Care Planning Process for Specialty Rotations

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Problem

Care planning is instituted in student nurse anesthesia education prior to the start of clinical rotations. Two main problems were discovered during informal discussions with some senior student registered nurse anesthetists (SRNAs) at Adventist University. First, when entering clinical specialty rotations, the perceived anxiety of didactic work and specialty rotation combined was daunting. Second, some pertinent lectures occurred after some of the specialty rotations. Additionally, when written care plans were no longer required to be submitted for a grade, it is speculated that some students may not have continued to use the formal care planning process to prepare for the care of the patients.

According to Dosch, Jarvis and Schlosser (2008), 9% of SRNAs do not graduate due to academic and clinical challenges. The most common explanation of attrition was the resignation of SRNAs due to personal reasons or dismissals due to poor scholastic performance. The students resigned for reasons of health problems, poor scholastic performance, a lack of time commitment, and overwhelming responsibilities. The reasons for dismissal included a lack of time management, poor preparation in didactic and clinical settings, and a lack of motivation. Phillips (2010) performed a qualitative study that examined the challenges and coping mechanisms of SRNAs who withdrew from their anesthesia programs. The study concluded that the stressors during the anesthesia program were divided into both personal and didactic causative factors. As Dosch et al. (2008) and Phillips (2010) described, the overwhelming stress from academic and personal challenges was a big obstacle for the SRNAs.

Care plans are a required and essential part of excellent anesthesia care. Course work takes time. Time management by combining the required work (typing and submitting care plans) with research for preparing for scheduled cases may help to decrease the perceived stress

of the student registered nurse anesthetist. Upon entering specialty rotations, students have expressed that during that transition it would be helpful to have specific clinical data prior to entering the specialty. Rather than reinventing the wheel, it is a practical use of time and energy to use care planning which is both a resource and requirement. Once the requirement of submitting a written care plan for a grade is lifted, continuing to use a care plan as a resource can reinforce critical thinking and decrease stress.

Taking advantage of required work can be a coping mechanism that may be helpful. The review of literature will include three different aspects. It will begin with a definition of nurse anesthesia care planning. This will be followed by how the benefits of care planning can overcome the barriers encountered when entering specialty clinical rotations. Evidenced based practice references as well as clinical experience will be presented in the actual care plans (see Appendix A for care plans and care plan references).

Review of literature

Defining Care Planning

Most simply defined by Chu, Hairston and Ludwin (2012), the anesthetic care plan organizes the anesthesia approach, tailoring both to the patients' needs and the surgeon's specific needs while also providing patient safety. The three aspects of the intraoperative anesthetic plan of care, which are induction, maintenance and emergence, are developed during the preoperative period. A history and physical examination allows for the identification of any coexisting diseases and ascertains the possibility of a difficult airway. It is during the preoperative time frame that the decision can be made as to whether the patients coexisting disease state may need to be optimized prior to surgery or whether additional equipment will be necessary for safe anesthetic administration. Surgeon preference, length of time of the surgical procedure, and

surgical technique are other factors to be taken into consideration when developing a plan of care.

According to Chu et al., the goals during the intraoperative period are to maintain anesthesia throughout the surgical procedure, while at the same time maintaining physiologic homeostasis. While developing a plan of care, the preoperative history and physical is also utilized to decide the type of anesthesia to be administered. Anesthetic choices for induction and maintenance may be either intravenous or inhaled anesthetics which provide "unconsciousness, immobility, analgesia, and possibly muscle relaxation" (Chu et al, 2012). Surgical stimulus and patient response require titration in the depth of anesthesia, analgesia, and neuromuscular blockade. The history and physical examination can cue the anesthesia provider prior to the maintenance period whether there will be any increased requirements of the medications needed to provide an adequate amount of anesthesia and analgesia, as well as providing information in regards to maintenance of hemodynamics.

