

Understanding the concept of geriatric anesthesia and its implication in clinical practice:

A Learning Module for Student Registered Nurse Anesthetists.

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Abstract

Increase in longevity of the geriatric population, and increase in number of the group has led to an increased frequency of requirement for anesthesia management. A thorough understanding of the physiological changes associated with aging, the effect of aging on various body systems, the intricate medication management, and dosing as it relates to anesthesia practice all become very important. A thorough knowledge of the healthcare implications concerning the geriatric population would be an important tool for the Senior Registered Nurse Anesthetists (SRNA).

The purpose of the project was to provide additional learning opportunities to Student Registered Nurse Anesthesia in clinical rotation as an addition to their knowledge base of adult anesthesia care. Grounded knowledge of the care of the geriatric involves a thorough understanding of all aspects of care for this population.

The presentation of this learning module involved use of current anesthesia textbooks and journal articles on geriatric anesthesia, as well as the use of visual and audio aids to educate underclassmen. Focusing on the physiology and pathophysiology changes with aging.

Understanding of the pharmacological problems associated with aging, the implication of inhalation anesthesia, and local anesthesia on aging were addressed by using current anesthesia literatures and journal articles.

A pretest tool was used to evaluate the knowledge base of the SRNAs. A post-test was used to re-evaluate the knowledge base post presentation. Upon review of the pre-test and post-test statistical analysis it was identified that the educational module was instrumental in increasing the knowledge base of the SRNAs who participated in the study.

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Chapter 1: Introduction

Introduction to the Problem

It is important to have an in-depth knowledge of what physiological changes are normal in the geriatric population as it pertains to anesthesia. The American Association of Nurse Anesthetists (AANA) Code of Ethics 3.1 states that the Certified Registered Nurse Anesthetist (CRNA), as an independently licensed professional, is responsible and accountable for judgments made and actions taken in his or her professional practice (AANA, 2014). Neither physician orders nor institutional policies relieve the CRNA of responsibility for his or her judgments made or actions taken. This implies that the SRNA must be grounded in every aspect of care in the geriatric population. Such knowledge will become an asset in anesthesia delivery as professionals.

The rapidly increasing population of elderly patients requiring anesthesia mandates a thorough knowledge of the patient population. Because advanced age is a major risk factor for increased morbidity and mortality during the perioperative period, a thorough knowledge of the geriatric patient becomes essential (Bhaskar & Bajwa, 2014). A comprehensive knowledge of the patient population will also equip the SRNA to avoid complications postoperatively.

In addition, due to the rapidly changing patient population, repetition of geriatric patient care will help instill a knowledge base of how to care for patients. Thorough presentation of preoperative medications and how they impact the cerebral physiology in the elderly is necessary for an SRNA to understand in order to avoid cognitive dysfunction in the patient. Polypharmacy, over-the-counter medications, and supplements for the elderly and its implications in anesthesia care are other factors SRNAs should be made aware of.

Fluid management, postoperative pain management, and induction doses for anesthesia medication during geriatric anesthesia are critical perioperative challenges that require early and careful education of the SRNA in clinical practice. A thorough understanding of intravenous anesthesia, inhalation anesthesia and regional anesthesia regarding the geriatric population also become significant (Owusu & Berger, 2014).

Chapter 2: Literature Review

As the number of geriatric patients increase, it is essential that healthcare professionals managing this patient population are well equipped with the necessary background knowledge to adequately care for this population. A gap in knowledge exists in the field of geriatric anesthesia in the area of research focusing on the challenges of geriatric anesthesia to the Student Registered Nurse Anesthetic (SRNA). Limited data is available with regard to the concept of assessing proper understanding of geriatric anesthesia in clinical practice among SRNAs.

Dilsen, Seyhan Serpil, Canan, Mustafa, and Nermin (2010) study the influence of various anesthesia techniques on postoperative recovery and discharge criteria among geriatric patients. Dilsen et al (2010) study 60 geriatric outpatient patients undergoing transuretheral interventions using general anesthesia cases, or selective spinal anesthesia. Hemodynamic variations, nausea and vomiting, and patient and surgeon satisfaction are variables studied by Dilsen et al, 2010. Their discovery is that no variation exists between outcomes using either technique in terms of hemodynamic variation and surgeon/satisfaction. This finding reinforces the need for adequate knowledge in performing geriatric anesthesia because spinal anesthesia and general anesthesia should not have the same hemodynamic effect.

Also, Bettelli (2010) studies anesthesia care of the elderly patient in the outpatient setting. Preoperative assessment and evaluation, postoperative pain management, and anesthesia

technique are areas researched. Age and functional status as well as criteria for selection of geriatric patient's suitability for outpatient surgery are examined but nothing is said about the knowledge base and traineeship of anesthetists performing anesthesia in the outpatient clinical setting. In another journal article by Bettelli, 2011, a look at preoperative evaluation in geriatric surgery with emphasis on geriatric functional status, comorbidities and pharmacological history is addressed. The study looks at the disease states common to the elderly. Hypertension, diabetes, and coronary artery disease, among others, are analyzed as very common to the elderly patient (Bettelli, 2011, p. 643). The conclusion from the study reiterates that more education is needed in the preoperative evaluation of elderly patients because of their rapid increase in number, increased commodities, and pharmacological history (Bettelli 2011 p.644).

Furthermore, Rortgen, Kloos, Fries, Grottke, Rex, Rossaint and Coburn (2010) compare early cognitive function and recovery after desflurane or sevoflurane anesthesia in the elderly with the goal of finding which gas increases the risk of postoperative cognitive dysfunction more. The study highlights the importance of a thorough knowledge base on the vast implication of various anesthesia choices facing the certified registered nurse anesthetist and students in the area of geriatric anesthesia. Rortgen et al (2010) discover that there is little difference in the occurrence of postoperative cognitive dysfunction in choice of anesthesia gas between desflurane and sevoflurane among the geriatric patients studied (Rortgen et al, 2010, p. 173).

It has also been documented that the population growth of people over 65 years of age has tripled in the last 50 years. In Europe, 30% of the population will be represented by individuals 65 years and older. This increase in population directly impacts the healthcare system medically and surgically. Elderly patients are accompanied by factors that increase surgical risk: polypathology, polymedication and disorders at the cellular level. Publications (Bettelli, 2011;

Deiner & Silverstein, 2011) review the importance of the anesthesia provider's knowledge on the geriatric patient's preoperative evaluation, comorbidities, functional status and pharmacological history. These publications discuss in detail three primary factors that contribute to increased perioperative risk in the elderly patient: progressive functional decline and decreased reserve capacity to compensate for impaired function or increased demand; associated illnesses that will limit baseline function and an altered neuro-humoral response to stress; and increased incidence of unexpected reactions to medications, anesthesia and surgery.

Functional status of the elderly population is associated with surgical complications. Bettelli (2011) discuss that the majority of anesthesia and surgeons do not complete a measured assessment of the geriatric population's physical and cognitive function in their preoperative assessment. Currently there is no gold standard in assessing the geriatric patient's cognitive and functional status. Use of assessment tools such as the comprehensive geriatric assessment (CGA) and basic and instrumental activities of daily life (BADLs; IADLs) were useful in assessing surgical risk in patients undergoing thoracic surgery. It is reported by Fukuse et al., of 120 subjects it that "subjects who lack autonomy in performing BADLs and were more likely to have complications, especially for long operation times" (Fukuse et al., 2010, p. 889). Another study of 178 geriatric patients, Kristjansson et al., identifies that "CGA can identify frail patients;" these patients are found to have a significantly increased risk of "severe complications after elective colorectal surgery" (Kristjansson et al., 2009, p. 213). Noimark (2009) identifies that frailty is a risk factor for postoperative delirium.

