPs participated in the study and concluded most GPs evaluate thyroid function due to clinical suspicion and will likely perform pertinent clinical and diagnostic investigation prior to specialist referral. The study also concluded that the GPs' knowledge of TD strictly corresponds to the GPs' personal attitudes toward patient management (Negro et al., 2011).

Another study explored healthcare professionals' (registered dietitians, occupational therapists and physical therapists) attitudes, beliefs, knowledge and behavior concerning evidence-based practice (EBP) at a Swedish hospital. The study started with total of 306 participants and 227 (74%) responded to the study. The study examined the participants' use and understanding of clinical practice guidelines, availability of resources and the skills in accurately accessing such resources. The questionnaire included 5 sections: attitudes towards the use of evidence, perceived benefits and limitations of EBP; understanding of clinical practice guidelines; resource availability to access information and the skills needed for accessing the

available resources. The study concluded positive attitudes towards EBP and the use of resources to support clinical decision making. Also, the study found the participants to be knowledgeable in understanding the importance of following EBP clinical practice guidelines. Time constraints were perceived as the major barrier to evidence-based practice and work productivity. Lastly, the study concluded evidence-based practice knowledge and resources were present but suggested the need of continuous support from management and the availability of easy to access resources (Heiwe et al., 2011).

A study explored physicians' adherence to guideline recommendations in clinical practice. The study explored GPs' adherence to clinical practice guidelines, and identified barriers to implementation of national guideline recommendations perceived by participating subjects, and explored the difference in recommendations within a specific guideline resulting from different barriers. The study included a total of 30 Dutch general practitioners (GP) in six focused groups and concentrated on selected national guidelines such as asthma among children, atrial fibrillation, cardiovascular disease risk management, cerebrovascular accident, depressive disorder, eye inflammation, rhino sinusitis, sexually transmitted disease, sleep disorder, thyroid disorders, transient ischemic attack, urinary tract infection, and etc. The study was conducted through focus group discussions where barriers to implementation of the key recommendations of two clinical practice guidelines were discussed and all data were audiotaped and transcribed verbatim. Perceived barriers identified in the study included knowledge, attitude, behavior, patient factors, guideline recommendations, and environmental factors. The study concluded that the most commonly perceived barriers were lack of evidence, lack of knowledge toward guideline recommendations (46%), environmental factors such as organization restraints (52%), and unclear or ambiguous guideline recommendations. In conclusion, as barriers to

implementation differ within guidelines, specific barrier-driven implementation strategies focusing on specific recommendations are important in adherence to clinical practice (Lugtenberg, Zegers-van Schaick, Westert & Burgers, 2009).

Thyroid Function in the Acutely Ill

Several studies explored altered thyroid function in severely injured patients and the relationship between thyroid function and ICU mortality. Two articles highlighted the importance of changes in circulating hormone levels during hemodynamic instability. Grill et al. (2013) hypothesized that alterations in thyroid function may be significantly altered in severely injured trauma patients who required massive resuscitation. The study investigated thyroid function in critically ill trauma patients who had a systolic blood pressure $<90\text{mmHg}$ $\times 2$, who survived >48 hours and blood samples for thyroid function were collected at initial presentation to trauma bay and serially for 48 hours over a six months period (Grill et al., 2013). The study found that thyroid functions significantly changed in injured patients on initial presentation and low T4 levels predict the need for massive resuscitation (Grill et al., 2013).

Another study explored the relationship between thyroid function and ICU mortality. A total of 480 patients without known thyroid disease were screened. The study utilized the Acute Physiology and Chronic Health Evaluation II (APACHE), an ICU scoring classification system that identifies the severity-of-disease (Knaus et al., 1985). The study investigated the ability of thyroid hormones and APACHE II score to predict ICU mortality by measuring the net reclassification improvement (NRI) and integrated discrimination improvement (IDI) indices (Wang et al., 2012). NRI and IDI were developed for dichotomous outcomes and used to quantify improvement offered by new markers with an immediate application to survival (Pencina, 2011). The study is currently the largest clinical investigation of the prognostic value

of thyroid hormones in ICU patients. The study found that free triiodothyronine (FT3) was the most powerful and the only independent predictor of ICU mortality and that the addition of FT3 levels in combination with APACHE II score could improve the ability to predict mortality in critical care (Wang et al., 2012). Limitations acknowledged in the appraised studies were the length of time of the study, sample size, exclusion of certain participants and the inclusion of some patients with undetected thyroid disease prior to ICU admission.