Emergence from anesthesia includes a plan of care that involves awakening the patient and maintaining a patent airway. Extubation includes deciding whether the patient's endotracheal tube will be removed when the patient is in stage III of anesthesia (deep extubation) or extubated fully awake, if the endotracheal tube is to be removed at this time. Difficult ventilation and intubation are factors that will contribute to the decision making process during emergence as well. Another factor to be considered prior to emerging a patient is whether the patient is at risk of postoperative nausea and vomiting. Pain control is important in the plan of care process to allow for smooth transitioning from the perioperative stage to the postoperative stage.

Clinical reasoning is an important aspect of the care planning process that incorporates patient centered care. Hoffman et al. (2011) discussed the clinical reasoning cycle and noted

imperative details to be added in the development of a plan of care. The authors discussed the importance of collecting cues or information while at the same time recalling didactic knowledge. With both clinical cues and didactic knowledge, information can be processed to discriminate and distinguish the relevancy and priority of each issue. This clinical reasoning cycle would presumably predict an outcome or several possible outcomes. Having several outcomes thought out in advance will give a foundation of options for the student to be prepared in advance with different alternatives. After implementing, it is suggested that reflecting on what occurred as well as what could be done differently to obtain an improved outcome will benefit the learner.

The role of the nurse anesthetist is to assess, plan, implement, and evaluate. This unique scope of practice includes the pre-anesthetic preparation and evaluation, anesthetic induction, maintenance and emergence, peri-anesthetic and immediate post-anesthetic care, all while promoting homeostasis. The plan of care should be patient centered to promote the best possible outcome for that particular patient. This patient centered process assists the anesthesia provider in avoiding ineffective or potentially harmful care. In preparing an appropriate care plan, clinical relevance needs to be identified, along with patient specific circumstances and behaviors.

Weiner et al. (2013) performed an observational study of 139 internal medicine residents from two residency programs at two Veteran's Affairs outpatient clinics. A total of three visits per physician were surreptitiously recorded. The data were evaluated for improved patient outcomes if patient-centered decision making (PCDM) was instituted. It was found that 71% had improved health outcomes with PCDM, while only 46% showed improvement without PCDM. This data supports the use of patient centered care planning to improve the health outcomes of patients.

Benefits and Barriers

Though the task of constructing a care plan may seem onerous, there are many benefits to the undertaking. There are more clinical barriers than there are care plan barriers. During the process of building the plan, as described above, the student is presented with repetition of material. The research involved in reading about the specifics of the patient plan of care and the task of writing the same information is reinforcement. Wright and Fallacaro (2011) measured "the relationship between memory, cognition and automaticity and situational awareness." Situational awareness, closely related to vigilance, is described as a key to safe delivery of anesthesia. Wright and Fallacaro found that cognition may be directly related to situational awareness. While the constructs of Wright and Fallacaro's study were designed to support the use of simulated operating rooms in nurse anesthesia practice, first, setting the ground work of being able to identify critical incidents is essential. It is this cognitive arena that can be addressed by care planning.

Phillips (2010) performed a focused qualitative study of 12 different recent graduates from five different anesthesia schools that investigated the problems graduate nurse anesthetists faced while in the anesthesia program. "Problem-focused coping included any action steps that were directed at a problem. Participants described techniques such as time management, obtaining further information about particular clinical situations, asking for additional materials, planning ahead for study group assignments, and using preprinted clinical data care plans." From these coping mechanisms, came a recommendation to modify "the didactic and clinical course load in combination with each other". A constructive use of time would be to let the requirements of school overlap in a single assignment. For example, preparation for a pediatric

case could include reading material that may not, as yet, have been presented, but will be required.

Can and Erol (2012) discussed the value of care planning, saying that it provides a "framework for the knowledge, thought and actions" of patient care. This "road map" helps students to "integrate theoretical knowledge into practice, develop their skills, and gain clinical experiences." Can and Erol assessed 55 nursing students' perceptions on the effect that the use care planning had on their occupational development. Sixty percent reported favorable effects.