Kozian et al. (2015) discuss the importance of the physiological changes that occur in the body due to aging and considerations to take with thoracic surgery anesthesia with emphasis on the pulmonary system. This is important to anesthesia practice because of the administration of

volatile agents to produce anesthesia. With the continued decline in the aging person's physiological reserves, respiratory complications considerably contribute to thoracic surgery outcomes. Preoperative lung function is a priority and must be evaluated via both clinical examination and lung function testing. The identified test parameter that is of importance for the anesthesia provider to know is the FEV1. This parameter has been identified by Licker et al. (2014) to show an augmented occurrence of postoperative pulmonary complications. "The most important variable is the global cardio-pulmonary reserve" (Licker et al, 2014, p. 127).

Use of different anesthesia techniques has been researched regarding lengths of stay and prolonged hospitalization. In the study done by Le-Wendling et. al. (2012), it is identified that the use of regional anesthesia when compared to general anesthesia for surgery on geriatric patients with hip fractures shows no statistical difference between the two groups. In addition, in-hospital mortality and readmission are not statistically different between the groups. This study includes all assessed costs of hospitalization, including procedures, labor and equipment, at "\$16,789 + 631 vs \$16815 +643 respectively, P=0.9557." (Le-Wendling et al., 2012, p.948).

Bettelli (2011) identifies that it would take an anesthesia provider an additional 10-15 minutes to interview geriatric patients on functional status. In today's operating arena it is not often that an anesthesia provider has an additional 10-15 minutes to add to a preoperative evaluation. The literature supports that some institutions have the pre-anesthesia interview outside of the day of surgery; this allows an increased time frame to implement a variables test that is followed by an action plan postoperatively when specific criteria are met. (See Index 1.) An example is BADL/IADL. If dependence is more than moderate, alert for perioperative extra nursing; and for Mini Mental State Examination, (MMSE) if MMSE <20, alert for perioperative psychological support.

Deiner & Silverstein (2011) discuss homeostasis; changes in physiologic reserves; cardiac physiology and pathophysiology changes on cardiac, respiratory, cerebral, hepatic and renal metabolism; and immunological function and the effect of anesthetic agents upon them. It is discussed that MAC decreases by 6% every decade after 40 years of age. Deiner & Silverstein (2011) discuss the condition "triple low." "Triple low" is a state that occurs when the Bispectral Index (BIS) is <45, mean arterial pressure (MAP) <75mmHg, and end-title volatile anesthetic MAC <0.7. This combination of values identifies patients who are sensitive to anesthesia and are at increased risk of cerebral hypoperfusion. This increased risk identifies that individuals with double low parameters are doubled the risk of 90-day mortality.

Unplanned perioperative hypothermia (UPH) is a complication that can be proactively prevented by the anesthesia provider. Erdling and Johansson (2015) research the differences between esophageal and nasopharyngeal temperature monitoring comparison with pre-warming, age, and weight. Unplanned perioperative hypothermia is defined as a core body temperature <36 degrees centigrade. It is known that both general and regional anesthesia affect both the central nervous system and peripheral tissue properties of vasoconstriction. Review of the data results in finding the group that had pre-warming demonstrate an increase in core temperature double that of the no pre-warming group. The study also noted that in the first hour of surgery both groups have a drop in core temperature measured only by the esophageal temperature probe and not the nasopharyngeal probe. It is believed that the esophageal temperature probe provides a more accurate reading compared to the nasopharyngeal temperature probe. The study concludes that pre-warming is beneficial in intraoperative UPH prevention.

Hadzimesic et al. 2013 research the cognitive function recovery rate in patients averaging approximately 45 years old during the early postoperative period comparing the following

anesthetics, propofol, sevoflurane, and isoflurane. The three anesthetic agents are assessed using the Orientation-Memory-Concentration (OMC) Test at the 1, 5, and 10 minute times after extubation. Isoflurane demonstrates the longest recovery of cognitive function using the OMC when compared to the propofol and sevoflurane groups. Propofol anesthesia when compared to isoflurane shows a statistical significance at the three times measured. Hadzimesic et al. 2013 demonstrates an important anesthetic point for anesthesia providers to consider when administering these anesthetics to adults 40 years and greater.

In the retrospective study completed by Korhan et al. 2013 on mortality rates in the Cardiovascular Surgery Intensive Care Unit in Turkey with the age groups 65-74 years old and 75 years and older, the increase in elderly patient population requiring surgical intervention has demonstrated a gradual increase from 2003 to 2013. Cardiac surgery places a demanding stressor upon the elder patients' organ systems, increasing their sensitivity to poor outcomes. The study does not demonstrate a statistical significance between the two elderly patient populations and increased mortality related to cardiovascular surgery followed by a stay in the Cardiovascular Surgery Intensive Care Unit. This study supports that elderly patients have a good prognosis following cardiovascular surgery with recovery in a Cardiovascular Surgery Intensive Care Unit.

Research is completed by Li et al. (2014) on the outcomes of peripheral nerve blocks compared to general anesthesia for hip fractures in geriatric Chinese patients. Patients who undergo a hemiarthroplasty for hip fracture are divided into two groups: general anesthesia and peripheral nerve block. The researchers compare the two groups looking at postoperative complications and mortality during the time frames; in hospital, 30 day, and one year respectively postoperatively. Acute cardiovascular events, delirium, and electrolyte disturbances are the most common postoperative complications identified (Li et al., 2014). "The study showed

6.9%, 14.7%, 23.5% mortality at in-hospital, 30-day, and 1-year postoperatively in this study" (Li et al., 2014, p. 655). The research statistical analysis concludes that mortality and postoperative complications are statically significant between the two groups. The general anesthesia group did have a higher incidence of dementia post operatively than the PNB group. The researchers discuss the possibility of improving this patient population's outcome by creating a team of practitioners to co-manage the geriatric hip fracture population. This team could have a stronger influence on improving patient outcomes than anesthesia type.

Research completed on anesthesia for the elderly in the outpatient setting by Aurini and White (2014) reviews evidence that supports the continued growth and expansion of ambulatory surgery centers for elective surgical procedures by the elderly patient population. The global population of the world is aging. This is a direct result from the parallel decline in mortality and fertility rates (Aurini and White, 2014). As of 2009 the US Census Bureau documents the elderly population number at 39.6 million, or 12.9% of the population. By 2030, the elderly population will almost double to approximately 72.1 million, or 19% of the US population. Elderly patient physiology is associated with cardiovascular system loss of compliance, autonomic nervous system decline, and increased risk of intraoperative hypothermia. Cerebral perfusion and neuron numbers decrease with aging. This increases the postoperative complication of post-operative cognitive disorder (POCD). The ambulatory setting has been identified as an arena that POCD, post-nausea and vomiting, and frequency and severity of post-operative pain is reduced after general anesthesia (Aurini and White, 2014). General anesthesia versus regional anesthesia does not show one greater than the other in outpatient surgery. Use of non-opioid pain medications such as acetaminophen, NSAIDS, Cyclooxygenase-2 inhibitors, and glucocorticoid steroids results in good pain control without the increase of postoperative bleeding risk in the elderly

patient. The American Society of Anesthesiologists is encouraging anesthesiologists to include surgical home care programs as part of the perioperative care given to the elderly patient in the outpatient surgical setting. Proactive anesthesia management and evidence-based perioperative management of the elderly population will improve outcomes and create a savings to the healthcare system.