Another study investigated the prevalence of subclinical hypothyroidism (SCH) among patients with acute myocardial infarction. This descriptive study looked at the association between subclinical hypothyroidism and increased cardiovascular risk. The study consisted of 604 patients who were admitted to the coronary intensive care unit from 2004-2009 with the diagnosis of ST elevation (STEMI) or non-ST elevation acute myocardial infarction (NSTEMI). The study evaluated free T3, free T4 and TSH levels among participants. The study concluded that mild subclinical hypothyroidism was present in 54 participants and severe subclinical hypothyroidism found in 11 participants, with a total of 65 participants (10.76%) with TSH levels between 4.5 and 20 (Ertugrul & et al., 2011). The study was conducted over a five year period with a sufficient sample size to conclude that large-scale randomized trials are needed to identify the effects of SCH in patients with myocardial infarction (Ertugrul & et al., 2011).

Another study evaluated the effect of diabetes mellitus on thyroid hormone levels. The study consisted of 200 participants (100 diabetic and 100 non-diabetics). The study investigated levels of TSH, T3, FT4, and FT3 in subjects who were physically examined to rule out any underlying thyroid disorders prior to the study. The study concluded a high incidence of abnormal thyroid hormone levels in the DM participants (Pasupathi, Bakthavathsalam, Saravanan & Sundaramorrthi, 2008).

A literature review explored the effects of critical illness on metabolism such as how the body's metabolic system responds to sepsis which presents with multi-organ and tissue involvement but little is known about the underlying mechanism (Economidou et al., 2011). Critical illness is often in association with altered thyroid hormone concentrations in patient with no previous history of intrinsic thyroid dysfunction. The authors explains that nonthyroidal illness syndrome involves low T3 syndrome or euthyroid sick syndrome (low serum T3, high levels of reverse T3, with normal or low level of T4 and normal or low levels of TSH) as a result of abnormal thyroid function tests found in patients who experience acute or chronic systemic illnesses. Alterations in thyroid hormones during acute phase of critical illness includes decreased T3, increased T4, normal TSH and dependent on severity of illness. Chronic phase is clinically defined as low T3, low T4 and low to no changes with TSH and clinical correlation may indicate recovery with appropriate medical management. The review concluded that the evaluation of altered thyroid function in patient with systemic illness in both acute or chronic and stress remains a complex issue and continues to present may diagnostic problems due to alterations at all levels of the hypothalamic-pituitary-thyroid axis. In addition, the authors concludes that establishing TD based on a single set of TFTs may be misleading and will require further evaluation with careful clinical examination, knowledge of current practice protocols in management of TD, accurate interpretation of all diagnostic testing and early consultation with endocrinology specialist may be helpful (Economidou et al., 2011).

ACNP Roles in Acute Care

Kapu & Kleinpell (2012) highlights the importance of nurse practitioner associated metrics for evaluating the outcomes of NP care and patient-specific quality of care measures. Developing metrics that directly relate to quality of care measures and patient outcomes

established from specific practices of an NP can help identify the impact of NP care (Kapu & Kleinpell, 2012). A comprehensive literature review was conducted to identify areas of research that explored the importance of adult, pediatric and neonatal critical care nurse practitioners and the impact of critical care nurse practitioner models, roles, activities and outcomes.

Internationally, 95 Nurse Practitioner (NP) roles were identified with hospital in-patient and outpatient services. According to the US Census Bureau, 2005 there were 141,209 authorized NPs and 6,000 NP students educated annually.

Hoffman et al. (2005) utilized a 12 month comparative single site study where comparisons between NPs and Physicians, identified NPs spent more time in coordination of care ($p < 0.001$), less time in non-unit activities and more time interacting with patients and collaborating with members of the interdisciplinary team. Another study they examined was conducted in 1998 over a period of 14 months, compared critical care NPs ($n=11$), physician assistants ($n=5$) with medical officers in care management and patient outcomes specifically in the ICU showed that the NPs and Pas managed similar patients but minimal participation in invasive procedures in comparison to the medical officers. A 12 month prospective longitudinal study by Burns et al. (2003) focused on critical care NPs working in before-and-after-study design across five ICUs (medical, coronary care, neuroscience, surgical trauma, and thoracic cardiovascular) concluded that critical care NPs had widely demonstrated reduction in hospital length of stay (Fry, 2011).

As NPs assume an increasing role in providing care for hospitalized patients, identifying metrics that relate to quality of care measures and patient outcomes will significantly impact patient-specific quality healthcare (Kapu & Kleinpell, 2012). Development of NP-associated metrics specific to total days from initial ICU admission until the transfer to primary care

providers in continuity of care in disease management such as thyroid dysfunction will significantly impact patient outcomes and hopefully decrease future hospitalization of life-threatening diseases. However, throughout my literature search no studies specifically addressed AGACNP/ACNPs' knowledge, attitudes and practice in managing acute illnesses in the acute care setting.