Furthermore, Wong & Li (2011) mentioned that certain characteristics of SRNAs were important to perform safe anesthesia care such as being vigilant, being able to critically think, and having good judgment in their scope of practice. Care planning offers the SRNA the opportunity to practice vigilance, critical thinking, and to exhibit good judgment based on evidence based practice. In addition, it seems that certain characteristics are required to successfully transition from novice SRNAs to professional CRNAs such as calmness, clear communication, and problem solving skills. Obviously, these characteristics cannot be established in one day. By practicing the care plan process each day with various types of surgeries, the SRNAs can develop these characteristics.

As a caveat, the value of teaching for the student researchers of this project should also be mentioned. Colvin and Ashman (2010) are among the researchers who show a clear connection from learning through the means of teaching. Colvin and Ashman emphasized the benefits to the student teacher which include helping to increase their involvement and scholastic commitment, developing friends, continued learning and growth, and improved grades while becoming better students. Lafleur and White (2010) showed that the role of teaching enhanced

learning, promoted further study, allowed the teachers to be personally better able to handle conflict and duty, and they also derived joy by helping others.

Experience in the clinical setting has led to an identification of disparity in the expectations and perceptions between preceptor and student regarding effective clinical teaching skills. Smith, Swain, and Penprase (2011) executed a descriptive, quantitative study that analyzed responses from participants that included 50 SRNAs and 125 CRNAs. Twenty-four characteristics were presented and their responses were gathered and analyzed to identify what each group considered were effective skills. An incongruence regarding characteristics of effective clinical instructors were identified between the two groups. Although incongruence was identified, both groups considered all 24 characteristics as either important or highly important. Three characteristics scored in the top five for both the SRNA and CRNA group. These aspects of an effective clinical instructor included stimulates student involvement, appropriately encourages independence, and calm during times of stress.

It is valuable to note that not all clinical preceptors are willing to share the care of the patient with the student in the operating room. Those who are willing to allow the student to have increased autonomy may be more receptive if the student has a sound plan in place that is patient specific, considering all complications that may arise during the case with an understanding of the interventions that are needed when deemed necessary. Developing a care plan with an understanding of all risks involved and discussing this with the clinical preceptor may help the preceptor to recognize the student's motivation to learn. This information sharing creates a positive impact on the learning process and creates more opportunities for hands on learning.

Anxiety of student nurse anesthetists has been shown to influence their ability to learn and perform safely and effectively. Smith, Swain, and Penprase (2011) discussed the stresses involved in the clinical setting that can lead to unintentionally harming patients, being embarrassed or humiliated and not being as efficient in the delivery of care. It is this type of discomfort that may be assuaged by the preparation of an evidence based plan of care.

Project Description

To help decrease the stress for junior SRNAs, care planning for specialty clinical rotations will be presented in a Power Point lecture prior to reporting for the specialty rotation. Six specialty rotations have been selected with the assistance of project mentors and the project chair. These specialties are cardiovascular, obstetrics, neurosurgery, orthopedics, ear nose and throat, and pediatrics. The object of the lecture will be to provide the students with didactic material pertinent to specialty rotations that may not have been covered in class yet and to help guide the care plan process for the specialty rotation. This lecture is intended to help alleviate the anxiety of preparing for specialty rotations.

A convenience sample of junior nurse anesthesia students at Adventist University of Health Sciences will be asked to voluntarily perform an anonymous assessment both before and after the lecture. In addition, the students will be provided with an electronic copy of the lecture as well as the actual care plans to utilize for their own planning.