Surgery is a life altering event that affects the elderly body, deviating it from the original preoperative diagnosis (Kim et al., 2015). Intraoperative and postoperative stress is both physically and psychologically an imbalance to the body's autonomic, endocrine, metabolic, and immune functions. The aging adult body has a reduction in physiologic reserve, or frailty. Kim et al (2015) discuss the two phenotypes of frailty, physical and multidomain. Physical phenotype of frailty is a clinical syndrome which an individual must have three or more of the following criteria present: unintentional weight loss (10 pounds in the last year), self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity (Kim et al., 2015). Multidomain phenotype of frailty considers additional components such as cognitive impairment, mood disorders, sensory impairment, chronic diseases, poor social conditions and support, and disability (Kim et al., 2015). With use of the modified Frailty Index (mFI), which was created from comparing the Canadian Study of Health and Aging Frailty Index with the mathematically measured outcomes from the National Surgical Quality Improvement Program (NSQIP), eleven items can be assessed without hands-on measurement. This is important since preanesthesia evaluation is not a time for a full hands-on assessment by an anesthesia provider. The following are the eleven items of the mFI: History of diabetes mellitus, CHF, hypertension requiring medication, transient ischemic attack or cerebrovascular accident, myocardial infarction, either peripheral vascular disease or rest pain, cerebrovascular accident with

neurological deficit, COPD or pneumonia, either prior PCI, PCS, or angina, impaired sensorium, functional status 2 (not independent). In the case of emergency surgery the higher the mFI score the higher the complications of wound infection, wound occurrence, any infection, any occurrence of complications, and mortality. With the elderly population increasing in numbers, the demand for surgical services and perioperative care will also increase. A thorough preoperative evaluation that includes use of mFI will aid the anesthesia provider in anesthesia administration with the goal of decreasing perioperative complications.

Neuroaxial verses general anesthesia administration in the geriatric patient population who have sustained a hip fracture remains a controversial topic in the medical literature. In a retrospective analyses of current literature search covering 18,715 patients with hip fractures, it is concluded that spinal anesthesia is associated with a reduction in mortality, deep vein thrombosis, less acute postoperative confusion, fewer myocardial infarctions, pneumonia, fatal pulmonary embolisms, and postoperative hypoxia (Luger et al., 2010). General anesthesia demonstrates advantages of lower incidence of hypotension, postoperative delirium, and fewer cerebrovascular accidents (Luger et al., 2010). These differences between Neuroaxial and general anesthesia have limited evidence leading to a definitive conclusion that one is superior to the other.

The current research completed by Makary et al. (2010) supports that frailty can be used as a predictor of surgical outcomes in the older patient population. In the past frailty has been used to evaluate surgical patient outcomes. Through a prospective study of 594 patients 65 years of age and greater who were undergoing elective surgery, frailty is categorized using the following validated scale of zero to five that includes weight loss, weakness, low physical activity, exhaustion, and slowed walking speed. Patients are put into three groups: 4-5 frail, 2-3

intermediately frail, and 0-1 non-frail. After analysis of the data it is identified that frailty is associated with an increased risk for postoperative complications, increased length of stay, and placement into a skilled nursing facility. Use of frailty assessment tools can aid patients, physicians, and Nurse Anesthetists in making a more informed decision.

Further research of frailty has lead researchers in to the area of ensuring assessment tools and scales have validity and reliability. Rolfson et al. (2006) research the validity and reliability of the Edmonton Frail Scale. The researches conclude that the Edmonton Frail Scale (EFS) has "good construct validity, good reliability and acceptable internal consistency." (Rolfsen et. al., 2006, p. 528). It supports the use of EFS as a measure of frailty in a variety of settings. The researchers do state "it is no gold standard," but is a good scale to use to alert health care professionals of frail populations so they may be optimized prior to elective procedures.

Geriatric surgery is viewed by surgeons as a clinical community rather than an independent society. Researchers Zenilman, Kathlic, and Rosenthal (2015) have reviewed current scientific data and opinions from surgical leaders in the field of surgery in the elderly population. The definition of a clinical community by the researchers is described as a "state of mind." They further discuss the details of a clinical community being "a group of people who work together interdependently as a team who share a common commitment" (Zenilman, Kathlic, Rosenthal, 2015, p.948). As the geriatric surgical community continues to develop and grow over time areas, the researchers see further development would assist the interdependent practitioners with outcomes. The following areas are mentioned: frailty, tests of cognition, education of geriatric principles in surgical internships and fellowships, prevention and treatment of post-operative delirium, increased focus on multidisciplinary care at annual meetings, and partnering with nurses to improve geriatric care. One last area discussed by the researcher is the

importance to generate new evidence on geriatric surgery with the goal of creating a specialty unit and care team.

Chapter 3: Project Description

The capstone project focuses on the anesthesia care of the geriatric patient. The purpose of the project was to provide additional learning opportunities to Student Registered Nurse Anesthesia in clinical rotation as an addition to their knowledge base of adult anesthesia care. The rapidly increasing number of the geriatric population seeking anesthesia care makes it important to ensure a broad understanding of the care of these patients during clinical rotations. Grounded knowledge of the care of the geriatric involves a thorough understanding of all aspects of care for this population.

The presentation of this learning module involved use of current anesthesia textbooks and journal articles on geriatric anesthesia, as well as the use of visual and audio aids to educate underclassmen. Focusing on the physiology and pathophysiology changes with aging.

Understanding of the pharmacological problems associated with aging, the implication of inhalation anesthesia, and local anesthesia on aging was be addressed using current anesthesia literatures and journal articles.

A pretest tool was be used to evaluate the knowledge base of the SRNAs. A post-test tool was used to re-evaluate to the knowledge base post presentation. Clinical challenges encountered as students during anesthesia care of the geriatric patient necessitate this learning model as a reinforcement tool aimed at increasing the knowledge base of SRNAs.

Evaluation

The 60-minute Power Point presentation will be presented to the SRNAs. The presentation was held in the classroom. The evaluation of the success of the lecture was based on

the results of the SRNAs post lecture evaluation test compared to a pretest evaluation test before the learning module presentation. The evaluation of the outcome of the teaching model was hoped to reflect increased understanding of all aspects of geriatric anesthesia and its implication in clinical practice. The evaluation scores from the pretest were averaged and compared to the average scores of the post test scores to assess the effectiveness of the Power Point presentation in knowledge enrichment on geriatric anesthesia implications in clinical practice among SRNAs.

The evaluation plan was reassessed via in-lecture review questions to help realize the project goal of assisting in the overall growth and development of SRNAs to be better providers of anesthesia in the fast growing geriatric population.

Results and Conclusion

Paired Samples Statistics

		Mean	Ν	Std.	Std. Error		
				Deviation	Mean		
	PreTest	13.3810	21	2.85440	.62288		
Pair 1	Scores						
	PostTest	18.2857	21	3.83592	.83707		
	Scores						

Paired Samples Test

-			Paired Samples	1631				
			Paired Difference	es				
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair PreTest Scores - 1 PostTest Scores	-4.90476	4.67873	1.02098	-7.03449	-2.77503	-4.804	20	.000

The paired samples statistics table shows the average score increase from 13.3810 to 18.2857 demonstrating an improvement from pretest scores. In the paired samples test table, the obtained t value is -4.804 with and associated p that is less than .05 level of confidence. This signifies statistical significance is achieved. In addition, the negative t value is indicative that a significant improvement was achieved after the presentation of the educational module. In conclusion, the educational module was instrumental in increasing the knowledge base of the SRNAs who participated in the study. Results and conclusion of the statistics of this study are based on the pre-test and post-test statistical analysis results.