METHODS

Ethical Issues

Ethics is described as the study of moral conduct and behavior which serves to govern conduct, thereby protecting the rights of an individual (ANA, 2014). All those participating in this project are health professionals currently practicing in acute care settings (i.e. AGACNP/ACNP). The project will focus on identifying AGACNP/ACNPs' knowledge, attitudes and behaviors in management of thyroid dysfunction. A thorough knowledge of thyroid dysfunction would allow the providers to better manage the symptoms, laboratory work-ups and therapeutic follow-ups safely and efficiently to provide maximum benefits to each individual. The population in this project involves healthcare providers in acute care settings. Participant names or other identifying material will not be used in the study in order to maintain confidentiality.

This study will meet the requirements of "Minimal risk" means that "the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests." (Selwitz, Epley & Erickson, 2003). Informed consent will be obtained through the project survey cover letter [APEENDIX A] and disclosure statement

[APPENDIX B] that will be presented prior to the project survey. Lastly, this project will be carefully reviewed and approved by the Institutional Review Board at the University of Arizona.

Planning the Project

This project is a descriptive study that will incorporate Theory of Planned Behavior (TPB) to better understand AGACNPs and ACNPs underlying knowledge, attitudes and practice on current thyroid dysfunction testing and management within the critically ill population. It is essential to better understand current TD management and practices by AGACNP/ACNPs to promote continuity of care, prevention of life-threatening conditions associated with TD and provide patient specific treatment. Recognizing current practice with TD management will greatly promote patient specific care and decrease hospital length of stay (Garber et al., (2012), Fry, (2011), Ertugrul & et al., (2011)). To accurately interpret thyroid function test (TFTs), the ACNP/AGACNP should be knowledgeable and familiar with changes that occurs during critical illness in the function the thyroid hormone metabolism and effects of certain medications on the impact of thyroid physiology (Economidou & et. al., 2011).

There are many drugs that are commonly used in the critical setting that affects TSH secretion may include but not limited to glucocorticoids (20mg or more of Prednisone or equivalent), Dobutamine, Dopamine and others (listed in TABLE 2). Antipsychotic medication Lithium is another drug with a potential to cause hypothyroidism. Hypothyroidism in patients consuming certain medication with no previous history of any TD is often preceded by destructive thyroiditis and transient suppression of TSH. The use of Amiodarone, steroids and beta blockers in hospitalized elderly should be monitored closely and used with caution as they inhibit 5-monodeiodinase, and thereby cause decreased formation of T3. Drug interactions could potentially alter the steps in the metabolism of thyroid hormones. This is of special concern in

the gerontology population considering these individual typically have multiple co-morbidities is frequently combined with multiple medications. This increases the possibility of altered drug metabolism and drug interactions. Depending on the drug class or underlying disease process, medication-induced hyperthyroidism, hypothyroidism or change in thyroid function profile may occur (Sehgal, V., et al., 2014).

TABLE 2.

Drugs causing abnormal thyroid function tests without previous thyroid dysfunction
<u>Low serum TBG</u> : Androgens, danazol, glucocorticoids, nicotinic acid, 1-asparaginase
<u>High serum TBG</u> : estrogens, tamoxifen, raloxifene, methadone, 5-fluouracil, clofibrate, heroin, mitotane
<u>Decreased T4 binding to TBG</u> : Salicylates, salsalate, furosemide, heparin, NSAIDs
<u>Increased T4 clearance</u> : phenytoin, carbamazepine, rifampin, phenobarbital
<u>Suppression of TSH secretion</u> : Dobutamine, glucocorticoids, octreotide
<u>Impaired conversion of T4 to T3</u> : amiodarone, glucocorticoids, contrast agents, propylthiouracil, propranolol

(Sehgal, V., et al., 2014 & Economidou, F., et al., 2011)

DESIGN

This DNP project utilized a descriptive design which is often utilized in studies focusing on the importance of evaluating, identifying and assessing behaviors of healthcare professionals when attempting to initiate practice improvements (Moran, Burson, Conrad, 2014). The project includes an 18 questions survey which includes demographics of participants, Likert scale questions, yes/no and true or false questions. Survey was adapted from a previous survey by

Negro, R, Dazzi, D. & Pezzarossa, A. (2001) in the management of thyroid disease by general practitioners and also from Kut, A. et al. (2015) in exploring the knowledge, attitudes and behaviors of physicians towards thyroid disorders and iodine requirements in pregnancy. The study will be conducted in an online setting with a sample of board certified practicing ACNP/AGACNPs. The survey will be provided through Qualtrics, which is secure, online survey software that is free for University of Arizona students to use for scholarly purposes. Written permission to advertise through two list services: Advanced Nursing Practice in Acute and Critical Care (ANPACC) and NP Info has been obtained.