Four CRNAs have been selected to co-mentor as a way to provide congruent information from both didactic sources and practice for the students. All of the information synthesized from this project will come from the collaborative efforts of the faculty at ADU, evidence based research, lecture notes from Adventist University, required texts for the nurse anesthesia program at Adventist University, supplemental texts suggested by the anesthesia program at Adventist

University and the practical experience of the CRNAs from JLR Medical Group. The care plans will be adjusted based on the clinical experience from the CRNAs and from the academic experience of the project chair. The care plans will be devised using hypothetical patient information. Hence there will be no problems concerning the ethical considerations of patient privacy.

Evaluation

There were many different facets to this project. The criteria to determine the projects successful completion involved research that identified what care planning is and the benefits and barriers to utilizing and implementing the care planning process. The onerous task of compiling data to construct the care plans for the specialty rotations included the use of textbooks, evidence-based practice, both in print and online journals, an anesthesia mobile application, as well as the collaboration of multiple sources that included three senior SRNA's and five CRNA's. The final aspect of the project was presenting the lecture to junior SRNAs, evaluating the effectiveness of the lecture with the pre and post questionnaire, and collaborating with a statistician to identify significant findings regarding the questionnaire results.

The project was evaluated using an anonymous questionnaire (see appendix B). This questionnaire addressed the perceived benefit of this education tool to help prepare the students for transitioning into specialty rotations. The questionnaire utilized the Likert scale and was administered before and after the lecture. Measureable outcomes included a comparison of the students' perceptions prior to the lecture being presented and after the lecture was presented. The junior student nurse anesthetists perceptions included their level of anxiousness, their understanding of the process of care plan utilization, and their comfort levels going into the specialty rotation. An additional question was asked at the end to evaluate if the lecture

objectives were met. The data from the surveys were immediately available after the lecture and statistically evaluated.

Once the data was compiled (see Appendix E for the raw data), successful completion of the project hinged on the expertise of and collaboration with a college statistician. Due to the small sample size and data infrequencies, the Fisher's Exact Test and the Chi-Square Test were employed to analyze the data. Since the objective of the study was to investigate for an indication of improvement between the pre-questionnaire and the post-questionnaire, positive ratings (agree and strongly agree) were collapsed. Likewise, negative ratings (neutral, disagree and strongly disagree) were collapsed as well (see Appendix D for graphics and charts). The statistical evaluation compiled from the questionnaires was utilized to form opinions as to the usefulness of the project.

Results and Conclusions

The following are the results of the statistician's analysis. Regarding pre item 1 and post item 1 cross tabulation, Fisher's Exact Test result is associated with $p = 0.045$ which is statistically significant. Regarding pre item 2 and post item 2 cross tabulation Fisher's Exact Test result is associated with $p = 0.468$ which is not statistically significant. Regarding pre item 3 and post item 3 cross tabulation Fisher's Exact Test result is associated with $p = 0.333$ which is not statistically significant. Regarding pre item 4 and post item 4 cross tabulation, Fisher's Exact Test result is associated with $p = 0.257$ which is not statistically significant. Regarding pre item 5 and post item 5 cross tabulation, Fisher's Exact Test result is associated with $p = 0.106$ which is not statistically significant. Regarding pre item 6 and post item 6 cross tabulation, Fisher's Exact Test result is associated with $p = 0.041$ which is statistically significant. Regarding pre item 7 and post item 7 cross tabulation, Fisher's Exact Test result is associated with $p = 0.147$

which is not statistically significant. Regarding pre item 8 and post item 8 cross tabulation, Fisher's Exact Test result is associated with $p = 0.517$ which is not statistically significant.

Based on the data analysis the anticipated outcomes were not achieved and in fact unexpected results were obtained. With the exception of two items (item 1 and item 6), the Fisher's exact test did not show any significant statistical value. The results of Item 1 showed that the junior SRNA's were more anxious after the lecture than prior to the lecture. It was difficult for us to evaluate this item since our anticipated outcome was a decrease in anxiousness. There are two plausible explanations for this unexpected outcome.