References

- American Association of Nurse Anesthetists, (2014). Retrieved from http://www.aana.com
- Aurini, L., & White, P. (2014). Anesthesia for the elderly outpatient. *Current Opinion in Anaesthesiology*, 27(6), 563-575. doi:10.1097/ACO.0000000000000135
- Barash, P. (2013). *Clinical anesthesia (7th ed.)*. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.
- Bettelli G. (2010). Anesthesia for the elderly outpatient: preoperative assessment and evaluation, anesthetic technique and postoperative pain management. Italian National Research

 Centres on Aging, Ancona, Italy ttp://dx.doi.org/doi:10.1097/ACO.0b013e3283400b6c
- Bettelli, G. (2011). Preoperative evaluation in geriatric surgery: comorbidity, functional status and pharmacological history. *Minerva anestesiologica*, 77(6), 637. ISSN: 0375-9393
- Bhaskar, S., & Bajwa, S. (2014). From pre-operative comorbidities to post-operative cognitive dysfunction: The challenging face of geriatric anesthesia. *Indian Journal of Anesthesia*, 58(3), 248. http://dx.doi.org/doi:10.4103/0019-5049.135024
- Deiner, S., & Silverstein, J. (2011). Anesthesia for geriatric patients. *Minerva anestesiologica*, 77(2), 180-189. (PMID:21368727)
- Dilsen, O., Seyhan, M., Serpil, D., Canan, U., Mustafa, M., Bayazit, D., and Nermin, G. (2010)

 The influence of various anesthesia techniques on postoperative recovery and discharge criteria among geriatric patients. *Clinics (Sao Paulo)* 65(10): 941–946.doi: 10.1590/S1807-59322010001000003
- Erdling, A., & Johansson, A. (2015). Core temperature--the intraoperative difference between esophageal versus nasopharyngeal temperatures and the impact of prewarming, age, and weight: A randomized clinical trial. AANA Journal, 83(2), 99.

- Fukuse, T., Satoda, N., Hijiya, K., & Fujinaga, T. (2005). Importance of a comprehensive geriatric assessment in prediction of complications following thoracic surgery in elderly patients. *CHEST Journal*, *127*(3), 886-891. doi:10.1378/chest.127.3.886
- Hadžimešić, M., Imamović, S., Uljić, V., Hodžić, M., Iljazagić-Halilović, F., & Hodžić, R.
 (2013). Cognitive function recovery rate in early postoperative period: Comparison of propofol, sevoflurane and isoflurane anesthesia. Journal of Health Sciences, 3(1), 48-54.
 doi:10.17532/jhsci.2013.29
- Janis, K. (1982). Outpatient anesthesia in a geriatric setting. *International Anesthesiology Clinics*, 20(1), 89-98. doi:10.1097/00004311-198220010-00010.
- Kim, S., Brooks, A., & Groban, L. (2015). Preoperative assessment of the older surgical patient: Honing in on geriatric syndromes. *Clinical Interventions in Aging*, 10, 13-27. doi:10.2147/CIA.S75285
- Korhan, E. A., Hakverdioglu, G., Ozlem, M., Yurekli, I., Gurbuz, A., & Alp, N. A. (2013).

 Geriatric patient profile in the cardiovascular surgery intensive care unit. JPMA.the

 Journal of the Pakistan Medical Association, 63(11), 1338
- Kozian, A., Kretzschmar, M., & Schilling, T. (2015). Thoracic anesthesia in the elderly. *Current Opinion in Anaesthesiology*, 28(1), 2. doi:10.1097/ACO.0000000000000152
- Kristjansson, S., Nesbakken, A., Jordhøy, M., Skovlund, E., Audisio, R., Johannessen, H., & Wyller, T. (2010). Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery for colorectal cancer: a prospective observational cohort study. *Critical reviews in oncology/hematology*, 76(3), 208-217. doi:10.1016/j.critrevonc.2009.11.002
- Le-Wendling, L., Bihorac, A., Baslanti, T., Lucas, S., Sadasivan, K., Wendling, A., Heyman,

- J., Boezaart, A. (2012). Regional anesthesia as compared with general anesthesia for surgery in geriatric patients with hip fracture: Does it decrease morbidity, mortality, and health care costs? results of a single-centered study. *Pain Medicine*, *13*(7), 948-956. doi:10.1111/j.1526-4637.2012.01402.x
- Liu, J., Wang, X., Gong, M., Mai, H., Pei, S., Yuan, W., & Zhang, H. (2014). Comparative outcomes of peripheral nerve blocks versus general anesthesia for hip fractures in geriatric chinese patients. Patient Preference and Adherence, 8, 651-659. doi:10.2147/PPA.S61903
- Licker, M., Triponez, F. Diaper, J., Karenovics, W., Bridevaux, P. (2014). Preoperative evaluation of lung cancer patients. *Current Anesthesiology Reports*, *4*(2), 124-134. Doi:10.1007/s40140-014-0049-6
- Luger, T. J., Kammerlander, C., Gosch, M., Luger, M. F., Kammerlander-Knauer, U., Roth, T., & Kreutziger, J. (2010). Neuroaxial versus general anaesthesia in geriatric patients for hip fracture surgery: Does it matter? *Osteoporosis International*, 21(S4), 555-572. doi:10.1007/s00198-010-1399-7
- Makary, M. (2010). Frailty as a predictor of surgical outcomes in older patients. *Journal of American College of Surgeons*, 210(6), 901-908. doi:10.1016/j.jamcollsurg.2010.01.028
- Nagelhout, J. & Plaus, K. (2014). *Nurse anesthesia (5th ed.)*. St. Louis, Mo: Elsevier/Saunders
- Noimark, D. (2009). Predicting the onset of delirium in the post-operative patient. Age and Ageing, 38(4), 368-373. doi:10.1093/ageing/afp024
- Ornek D., Metin S., Deren S., Un C., Metin M., Dikmen B., Gogus N. (2010). The influence of various anesthesia techniques on postoperative recovery and discharge criteria among

- geriatric patients. Department of Anesthesia and Reanimation, Ankara, Turkey http://dx.doi.org/doi:10.1590/S1807-59322010001000003
- Owusu, C. & Berger, N. (2014). Comprehensive geriatric assessment in the older cancer patient: Coming of age in clinical cancer care. *Clinical Practice*, 11(6), 749-762. http://dx.doi.org/doi:10.2217/cpr.14.72
- Rolfson, D., Majumdar, S., Tsuyuki, R., Tahir, A., & Rockwood, K. (2006). Validity and reliability of the edmonton frail scale. *Age and Ageing*, *35*(5), 526-529. doi:10.1093/ageing/afl041
- Rortgen, D., Kloos, J., Fries, M., Grottke, O., Rex S., Rossaint, R., and Coburn, M. (2010)

 Comparison of early cognitive function and recovery after desflurane or sevoflurane anaesthesia in the elderly: a double-blinded randomized controlled trial *British Journal of Anaesthesia* 104 (2): 167–74 http://dx.doi.org/doi:10.1093/bja/aep369
- Stoelting, R., Hines, R., Marschall, K. (2012). Stoelting's anesthesia and co-existing disease (6th ed.). Philadelphia: Saunders/Elsevier.
- Zenilman, M., Katlic, M., & Rosenthal, R. (2015). Geriatric surgery--evolution of a clinical community. *American Journal of Surgery*, 209(6), 943.doi:10.1016/j.amjsurg.2015.01.016

APPENDIX A

Geriatric Anesthesia Assessment tool Pre/Post test

- 1. At what age are half of the glomeruli are lost?
 - a. 60
 - b. 70
 - c. 80
 - d. 90
- 2. Renal sodium management is affected in the elderly by which of the following:
 - a. Reduction in the secretion of aldosterone
 - b. Decreased elimination of excessive sodium
 - c. Decreased retention of sodium
 - d. All of the above
- 3. Renal Cortex decreases by what percent with age?
 - a. 10-15%
 - b. 20-25%
 - c. 30-35%
 - d. 40-45%
- 4. How does the decline in the overall endocrine function in the elderly affect anesthetic management?
 - a. Typically it does not
 - b. They have lower insulin requirements
 - c. They have higher insulin responses to glucose loads
 - d. They have decreased insulin resistance in skeletal muscle
- 5. How much does brain mass decrease by age 80?
 - a. 10%
 - b. 20%
 - c. 30%
 - d. 50%
- 6. How is blood circulatory time affected by aging?
 - a. Unaffected
 - b. Decreased
 - c. Increased
 - d. None of the above
- 7. How does blood circulatory time affect intravenous and inhalation induction times? (pick all that apply)
 - a. Inhalation induction will proceed more quickly
 - b. FA/FI ratio will approach 1 more slowly