SETTING AND SAMPLE

Advanced Practice Nurses with specialties in adult gerontology acute care and acute care who are currently working in acute care settings will be sampled. The project will specifically explore AGACNP/ACNPs knowledge, attitudes, behaviors and practice on current TD management, signs and symptoms of TD, testing recommendations within the critical illness population. The survey will be completely via web-based and should not take more than 10-15 minutes. The project will rely on web-based resources. The study will be conducted entirely online through two list services: ANPACC with 2,720 members and NPInfo with approximately 1000 members. The surveying software that will be used to conduct study procedures and collect data (Qualtrics) is provided free of charge to University of Arizona students. Participants will range from various years of experience in clinical practice as acute care nurse practitioners.

The target number of study participants will be a minimum of 20 participants and will vary depending on recruitment and number of volunteers.

Data Collection

The survey will be distributed by email using Qualtrics, an electronic survey application. The project will rely on web-based resources. The study will be conducted entirely online through two list services: ANPACC with 2,720 members and NPInfo with approximately 1000 members. Participants will be provided with cover letter [APPENDIX A] explaining the purpose of the project prior to the start of the survey. A disclosure form [Appendix B] will be included with each survey, explaining the voluntary nature of the study, the purpose of the project survey questions, and how the results will be utilized in this DNP project.

The survey [APPENDIX C] will consist of 18 questions integrating Theory of Planned behavior concepts and Likert-scale questions. Section III of the survey focuses on the concepts of TPB with questions identifying the providers' knowledge, attitudes, behaviors and beliefs regarding thyroid dysfunction. A follow-up reminder email will be sent 7 days after the initial notice of the survey and every Monday until the end of the 4 week period.

A disclaimer will be shown at the start of the survey. This disclaimer reviews participant inclusion criteria and describes how participants offer consent online through their willing participation in the survey. It is reiterated that participation is completely voluntary, that no compensation will be offered, that the survey should take 10-15 minutes to complete, that there are no identifiable risks to participants, and that the key benefit of participation is to produce new knowledge for future use in clinical practice. This disclaimer also reminds participants that they may choose to stop participating at any point in the survey prior to completion, and that only surveys completed in full will be used in data analysis; thus, completion of the survey implies consent.

DATA ANALYSIS

Quantitative content analysis will help identify the participant's perceptions and attitudes towards the study. The questions will consist of Likert scale questions and true/false questions. Data collected from the survey will be analyzed using descriptive statistics (i.e. mean, standard deviation, ranges) to describe nurse practitioners attitudes and behaviors in current TD management in the acute care setting. Data collected from each survey question was expressed as the percentage of participants and data from each survey to identify practice patterns, attitudes, beliefs and current practice of acute care nurse practitioners (Moran, Burson & Conrad, 2014).

RESULTS

Demographic Results

The thyroid dysfunction survey results indicated that all 25 participants are board certified AGACNP or ACNP. Of the 25 participants, 80% (N=20) is currently working in an acute care setting and 20% (N=5) does not currently work in an acute care setting. Most of the participants were females (80%) and rest were males (20%). A majority of the participants were between ages 45-54 (N=12, 48%), second largest group between ages 55-64 (N=8, 32%), third group between ages 35-44 (N=4, 16%) and one participant between ages 25-34. Eleven participants (44%) have been practicing as an AGACNP/ACNP for more than 10 years while participants with 5-10 years of experience had the same number of participants (N=11, 44%) and three participants (12%) indicated less than 5 years of experience. The majority of the participants (N=15, 60%) completed their Master's degree, 20% completed their Post-Master's Certificate in AGACNP/ACNP and 20% (N=5) of the participants completed either Doctor of Nursing Practice (DNP) degree or Doctor of Philosophy (PhD) degree. Nearly 48% (N=12) of the participants indicated that they have a friend or loved one who has some form of TD.

Current Practice Pattern Results

The results indicated that most of the participants (N=16, 67%) would order a thyroid function test (TFT) just from a clinical suspicion and 33% (N=8) would order a TFT as a routine or occasional check. One participant did not complete this question, only 24/25 participants completed this question. The survey also indicated that in case of a patient who presents with hypothyroid functions, 56% (N=14) of the participants would perform all the instrumental and biochemical tests and start thyroid dysfunction treatment immediately while 20% (N=5) would first perform all instrumental and biochemical test without starting any treatment and would refer patient to an endocrinologist for management. The other 24% (N=6) would refer patient directly to an endocrinologist prior to any diagnostic testing.