First, because the nomenclature of "neutral" was not clearly defined as either positive or negative, to utilize the Fisher's exact Test, neutral was collapsed into the heading as a negative finding. If neutral were identified as a positive finding, this would of course alter the results. This lack of clarity has led to inconclusive results since some students could have perceived this as either positive or negative. The concept of "Ignorance is Bliss" could be applied to the second explanation for the results of increased anxiousness. It is reasonable to believe that after being presented with a wide variety of complex information in a short period of time, that the students were indeed overwhelmed and more anxious.

Item number 6 addressed the orthopedic specialty rotation, showing an increase in comfort level in the post questionnaire compared with the pre questionnaire. Due to time constraints the orthopedic rotation was not presented, therefore the increase in comfort level in this rotation was unexpected. There were no statistically significant results in all the remaining items. This could be due to the fact that the neutral category was not clearly identified and its allocation in the negative category may have skewed the significance of the results.

Although the statistical significance of this study did not emphasize the value of care planning to the SRNA, it is likely attributable to the flaws found with the implementation of the project. There was two prime areas identified that likely contributed to the unexpected outcomes: a lack of time and a poor evaluation tool. For future presentations, it would be beneficial to decrease the content of information presented in a short time frame to no more than three separate specialties which would allow for an adequate amount of time in order to provide the quality information needed. Alternatively, if the presentation time were increased, possibly dividing it into two classes, the content could have been fully delivered at a less fevered pace. As far as the questionnaire evaluation tool, the first and most obvious change would be to eliminate the term neutral. Another helpful formatting idea would be to gear each question to follow a standard that an increasing number would indicate an improvement in every case. If more descript answers were desirable, an IRB may be considered for future use.

Implications for practice should still consider that utilizing a care planning process could be a strong building block to assist the SRNA in developing an increased preparedness, knowledge, and critical thinking skills to successfully transition into a professionally effective CRNA. In addition to the suggestions listed above further areas of study could include developing a class project where each student contributes to a bank of information citing references to be used for care planning. The findings of this project can be a foundation for future implementation with an improved evaluation tool to create a sound stepping stone for all SRNA's entering the specialty rotations.

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Appendix A

References for Care Plan

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Appendix B

OB: SURGICAL PROCEDURE: Scheduled C-SECTION			
BRIEF DESCRIPTION OF SURGICAL PROCEDURE: ***(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)*** **After incision through the different layers, a lot of external fundal pressure applied to upper abdominal area (top of uterus). After infant delivered uterus is brought out of the abdomen to be sutured. This causes the mother a lot of pressure & pain in the abdomen, chest, & shoulder (esp. right shoulder). Once baby is delivered, it is ok to give narcotics and benzo's if needed. Once abdomen closed, fundal massage performed to push out blood & clots.**	**PREOPERATIVE / PRE-INDUCTION VS** **HR: 89** **RR: 14** **BP: 121/82** **TEMP: 98.6** **AGE: 38** **(*Do NOT give specific age if less than 1 year or more than 89 years of age*)**	**GENDER: Female** **HEIGHT: (*in CM*) 165** **WEIGHT: (*in KG*) 101 kg** **IBW:** **Cm in height – 100 for men** **Cm in height – 105 women** **60 kg** **BMI:** **Kg/height in m 2** **37.1**	**AIRWAY ASSESSMENT** **MALLENPATTI: 2** **THYROMENT. DIST: > 3 fingerbreadths** **MOUTH OPENING: > 2 fingerbreadths** **TMJ PROBLEMS: patient denies** **NPO SINCE: 11 hours, last ate 2000**