- c. Intravenous induction will proceed more slowly
- d. Intravenous induction time is unaffected by blood circulatory time
- 8. Liver mass and blood flow are affected how with aging?
 - a. Increases in size
 - b. Decreases in size
 - c. 10-15% of blood flow decreases with age
 - d. 20-40% of blood flow decreases with age
 - e. A and B
 - f. B and C
 - g. B and D
- 9. Which is false regarding cerebral flood flow and brain mass changes in the elderly?
 - a. Neuronal density decreases
 - b. Cerebral blood flow and CRMO2 decreases
 - c. Loss in mass is primarily due to loss of white matter
 - d. Loss of mass is primarily due to loss of gray matter neurons in the cortex and frontal lobes
- 10. Which of the following is false regarding thermoregulation impairment in the elderly patient?
 - a. Lower basal metabolic rate
 - b. High proportion of body surface area to body mass
 - c. Lower ability to produce peripheral vasoconstriction to reduce heat loss
 - d. Low incidence of hypothyroidism
- 11. Which of the following is false regarding disadvantages of hypothermia in the elderly patient?
 - a. Drug metabolism can be impaired with hypothermia
 - b. Decreased platelet function
 - c. Increased risk of infection
 - d. Shivering decreases oxygen consumption by 400%
- 12. How do plasma protein levels change with age?
 - a. Serum albumin decreases slightly
 - b. Serum albumin is unchanged
 - c. Alpha-1 acid glycoprotein levels are usually unchanged or slightly increased
 - d. A and C
- 13. Which is true regarding changes in total body water with age?
 - a. Total body water increases with age
 - b. There is an increase in cellular water from the loss of muscle mass and decreased in adipose tissue
 - c. Total body water decreases with age

- d. None of the above
- 14. Which of the following are true regarding age-related hepatic function required dose-adjustments for medication in the elderly? (pick 2)
 - a. Decrease opiate dose by 50%
 - b. Decreases in hepatic function can result in a prolongation of anesthetic agents
 - c. Plasma clearance of opiates is unchanged
 - d. None of the above
- 15. How does the response to beta-adrenergic agents change in the elderly?
 - a. Decreased response to beta-adrenergic stimulation
 - b. Increased response to drugs that rely on beta-adrenergic stimulation
 - c. Increased response to beta-adrenergic stimulation
 - d. None of the above
- 16. Why are geriatric patients more susceptible to intraoperative hypotension under anesthesia?
 - a. due to dehydration
 - b. due to chronic use of diuretics
 - c. decreased capacity for sodium and water conservation by the kidney
 - d. limited response to beta-adrenergic drugs and decreased cardiac contractility that is exacerbated by anesthesia drugs
 - e. all of the above
- 17. The protective laryngeal reflexes such as swallowing and coughing decreases with increasing age. As a result of the decrease in the protective laryngeal reflexes aging patients are increase risk of which pulmonary complications?
 - a. Pulmonary inflammation
 - b. Loss of alveolar surface area due to repeated microaspirations
 - c. Contamination of the lower airway with enteric organisms
 - d. All of the above
- 18. Plasma norepinephrine levels are:
 - a. Increased in elderly patients
 - b. Decreased in elderly patients
 - c. Unaffected with age
 - d. None of the above
- 19. Of the following surgical procedures which two have the highest incidence of postoperative delirium in the elderly population?
 - a. Urology
 - b. Orthopedic
 - c. Cardiac
 - d. Hepatic

- 20. The elderly have a diminished tachycardic response to the following hemodynamics:
 - a. Hypotension
 - b. Hypovolemia
 - c. Hypoxia
 - d. All of the above
- 21. How is MAC affected by age?
 - a. Is decreased by about 4-6% per decade after the age of 40
 - b. Is decreased by about 8-10% per decade after the age of 40
 - c. Unaffected by age
 - d. None of the above
- 22. Elimination half-lives of atracurium and cisatracurium are affected by aging in which of the following ways?
 - a. They are increased
 - b. They are decreased
 - c. They are not affected
 - d. None of the above
- 23. With longer circulatory time and a decrease in skeletal muscle blood flow, the onset of all muscle relaxants ...
 - a. Is up to twice as long in elderly patients
 - b. Is up to four times as long in elderly patients
 - c. Is unaffected by age
 - d. None of the above
- 24. The duration of action of midazolam, diazepam and lorazepam are affect by aging in what ways?
 - a. Midazolam effects are increased in the elderly
 - b. Diazepam has the greatest lipid solubility increasing accumulation in lipid stores
 - c. Half-life of diazepam is increased from 30 hours to 36 hours in the elderly
 - d. Lorazepam is less lipid soluble, its half-life remains relatively unchanged
 - e. All of the above
- 25. The elderly patient has changes in body composition that affect the volume of distribution for water-soluble and fat-soluble drugs in which manor. What statement is false?
 - a. Total body water increases while total body fat decreases
 - b. Total body of water decreases while total body fat increases
 - c. Volume of distribution for water-soluble drugs such as gentamicin, glycopyrrolate and succinylcholine decreases
 - d. Volume of distribution for lipid-soluble drugs such as benzodiazepines, volatile anesthetics, and barbiturates increases

APPENDIX B

ANSWER SHEET FOR PRE/POST ASSESSMENT TOOL ON GERIATRIC ANESTHESIA

- 1. C
- 2. D
- 3. B
- 4. A
- 5. C
- 6. B
- 7. A/C
- 8. G
- 9. C
- 10. D
- 11. D
- 12. D
- 13. C
- 14. A / B
- 15. A
- 16. E
- 17. D
- 18. A
- 19. B / C
- 20. D
- 21. A
- 22. C
- 23. A
- 24. E
- 25. A

APPENDIX C

IRB Research Proposal

TITLE

Understanding the concept of geriatric anesthesia and its implication in clinical practice:

A learning module for Student Registered Nurse Anesthetists.

DESCRIPTION AND PURPOSE OF THE CAPSTONE

Increase in longevity of the geriatric population, and increase in number of the group has led to an increased frequency of requirement for anesthesia management. A thorough understanding of the physiological changes associated with aging, the effect of aging on various body systems, the intricate medication management, and dosing as it relates to anesthesia practice all become very important. A thorough knowledge of the healthcare implications concerning the geriatric population would be an important tool for the Senior Registered Nurse Anesthetists (SRNA).

It is important to have an in-depth knowledge of what physiological changes are normal in the geriatric population as it pertains to anesthesia. The American Association of Nurse Anesthetists (AANA) Code of Ethics 3.1 states that the Certified Registered Nurse Anesthetist (CRNA), as an independently licensed professional, is responsible and accountable for judgments made and actions taken in his or her professional practice (AANA, 2014). Neither physician orders nor institutional policies relieve the CRNA of responsibility for his or her judgments made or actions taken. This implies that the SRNA must be grounded in every aspect of care in the geriatric population. Such knowledge will become an asset in anesthesia delivery as professionals.