Practitioners' Knowledge in TD Management

Questions 9-12 in the survey focused specifically on the participants' knowledge in current TD management. All questions were adapted from Survey adapted from Negro, R, Dazzi, D. & Pezzarossa, A. (2001). The management of thyroid disease by GPs. Oxford University Press, 18(2): 195-198. Question 9 asked if Amiodarone can ONLY induce hyperthyroidism? 100% participants answered false. Amiodarone may induce both hypo or hyperthyroidism with an overall incidence of amiodarone-induced TD is reasonably estimated at 24% (Negro & Pezzarossa, 2001). Question 10 asked if your patient has a suppressed TSH value, only thyroid autoantibodies are conclusive for diagnosis? The majority 92% (N=23) of participants answered false. According to Negro & Pessarossa (2001), "the titre of thyroid autoantibodies is not conclusive for the etiology of hyper-functioning thyroid". Question 11 asked if TSH is more useful than thyroid hormones in evaluation of thyroid function? The answer was split between 60% who answered false and 40% who answered true. Negro & Pezzarossa (2001) suggested

this is true since FT4 and FT3 express the peripheral activity of thyroid function, small changes in FT4 and FT3 concentration have a large effect on TSH secretion. Lastly, question 12 asked if your patient is afflicted with Graves' disease and was started treatment with methimazole, after one week is it necessary to check a TSH level? The majority answered false (64%, N=16) and 36% (N=9) answered true. Patients would be re-evaluated after 4-6 weeks after the treatment has been started since clinic and biochemical improvements usually become evident 4-6 weeks after treatment (Negro & Pezzarossa, 2001).

Figure 1. TD Survey: Knowledge in TD Practice (N=25)

	True	False	Total Respondents
9. Amiodarone can ONLY induce hyperthyroidism?	0%	100%	100%
10. Your patient has a suppressed TSH value. Only thyroid autoantibodies are conclusive for diagnosis?	8%	92%	100%
11. TSH is more useful than thyroid hormones in evaluation of thyroid function?	40%	60%	100%
12. A patient of yours is afflicted with Graves' disease and started treatment with Methimazole. After 1 week, it is necessary to check for TSH?	36%	64%	100%

Attitudes and Behaviors Results

Descriptive statistics (mean, standard deviation, ranges) were utilized for each of the following survey questions in identifying acute care nurse practitioners' attitudes and behaviors towards current TD management. Each question had response scoring where 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree and 5=strongly agree. Continuous data was chosen for measurement since it requires use parametric statistics with interval data.

FIGURE 2. TD Survey: Attitudes and Behaviors Items (N=25)

Variable	Percentages Of participants who answered	Mean	SD	Min	Max
I treat symptoms of TD in the acute care setting often. 1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree	100%	3.36	0.91	2	5
I always consider under-managed TD in the acute care setting. 1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree	100%	3.48	1.08	1	5

<p>It is important to detect TD in the acute care setting.</p> <p>1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree</p>	100%	4.12	0.67	2	5
<p>I usually order a thyroid function test when I feel that it is necessary</p> <p>1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree</p>	100%	4.28	0.54	3	5
<p>I believe that treating thyroid dysfunction is an integral part of acute care management.</p> <p>1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree</p>	100%	4.08	0.70	2	5

Mean scores were calculated and majority of the highest scoring questions indicated a consensus of “agree” with scores ranging between 4.08-4.28 in three out of the five questions. All three questions pertained to the importance of detecting TD in the acute care setting, importance of ordering TFT panels and the importance of treating TD in the acute care setting. The mean scores for the other two questions were between 3.36-3.48 which falls between “neither agree or disagree” and “agree”. The two questions reflected the participant’s response to how often the practitioner treated symptoms of TD in the acute care setting and if the practitioner often considers under-managed TD while patient is managed in acute care. One participant indicated that they not believe that treating TD is an integral part of acute care management. When asked “It is important to detect TD in the acute care setting”, one participant answered “disagree”.

While most survey response indicated that acute care nurse practitioners believe that treating TD is an integral part of acute care management, it is interesting to note that some practitioners “neither agree nor disagree” or “disagree” that the detection of TD is important while the patient is managed in the acute care setting.

DISCUSSION

Strengths

The DNP project demonstrated that most acute care nurse practitioners believe that TD screening, diagnosis and management is important in the acute care setting. The survey results also indicated that most of the AGACNP/ACNPs would initiate treatment while managing patient in an acute care setting and will likely collaborate with endocrinology for overall management or follow ups to ensure quality and comprehensive care in management of TD.

Iodide exposure in acute care settings is one of the major key determinants of TD. The elderly population is often exposed to iodide in the acute care settings with increasing use of imaging studies and certain medications containing high doses of iodide which causes iodide auto-regulation mechanisms (Sehgal et al., 2014).