TODAY'S ANESTHETIC PLAN (*What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?*)	**ALLERGIES**	**PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS**	**REVIEW OF SYSTEMS**
PREOPERATIVE MEDS & DOSES: **Bicitra po 30 ml** **Zofran IV 4 mg** **Reglan IV 10 mg** **ANTICIPATED PATIENT POSITION** **Starting in sitting for spinal placement then supine LUD after spinal placement** **INDUCTION MEDS & DOSES:** **Spinal** **Bupivacaine 0.75% in Dextrose 8.25%;1.6 ml= 12 mg** **Duramorph PF (0.5mg/ml) 0.2 mg = 0.4 ml** **MAINTENANCE MEDS & DOSES:** **N/A** **EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES:** **N/A**	**1. NKDA** **2.** **3.** **4.** **5.** **6.** **PAST SURGICAL HISTORY:** **Previous C-SECTION** **Breast Augmentation**	**1. prenatal vitamins** **2. Glyburide** **3.** **4.** **5.** **6.** **7.** **8.**	**CV: S1S2, RRR, SR, no murmurs noted, denies edema, able to climb a flight of stairs without getting SOB** **RESP: RA Sats 98%, No signs of distress, CTA bilaterally, Denies smoking** **CNS: A&O X3, Denies neuromuscular issues, No deficits/limitations noted, MAE's freely, no ROM limitations, paresthesia bilat hands (carpal tunnel syndrome)** **HEP: Denies liver insufficiency, denies ETOH** **GI/GU: GERD with pregnancy, denies H/O renal insufficiency** **EXTREMITIES: paresthesia in bilat upper extremities (carpal tunnel), MAE's freely, no ROM limitations, 18 G IV in left hand, denies diabetic scleroderma** **OTHER: N/A** **PAST MEDICAL HISTORY:** **G2P1, GA 38 weeks** **Gestational Diabetes (risks AMA, Obesity)** **Obesity** **GERD with pregnancy** **AMA** **Macrosomia** **Polyhydramnios**

BLOOD AND BODY FLUID REQUIREMENTS

- Estimated blood volume 6,060 + 50% = 9,090 ml (increase in plasma volume by 40-50%)
  - Adult Female: 65ml/kg
  - Adult Male: 75ml/kg
  - Obese Female: 60ml/kg (50ml/kg)
  - Obese Male: 70ml/kg (50 ml/kg)
- Allowable blood loss (kg x 20%): 1,818 ml
- Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule
- Deficit = maintenance x hrs of NPO time:
  Replacement 1st hr- 50%
  2nd hr- 25%
  3rd hr- 25%
- Insensible Intraoperative loss usually 2ml/kg/hr
- 3rd space = Surgery:
  - Minimum: 2 – 4ml/kg/hr
  - Moderate trauma 4 - 6ml/kg/hr
  - Severe trauma: 6 – 8 ml/kg/hr
- Blood Loss: 3 : 1 crystalloid up to 20%
  1 : 1 > 20%

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	141 ml			
NPO	1551 ml for 11 hours			
3RD SPACE	200 ml			
BLOOD LOSS	600 ml not replaced, EBL expected approx..1000ml for C-section, mom has increased BV			
OTHER	0			
TOTAL	Mom is given a preload (bolus minimum 500-1000 ml's prior to spinal placement) Total Fluids that will probably be given approx. 2 L which includes NS 1 L bag with Pitocin			