Furthermore, the rapidly increasing population of elderly patients requiring anesthesia mandates a thorough knowledge of the patient population. Because advanced age is major risk factor for increased morbidity and mortality during the perioperative period, a thorough knowledge of the geriatric patient becomes essential (Bhaskar & Bajwa, 2014). A comprehensive knowledge of the patient population will also equip the SRNA to avoid complications postoperatively. In addition, due to the rapidly changing patient population, repetition of geriatric patient care will help instill a knowledge base of how to care for patients. Thorough presentation of preoperative medications and how they impact the cerebral physiology in the elderly is necessary for an SRNA to understand in order to avoid cognitive dysfunction in the patient. Polypharmacy, over the counter medications and supplements for the elderly and its implications in anesthesia care are other factors SRNAs should be made aware of.

Fluid management, postoperative pain management, and induction doses for anesthesia medication during geriatric anesthesia are critical perioperative challenges that require early and careful education of the SRNA in clinical practice. A thorough understanding of intravenous anesthesia, inhalation anesthesia and regional anesthesia regarding the geriatric population also become significant (Owusu & Berger, 2014).

BACKGROUND AND RATIONALE

The capstone project focused on the anesthesia care of the geriatric patient. The purpose of the project is to provide additional learning opportunity to Student Registered Nurse Anesthetist in clinical rotation as an addition to their knowledge base of adult anesthesia care. The rapidly increasing number of the geriatric population seeking anesthesia care makes it important to ensure a broad understanding of the care of these patients during clinical rotations.

Grounded knowledge of the care of the geriatric involves a thorough understanding of all aspects of care for this population.

The presentation of this learning module will involve use of current anesthesia textbooks and journal articles on geriatric anesthesia, as well as the use of visual and audio aids to educate underclassmen. Focusing on the physiology and pathophysiology changes with aging.

Understanding of the pharmacological problems associated with aging, the implication of inhalation anesthesia, and local anesthesia on aging will be addressed using current anesthesia literatures and journal articles.

PROBLEM STATEMENT

As the number of geriatric patients increase, it is essential that healthcare professional managing this patient population are well equipped with the necessary background knowledge to adequately care for this population. A gap in knowledge exists in the field of geriatric anesthesia in the area of research focusing on the challenges of geriatric anesthesia to the Student Registered Nurse Anesthetist (SRNA). Limited data is available with regard to the concept of assessing proper understanding of geriatric anesthesia in clinical practice among SRNAs.

Dilsen, Seyhan Serpil, Canan, Mustafa, and Nermin (2010) studied the influence of various anesthesia techniques on postoperative recovery and discharge criteria among geriatric patients. Dilsen et al (2010) studied 60 geriatric outpatient patients undergoing transuretheral interventions using general anesthesia cases, or selective spinal anesthesia. Hemodynamic variations, nausea and vomiting, patient and surgeon satisfaction were variables studied by Dilsen et al, 2010. Their discovery was that no variation existed between outcomes using either technique in terms of hemodynamic variation and surgeon/satisfaction. This findings reinforces

the need for adequate knowledge in performing geriatric anesthesia because spinal anesthesia and general anesthesia should not have the same hemodynamic effect.

Also, Bettelli (2010) studied anesthesia care of the elderly patient in the outpatient setting. Preoperative assessment and evaluation, postoperative pain management, and anesthesia technique were areas researched. Age and functional status as well as criteria for selection of geriatric patient's suitability for outpatient surgery were examined but nothing was said about the knowledge base and traineeship of anesthetists performing anesthesia in the outpatient clinical setting. In another journal article by Bettelli, 2011, a look at preoperative evaluation in geriatric surgery with emphasis on geriatric functional status, comorbidities and pharmacological history was addressed. The study looked at the disease states common to the elderly. Hypertension, diabetes, coronary artery disease among others were analyzed as very common to the elderly patient (Bettelli, 2011, p. 643). Conclusion from the study reiterated that more education is needed in the preoperative evaluation of the elderly patient because of their rapid increase in number, increased commodities, and pharmacological history Bettelli 2011 P.644.

Furthermore, Rortgen, Kloos, Fries, Grottke, Rex, Rossaint and Coburn (2010) compared early cognitive function and recovery after desflurane or sevoflurane anesthesia in the elderly with the goal of finding which gas increases the risk of postoperative cognitive dysfunction more. The study highlights the importance ofthorough knowledge base on the vast implication of various anesthesia choices facing the certified registered nurse anesthetist and students on the area of geriatric anesthesia. Rortgen et al (2010) discovered that there is little difference in the occurrence of postoperative cognitive dysfunction in choice of anesthesia gas between desflurane and sevoflurane among the geriatric patients studied Rortgen et al, 2010, p. 173).

The increasing number of geriatric patients, and the physiologic changes associated with aging necessitates a thorough background knowledge by anesthesia providers, especially student registered nurse anesthetists, on best practice for care of the population, but has not been studied the literatures reviewed.

PROJECT OBJECTIVES

The learning module will equip the Student Registered Nurse Anesthetist with the necessary knowledge with regard to the concept of geriatric anesthesia and its implication in clinical practice. Acquisition of this knowledge will contribute to enhance the student learning opportunity during their clinical rotations and in their future practice as Certified registered Nurse Anesthetists.

The capstone project focused on the anesthesia care of the geriatric patient. The purpose of the project is to provide additional learning opportunity to Student Registered Nurse Anesthetist in clinical rotation as an addition to their knowledge base of adult anesthesia care. The rapidly increasing number of the geriatric population seeking anesthesia care makes it important to ensure a broad understanding of the care of these patients during clinical rotations. Grounded knowledge of the care of the geriatric involves a thorough understanding of all aspects of care for this population.

The presentation of this learning module will involve use of current anesthesia textbooks and journal articles on geriatric anesthesia, as well as the use of visual and audio aids to educate underclassmen. Focusing on the physiology and pathophysiology changes with aging.

Understanding of the pharmacological problems associated with aging, the implication of inhalation anesthesia, and local anesthesia on aging will be addressed using current anesthesia literatures and journal articles?

RESEARCH DESIGN AND METHODOLOGY

• The project design is a learning module that will include a pre-lecture, and a post-lecture quiz. Quizzes will not have any names attached, and will be assigned random numbers to de-identify the subjects.

See attached multiple choice quiz questions.

- The population to be studied include Student Registered Nurse Anesthetists at the Adventist University of Health Sciences (ADU) in the Fall of 2015.
- The sample size is 23 subjects.
- The independent variable will include a formal educational lecture. This lecture material will be measured by administration of a pre and post lecture assessment tool on the topic.
- The dependent variable will include a post lecture survey to evaluate the effectiveness of the presentation.
- Data analysis will include the difference between pre and post lecture quiz score

APPENDIX D

ADU NAP CAPSTONE PROJECT - INFORMED CONSENT

Our names are Oluchi B. Uchegbu and Kim Rolfsen Simpson, and we are MSNA students in the Nurse Anesthesia Program (NAP) at Adventist University of Health Sciences (ADU). We are doing a Capstone Project called *Understanding the Concept of Geriatric Anesthesia and its Implication in Clinical Practice: A Learning Module for Student Registered Nurse Anesthetists.* This project is being supervised by Dr. Manuel Tolosa. We would like to invite you to participate in this project. The main purpose of this form is to provide information about the project so you can make a decision about whether you want to participate.

WHAT IS THE PROJECT ABOUT?

As the number of geriatric patients increase, it is essential that healthcare professional managing this patient population are well equipped with the necessary background knowledge to adequately care for this population. The purpose of the project is to provide additional learning opportunity to Student Registered Nurse Anesthetists in clinical rotation as an addition to their knowledge base of adult anesthesia care.

WHAT DOES PARTICIPATION IN THIS PROJECT INVOLVE?

If you decide to participate in this project, you will be asked to complete an anonymous pre-assessment, attend a classroom presentation, and then complete an anonymous post-assessment. The assessment will address information provided in the learning module. Your participation by attendance at the presentation and completion of the survey is anticipated to take approximately ninety minute.