Limitations

The percentage of participants was low (N=25) considering the two list services used in the study consisted of 2,720 active members with ANPACC and an estimated 1000 active members with NPInfo. In addition, only 80% (N=20) answered yes when asked if the participant currently practices in an acute setting. For this reason, survey results were not truly accurate since the survey is completed web-based and anonymous through the use of Qualtrics online survey software, PI was unable to determine the 5 participants who do not currently practice in acute care setting. Lastly, limited literature exists in management of TD in acute care setting.

CONCLUSION

In conclusion, the data presented in this project suggests that most acute nurse practitioners believe that diagnosis, evaluation and management of TD is very important in the acute care setting. To make a fundamental improvement in health equity, technical and medical solutions such as disease prevention and management, adequate resources, access to medical care and political and social involvement are important factors to consider (WHO, 2003). The elderly population is at the greatest risk of TD since they are often on polypharmacy and unfortunately thyroid medications may be lost during medication reconciliation in transition from oral to enteral route in the acute care setting. Therefore, multidisciplinary team collaboration would help ensure appropriate, safe and cost effective treatment in acutely ill patients especially the geriatric population in management of TD (Sehgal et al., 2014).

Currently, there are limited studies regarding management of TD by nurse practitioners in the acute care setting. The data collected from this survey reflects the participants' knowledge, attitudes and behaviors towards current TD management in acute care, it is necessary to provide continuing evidence based practice education, adequate resources, current practice guidelines, quality healthcare, interdisciplinary collaboration and patient/family involvement to ensure accurate diagnosis and management of TD in the acute care setting.

APPENDIX A
Survey Cover Letter

Date:

First, I'd like to take this opportunity to thank you in advance for your participation in this study and survey. My name is Angel Chu and I am a Doctor of Nursing Practice (DNP) student at the University of Arizona. The focus of my DNP project is to identify Acute Care Nurse Practitioners' knowledge, attitudes, behaviors and practices on current thyroid dysfunction management in acutely ill adults. Outcomes of the project include describing current thyroid dysfunction (TD) management such as TD testing, current practice in management of TD while in the acute care setting. Additional outcomes are to identify ACNP/AGACNPs' knowledge and attitudes towards management of TD.

The attached electronic survey contains 18 questions and will take 10-15 minutes to complete. While there is no compensation for your participation, a detailed summary of findings will be available per your request at the end of the project. This project has been approved by the Institutional Review Board at the University of Arizona. There are no risks associated with your participation in this study. All information collected from the survey may benefit providers and future advanced practice nurses in the improvement of patient specific quality of care. By completing and submitting this survey, you are providing your consent for this project. Once again, I greatly appreciate and thank you for your participation in this project.

If you should have any questions or concerns in regards to the survey, please email me at angelchu@email.arizona.edu.

Sincerely,
Angel Chu-Peterson
angelchu@email.arizona.edu
(602)819-1157

APPENDIX B

Disclosure Form

You are being invited to participate in a research project conducted by Angel Chu, a Doctor of Nursing Practice student enrolled at the University of Arizona. Please carefully read and review this form prior to your participation so that you are aware of potential risks and how the information you provide will be used. The information in this form is provided to help you decide whether or not to take part in the study. If you decide to take part in the study, your responses will be anonymous. If you decide you do not want to participate, there is no penalty to you, and you will not lose any benefit you normally would have. Participation in this study is voluntary. There are no costs associated with the study and there is no compensation for participation in the study. The purpose of the study is to identifying acute care nurse practitioners' knowledge, attitudes, behaviors and practice on current thyroid dysfunction management in acute care.

You are being asked to participate in this survey to determine acute care nurse practitioners' knowledge, attitudes, behaviors and practice on current thyroid dysfunction management in acute care. You will be asked to complete a survey of 18 questions, taking approximately 10-15 minutes and return electronically to the Principle Investigator (PI). There are no foreseeable risks to participating in the study.

Information about you will be kept confidential to the extent permitted or required by law. We will not know your IP address when you respond to the study.

An Institutional Review Board responsible for human subjects' research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or online at <http://rgw.arizona.edu/compliance/human-subjects-protection-program>.

You may contact the Principal Investigator to tell her about a concern or complaint about this research study. Principal Investigator Angel Chu, MSN, AGACNP-BC can be called at (602)819-1157. You may also contact the PI's advisor, Ted Rigney PhD, ANP, ACNP-BC, FAANP at (520)626-7058 or EMAIL: trigney@arizona.edu.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research survey, with the knowledge that you are free to withdraw your participation at any time without penalty.

APPENDIX C

Thyroid Dysfunction Survey Form

The purpose of this survey is to explore Acute Care Nurse Practitioner's knowledge, attitudes, behaviors and current practices in management of thyroid dysfunction in the acute care setting.