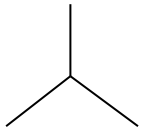
DIAGNOSTIC & LAB STUDIES

EKG: N/A

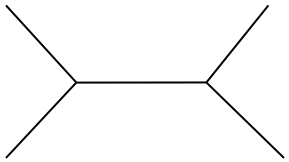
C x R: N/A

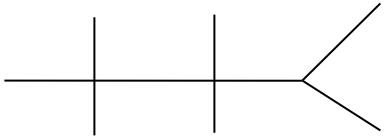
HCG: N/A

COAGS: N/A



CBC & CHEMISTRIES: N/A





OTHER DIAGNOSTIC STUDIES: Blood Sugar 112

POTENTIAL PATIENT-SPECIFIC OR CASE- SPECIFIC CONSIDERATIONS/ PROBLEMS	INTERVENTIONS & RATIONALE
1. Risk for difficult/failed Neuraxial block placement D/T Obesity	1. Utilize landmarks (line at bottom of second roll, butt crack). These might be the only landmarks available to place the spinal. Be prepared for GA just in case spinal fails. Have airway devices ready (6.5 & 7.0 ETT, blades, laryngoscope), along with induction medications (propofol, succs). Be prepared for a difficult intubation/ RSI (LMA ready, awareness of difficult airway cart location) D/T Obesity, airway edema, decreased FRC, increased oxygen consumption, decreased LES tone, decreased gastric emptying.
2. Risk for intraop & postop pain D/T tissue disruption and phrenic nerve irritation during uterine suturing	2. Spinal: Administer Bupivacaine 0.75% in Dextrose 8.25% 12 mg/1.6 ml for anesthesia and PF Duramorph 0.2 mg/0.4 ml (concentration 0.5 mg/ml) for post op analgesia. Verify spinal needle placement free flow of CSF (+ CSF swirl, no heme). Verification assists in identifying spinal needle is in the correct place (subarachnoid space). Immediately position (place supine with LUD). Verify level of block (T4 (book) -T6 (real world) dermatome level bilaterally] waiting at least 5 minutes before assessing to allow for adequate time of onset and action, with temperature/synmpathectomy (alcohol swab) & sensory (sharp prick with cracked tongue depressor), confirm with negative Allis test. If not a good block wait approx. 20 minutes for SAB to reach highest level of block, place pt. trendelenburg, consider reattempting spinal using caution with redosing, consider epidural, consider CSE, or convert to general (urgency of C-section dictates). Educate mom on pressure and pain felt during uterine suturing to reassure mom and confirm what she is feeling. Administer narcotics and benzo's after neonate is born to decrease any pain patient is experiencing and sedate patient if needed to prevent any disruption of the sterile field and allow for mom to be relaxed.
3. Risk for pulmonary aspiration due to obesity, decreased LES tone, increased intragastric pressure, decreased gastric motility (due to pain, anxiety, opioids, labor), and GERD	3. Administer Bicitra po 30 ml 20 min. prior to C-Section [neutralizes 255 ml of HCL (pH 1.0). All pts. are considered full stomach and require a nonparticulate antacid before Neuraxial anesthesia especially if obese and there is uncertainty the spinal insertion will be successful. Reglan IV 10 mg preop (Increases LES tone and gastric peristalsis), Zofran IV 4 mg preop (5HT3 antagonist, blocks serotonin in vagal nerve terminals & in the CTZ of CNS). Administer Zofran slowly to prevent HA in an awake patient.
4. At risk for hypoglycemia /hyperglycemia D/T diabetes/ NPO for 11 hours	4. Monitor Blood Sugar (112), do not have to treat for hypoglycemia at this time. Hyper/hypoglycemia treat appropriately to maintain blood sugar at a reasonable range for patient.
5. At risk for infection with Neuraxial placement D/T DM and tissue disruption	5. Utilize sterile technique (mask, sterile gloves, surgical cap) during insertion of spinal. Back cleaned with betadine and sterile drape. Administer prophylactic antibiotics within 1 hour of initial surgical incision.
6. At risk for fetal demise (decreased uteroplacental BF) D/T AMA , Neuraxial blockade, DM, aortocaval /vena caval compression, hypovolemia (NPO 11hrs), catecholamines (stress), vasopressin (in response to hypovolemia), vasopressors	6. Place 100% Oxygen (ETCO2 NC) on mom. Patient in supine position placed in LUD to prevent aortocaval/vena caval compression. Preload with a minimum of 500-1000 ml's of fluid when placing spinal to prevent hypotensive response to sympathectomy. Administer fluids based on 4-2-1 rule. Maintain BS within a reasonable range for the patient. Administer appropriate medications (Ephedrine 5-10 mg, Phenylephrine start with 50 mcg and see how pt. responds [be very careful giving Neo D/T bradycardia) for hypotension.