WHY ARE YOU BEING ASKED TO PARTICIPATE?

You have been invited to participate as part of a convenience sample of students currently enrolled in the ADU NAP. Participation in this project is voluntary. If you choose not to participate or to withdraw from the project, you may do so at any time.

WHAT ARE THE RISKS INVOLVED IN THIS PROJECT?

Although no project is completely risk-free, we don't anticipate that you will be harmed or distressed by participating in this project.

ARE THERE ANY BENEFITS TO PARTICIPATION?

We don't expect any direct benefits to you from participation in this project. The possible indirect benefit of participation in the project is the opportunity to gain additional knowledge about the concept of geriatric anesthesia in clinical practice.

HOW WILL THE INVESTIGATORS PROTECT PARTICIPANTS' CONFIDENTIALITY?

The results of the project will be published, but your name or identity will not be revealed. To maintain confidentiality of assessments, we will conduct this project in such a way to ensure information is submitted without participants' identification. Numbers will be assigned to the assessment tool in place of names and the results analyzed by comparing the pre and post-test assessment results. Data generated will be evaluated without names attached. We will not have access to participants' identity.

WILL IT COST ANYTHING OR WILL I GET PAID TO PARTICIPATE IN THE PROJECT?

Your participation will cost approximately ninety minutes of your time, but will require no monetary cost on your part. You will not be paid to participate.

VOLUNTARY CONSENT

By signing this form, you are saying that you have read this form, you understand the risks and benefits of this project, and you
know what you are being asked to do. We will be happy to answer any questions you have about the project. If you have any
questions, please feel free to contact Oluchi B. Uchegbu oluchi.uchegbu@my.adu.edu or Kim Rolfsen Simpson Kim.Rolfsen.
Simpson@my.adu.edu. If you have concerns about the project process or the investigators, please contact the Nurse Anesthesia
Program at (407) 303-9331.

Participant Signature	Date
Participant Name (PRINTED LEGIBLY)	

APPENDIX E

Poster Presentation

Understanding the Concept of Geriatric Anesthesia and its Implication in Clinical Practice: A Learning Module for Student Registered Nurse Anesthetists

Presentors: Kim Rolfsen Simpson, RN, MSN, BSN, SRNA and Oluchi B. Uchegbu, RN, BSN, SRNA Advisor: Manuel Tolosa, CRNA, DNAP Mentor: Emily Whitcome, CRNA, MSNA Statisticians: Roy Lukman, PhD

ABSTRACT

· A learning module was created to · A gap in knowledge exists in provide additional learning opportunities to the Student Registered Nurse Anesthesia (SRNA) about geriatric anesthesia and its implication in clinical practice.

- · The module focused on the physiology and pathophysiology changes with aging, along with the understanding of the pharmacological problems associated with aging, the implication of inhalation anesthesia, and local anesthesia on this population.
- · A pretest tool was used to evaluate the knowledge base of the SRNAs, along with a posttest tool that was used to reevaluate the SRNAs knowledge base post learning module presentation.

BACKGROUND

- the field of geriatric anesthesia.
- · Limited data is available with regard to the concept of assessing proper understanding of geriatric anesthesia in clinical practicing SRNAs.

METHODS

- · A pretest tool was used to evaluate the knowledge base of the SRNAs.
- · 60-minute educational module was then presented.
- · A post-test was used to reevaluate the knowledge base post presentation.

RESULTS

- · Paired samples statistics table shows the average score increased from 13.3810 to 18.2857.
- · Paired samples test table value is -4.804 with and associated p that is less than .05 level of confidence.
- · Statistical significance was achieved.

CONCLUSIONS

· The educational module was instrumental in increasing the knowledge base of the SRNAs.

REFRENCES

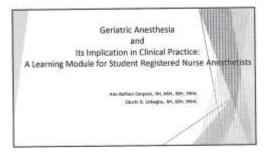
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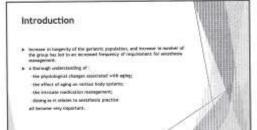
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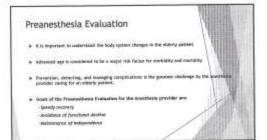
APPENDIX F PowerPoint

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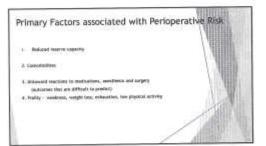




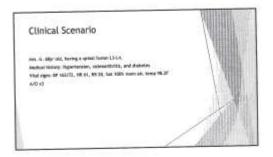
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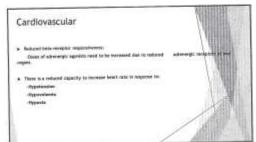


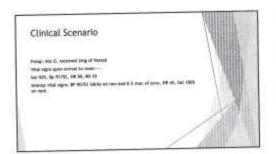
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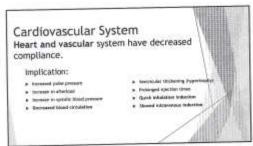


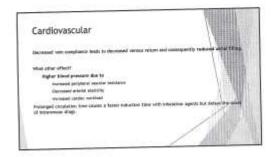
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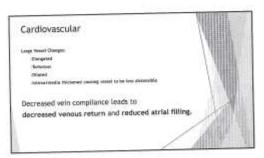


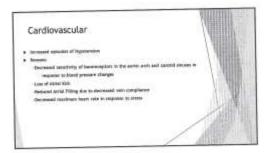


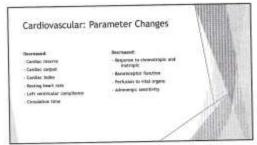


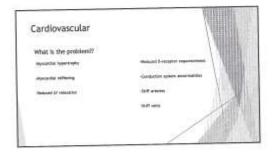


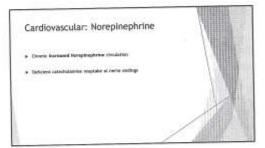


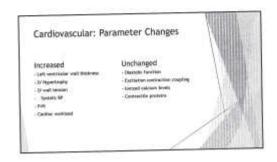


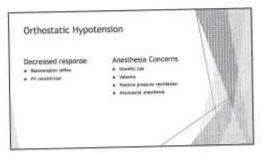








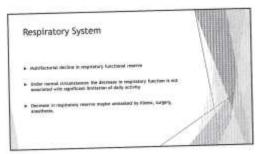




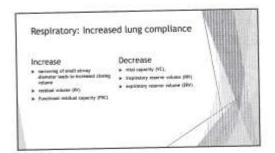
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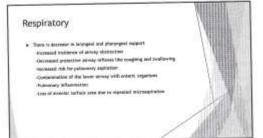


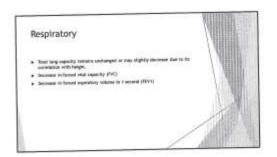
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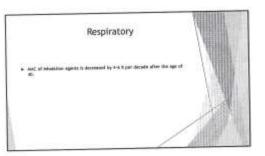


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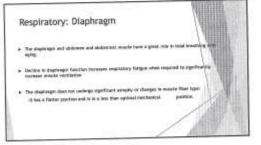


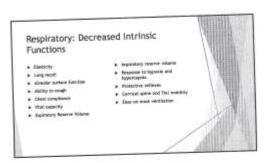


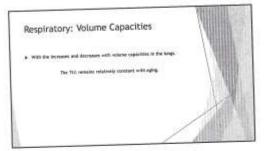


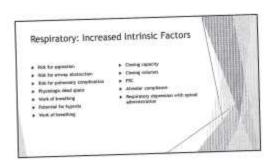


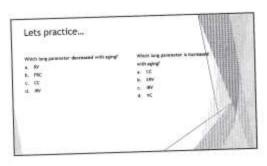
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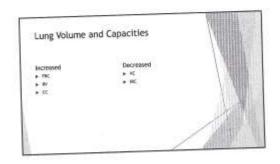