1. Are you a board certified AGACNP or ACNP?
 - Yes
 - No

2. What is your gender?
 - MALE
 - FEMALE

3. Age:
 - 18-24
 - 25-34
 - 35-44
 - 45-54
 - 55-64
 - 65+

4. How many years have you been practicing as an AGACNP/ACNP?
 - Less than 5 years
 - 5-10 years
 - 10 years or more

5. Highest level of education you have completed?
 - Master's degree
 - Post-Master's Certificate
 - Doctor of Nursing Practice (DNP) degree
 - Doctor of Philosophy (PhD) degree

6. Do you currently work in an acute care setting?
 - YES
 - NO

7. You ask for thyroid function test:
 - Just if I have a clinical suspicion
 - Just in the presence of genetic predisposition
 - As a routine check and/or occasionally
 - After the advice of the specialist

8. You find out that a patient of yours has hypothyroid. What is your behavior?
 - I refer the patient to the endocrinologist

- I perform all the instrumental and biochemical test and then refer the patient to the endocrinologist
- I perform all the instrumental and biochemical tests and then start the treatment

9. Amiodarone can ONLY induce hyperthyroidism?

- TRUE
- FALSE

10. Your patient has a suppressed TSH value. Only thyroid autoantibodies are conclusive for diagnosis?

- TRUE
- FALSE

11. TSH is more useful than thyroid hormones in evaluation thyroid function?

- TRUE
- FALSE

12. A patient of yours is afflicted with Graves' disease and started treatment with Methimazole. After 1 week, it is necessary to check for TSH?

- TRUE
- FALSE

13. I have a friend or loved one who has some form of thyroid dysfunction.

- TRUE
- FALSE

(Please check ONE best response for each statement)

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
14. I treat symptoms of thyroid dysfunction in the acute care setting often.	1	2	3	4	5
15. I always consider under-managed thyroid dysfunction in the acute care setting	1	2	3	4	5
16. It is important to detect thyroid dysfunction in the acute care setting	1	2	3	4	5
17. I usually order a thyroid function test when I feel that it is necessary.	1	2	3	4	5
18. I believe that treating thyroid dysfunction is an integral part of acute care management	1	2	3	4	5

Survey adapted from Negro, R, Dazzi, D. & Pezzarossa, A. (2001). The management of thyroid disease by GPs. *Oxford University Press*, 18(2): 195-198. Kut A. et al. (2015). Knowledge, attitudes and behaviors of physicians towards thyroid disorders and iodine requirements in pregnancy. *Journal of Endocrinological Investigation*, 38,(10), 1057-1064.

APPEDIX D

Literature Synthesis Table From

Project Question: What are acute care nurse practitioner' knowledge, attitudes, behaviors and practice on current thyroid function management in acute care?

Author / Article	Qual: Concepts or phenomena Quan: Key Variables Hypothesis Research Question	Design	Sample (N)	Data Collection (Instruments/tools)	Findings
Economidou et al., (2011). Thyroid function during critical illness	The article summarizes current knowledge on status of thyroid hormones in critically ill patients	Systematic Review	N/A	Literature review	Single set of TFTs to determine TD may be misleading and will require careful clinical evaluation, knowledge of accurate manage and prompt consultation with endocrinology.
Ertugrul et al., (2011). Prevalence of subclinical hypothyroidism among patients with acute myocardial infarction.	To evaluate SCH prevalence among patients with acute MI and demographic differences between patients with and without SCH	Descriptive	N=604	Between 2004-2009 patients with diagnosis of ST elevation (STEMI) or non-ST elevation acute myocardial infarction (NSTEMI) were classified into 2 groups based on TFTs and subclinical hypothyroidism Between March 2008 to Sept 2008 blood samples were collected in the	The study concluded that mild subclinical hypothyroidism was present in 54 participants and severe subclinical hypothyroidism found in 11 participants with a total of 65 participants (10.76%) with TSH levels between 4.5 and 20.

<p>Grill, E., et al. (2013). Altered thyroid function in severely injured patients. <i>Journal of Surgical Residents</i>, 179(1):132-147</p>	<p>The study hypothesize that alteration in thyroid function may be particularly pronounced in severely injured trauma patients who require massive resuscitation. The study investigated the profile of circulating thyroid hormone levels in severely injured trauma patients during their initial hospitalization and evaluated potential impact of resuscitation</p>	<p>Prospective, observational study</p>	<p>N=96</p>	<p>trauma bay, on admission to ICU and 24 to 48 hours post admission</p> <p>Data were collected using a translated questionnaire in a study of American physical therapists. The questionnaire was originally created and designed to assess the attitudes, beliefs and knowledge of general practitioners relating to evidence-based practice Literature Review</p>	<p>Measurements of thyroid function are significantly altered in severely injured patients on initial presentation and low T4 levels predict the need for large resuscitation.</p>
<p>Heiwe, S., et al. (2011). Evidence-based practice: attitudes, knowledge and behaviour among allied health care professionals. <i>International Journal for Quality in Health Care</i>, 23(2):198–209.</p>	<p>To explore dieticians', occupational therapists' and physical therapists' attitudes, beliefs, knowledge and behavior concerning evidence-based practice within a university hospital setting</p>	<p>Cross-sectional survey</p>	<p>N=306</p>	<p>The focus groups were transcribed verbatim. Two researchers independently studied the transcripts according to framework. # main categories of framework was address with barriers related to knowledge, barrier related to attitude and external</p>	<p>Findings showed positive attitudes towards evidence-based practice and the use of evidence to support clinical decision-making</p>

<p>Kapu, A., et al. (2012). NPs in the ICU: the Vanderbilt initiative. <i>The Nurse Practitioner</i>, 37(8):46-52.</p>	<p>ACNP in critical care managing patients with acute and multifaceted health conditions</p>	<p>Review/Expert Opinion</p>	<p>N/A</p>	<p>barriers that are subdivided into several subcategories</p> <p>Literature Review, case reports</p>	<p>Developing metrics that directly relate to quality of care measures and patient outcomes established from specific practices of an NP can help identify the impact of NP care</p>
<p>Lugtenberg, M., et al. (2009). Why don't physicians adhere to guideline recommendations in practice? An analysis of barriers among Dutch general practitioners. <i>Implementation Science</i>, 4(54):1-9.</p>	<p>To identify perceived barriers towards the use of national guidelines for general practice by focusing on the key recommendations within the guidelines</p>	<p>Qualitative study: six focused groups</p>	<p>N=30</p>	<p>Statistic evaluation of the data was done with chi square analysis and Fisher's exact test; a P-value <0.05 was considered significant</p>	<p>Within the 3 categories, the most perceived barriers were lack of agreement with guideline recommendations (68%), environmental factors (52%), lack of knowledge of the guidelines recommendations (46%) and guideline recommendation factors (43%)</p>
<p>Mathew, V., et al. (2011). Myxedema Coma: A new look into an old crisis. <i>Journal of thyroid research</i>, 11:1-7.</p>	<p>Explores the standard clinical presentation, treatment, predictors of mortality and controversies that overshadow the current concepts in the management of myxedema crisis</p>	<p>Case Reports/Case Series</p>	<p>N/A</p>	<p>Between Jan 2007 to March 2008, the initial criteria separated type 1 from type 2 subjects based on age of onset of DM and dependence on insulin therapy alone. All samples were specimens taken from participants who</p>	<p>Myxedema crisis is a life-threatening extreme form of hypothyroidism with a high mortality if untreated</p>

<p>Negro, R, Dazzi, D. & Pezzarossa, A. (2001). The management of thyroid disease by GPs. Oxford University Press, 18(2): 195-198.</p>	<p>To assess knowledge and management by GPs of common endocrine disorders such as thyroid diseases.</p>	<p>Descriptive Study</p>	<p>N=122</p>	<p>fasted for at least 8 hours Statistic evaluation of the data was done with chi square analysis and Fisher's exact test; a P-value <0.05 was considered significant</p>	<p>The study concluded that 72.1% of GPs in the study evaluate thyroid function on the basis of a clinical suspicion and perform preliminary investigations before referring the patient to a specialist</p>
<p>Pasupathi, P., et al. (2008). Screening for Thyroid dysfunction in the diabetic/non-diabetic population. Thyroid Science, 3(8):1-6.</p>	<p>To investigate the effect of diabetes mellitus on thyroid hormone levels and other biochemical variables</p>	<p>Case Control Study</p>	<p>N=200 (100 diabetics, 100 non-diabetics)</p>	<p>Between Jan 2007 to March 2008, the initial criteria separated type 1 from type 2 subjects based on age of onset of DM and dependence on insulin therapy alone. All samples were specimens taken from participants who fasted for at least 8 hours</p>	<p>The study concluded a high incidence of abnormal thyroid hormone levels in the DM participants</p>

<p>Wang, F., et al. (2012). Relationship between thyroid function and ICU mortality: a prospective observation study. Critical Care, 16:1-9.</p>	<p>Explores the relationship between thyroid function and ICU mortality</p>	<p>Prospective observation study</p>	<p>N=480</p>	<p>Between Jan 2009 and March 2010 the researchers collected patient's baseline characteristics which included APACHE II score, thyroid hormone, NT-proBNP and CRP levels and evaluated the ability of thyroid hormones in combination with APACHE II score to predict ICU mortality by calculation of NRI and IDI indices</p>	<p>The study found that FT3 was the most powerful and the only independent predictor of ICU mortality and that the addition of FT3 levels in combination with APACHE II score could improve the ability to predict mortality in critical care</p>
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