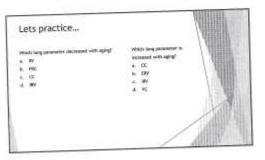




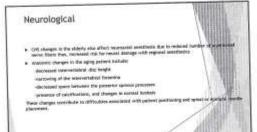




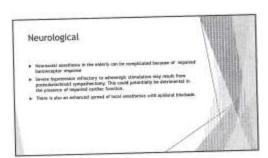




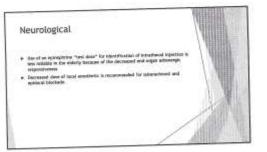
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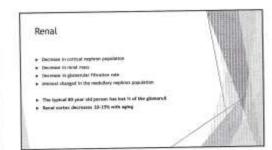
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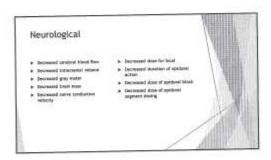


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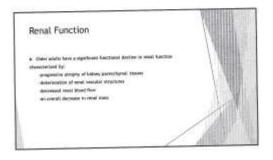


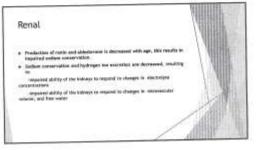
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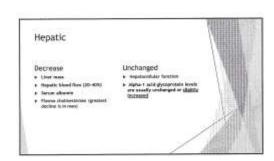




Renal The torum presentate is often swiftenged. Creatives classics is the tient meticator of drug classics.

Hepatic Function - Age-related changes in Inspatic European are characterized by a discrease to destroyee a postal and later bland Bure - European special and lateria - Discreased stream alliancia - Discreased elasyeer artifety

Renal. • Case patients with rotal insponent may be at increased risk for fluid window. - exemulation of seatabolism and draps that are received by the fathery destinated draps standards, which are prolong the effects of a more received should be always a constant to the more of exemulations, which are lead to enhydrosine by affecting conduct conduction.



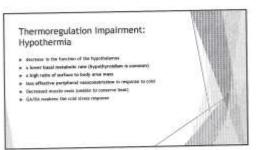
Renat: Parameters that decrease with Aging > Solution formation > Solution formation > Solution formation ability > CIP. > Solution formation ability > CIP. > Solution formation > Solution (Solution) > Solution (Solution) > Constitute possibilities > That benefiting

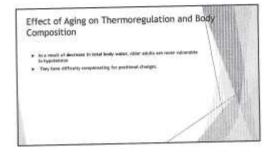


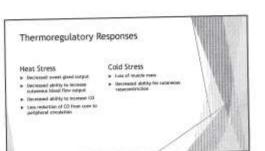
Hepatic because body for and decreased vister conduct to the disket patient has considered to include the conduction of the reliance destination (visit of name strap. The first despitation of the reliance destination (visit of name strap. The reliance consideration. The visit of people display in the delian patient to decreased, naming an increase or please consideration. The visit of people display in the delian elegants, traceing a decrease or delir please consideration. The end results to preference equivale discool by SVX.

Thermoregulation and Body Composition • total of total body mass • movement total body tests • decreased total body value • decreased total body value • selection in broad values at 380 to 300

Endocrine System Autopic bedicula force Interrupt withwood by enorthysis and sulpical states. Interrupt withwood by enorthysis and sulpical states. Interrupt withwood by enorthysis and support to the annual doctrine states response that it is reflected by because assurable of many thresholding. Interrupt from tool Integrational front tool This control, rimities in the idderty patients endocrine function topically does for other annual to many appearance.

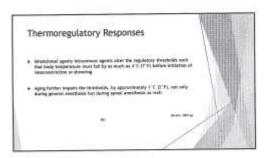


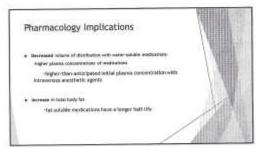


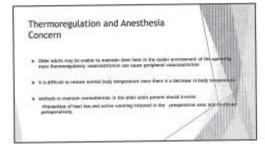


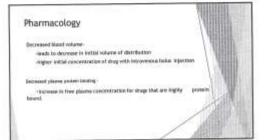
Thermoregulation and Anesthesia Concern Site anachatic ofmoston due to impered metaleites with hypothermia Indicagal recovery from anedona Suprand congulation Narrows did all infection Narrows did all infection Narrows the characters that the patient will show Suprand process cogges recommendate by as to 400%, which leads to hypothesis and confect companyons by as to 400%, which leads to hypothesisms



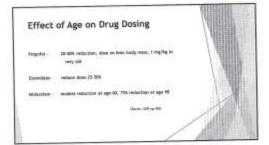




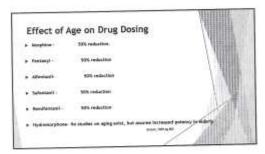


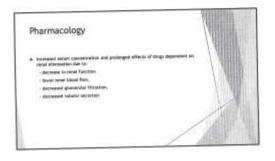


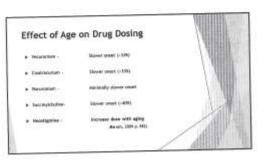
Pharmacology * Manuscidentic attentions toked bit. *indumm of 680/1540/00 -Renal and hepatic clearance rather declar/basino distribution half-bers - Manuscidentic effects - Longerisation for secrificitic drigs (notineged distribution of action



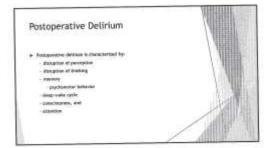
Pharmacology • Remandification drains - shared recopic density and blading - shared in signal translation - sequence callular responses

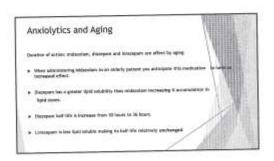


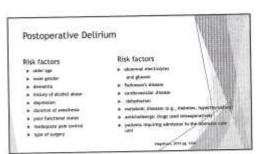


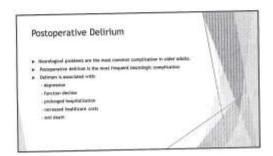


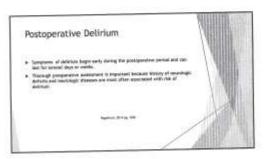
Muscle Relaxants on set time Difference of Opinion is noted Nose-depolarizing Muscle Relaxants In out offected by spire, - discretion and foot of Association and constanting our not effected by aping ((Automoretis et al., 1815) - characterion takes - 12th langue (Bossen, 1809)



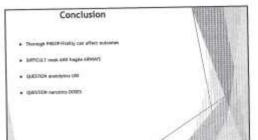




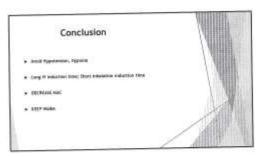




Post Operative Delirium Orthopedic and Cardiac surgical procedures > Nove two identified 20-how the highest 496-for for operative Delirius Hagelitons, 2014 pg. 1222



Postoperative Cognitive Dysfunction • FOCO characterized by cognitive impainments like immunity solubils. • #Rough with concentration • indused congrations are indused appropriate speed • course of FOCO is solvible • Serviceogrative deficits may result weeks to months after balgers.



Conclusion Less is more in the elderly patient population... Physiological changes decrease responses to anesthesia and perioperative stress associated with anesthesia.



Reference In date, 1, least in, 1995, in, 1995, in 1995,

Reference | Institute | Insti