7. At risk for hemodynamic instability (hypotension, bradycardia) D/T Neuraxial/ sympathectomy/ hypovolemia (NPO 11 hrs)	**7. Check BP every minute after the spinal is placed until delivery. Preload with a minimum of 500-1000 ml's of fluid prior to Neuraxial placement to decrease incidence of hypotensive response to sympathectomy, administer fluids based on 4-2-1 rule, have emergency drugs drawn up and dated (ie. Ephedrine [5-10mg IV], phenylephrine [50-100mcg IV], atropine [0.4 mg IV]) to treat hypotension and bradycardia. Consider using epinephrine (50-100 mcg IV) if other pressers/fluids are unsuccessful. Apply compression stockings. All interventions reduce incidence and severity of hypotension but do not eliminate it. Treat aggressively with 10 mg IV ephedrine or 50 mcg IV Phenylephrine. Rule of thumb is utilize ephedrine if HR is below 80 and use phenylephrine if HR is above 110. Please keep in mind that maternal HR will decrease significantly more than in a non-pregnant patient so have glycopyrolate and atropine available to treat bradycardia.**
8. Aortocaval /Vena caval compression D/T supine position	**8. LUD 15-30 degrees (approx. 10-15 cm wedge). Keeps fetus's weight off mother's aorta. Decreasing or removal of compression allows for adequate venous return and CO, which in turn allows for adequate uteroplacental blood flow to fetus.**
9. Risk for N/V D/T decreased Gastric Motility/ Hypotension / Bicitra	**9. **** Very important to treat for a decreased BP (not waiting for BP cuff to take BP) with ephedrine or phenylephrine ASAP when patient complains of nausea!!!!!! Treat aggressively with 10 mg IV ephedrine or 50 mcg IV Phenylephrine. Rule of thumb is utilizing ephedrine if HR is below 80 and use phenylephrine if HR is above 110. Please keep in mind that maternal HR will decrease significantly more than in a non-pregnant patient so have glycopyrolate and atropine available to treat bradycardia. Make sure you take the BP at that time of complaints of nausea to verify what BP is at that time. Premedicate with Reglan IV 10 mg 5-10 minutes prior to block decrease intraop N/V [Increases LES tone and gastric peristalsis) and Zofran IV 4 mg prior to block (5HT3 antagonist, blocks serotonin in vagal nerve terminals & in the CTZ of CNS). Zofran slow push to prevent HA in awake patient. Preload with a minimum of 500-1000 ml's prior to spinal placement to prevent hypotensive response to sympathectomy.**
10. Risk for high sympathectomy/total spinal D/T increased nerve tissue sensitivity to LA, reduced CSF volume (increased epidural fat & veins), increased rostral spread (widening of pelvis), higher level of apex of thoracic kyphosis, inward displacement of intervertebral foraminal soft tissue, dependence on SNS for hemodynamic stability is increased with pregnancy	**10. Decreased requirement of LA. Do not give all 15 mg of LA unless patient is tall (5 foot 8 inches or taller) or obese. This will decrease risk of high sympathectomy/total spinal. Profound sensory motor and autonomic blockade and associated CV collapse or cardiac arrest related to unintentional or excessive intrathecal LA blockade. The severity of symptoms may vary depending upon the concentration, volume, and baricity of the LA employed. Early symptoms include rapid and unexpected sensory motor blockade with associate hypotension and tachycardia. Progressive increases in the density and the number of dermatome's blocked-symptoms include: upper extremity weakness, bradycardia, respiratory and CNS depression, higher levels of dermatome (above C4-5) and brainstem blockade, termed "total spine"—dysarthria or aphonia, unconsciousness, CV collapse, respiratory arrest and death. Patients experience rapid and dense sensorimotor blockade that can inhibit or prevent ventilation, as well as intrathecal sympatholysis that results in cardiovascular collapse and cardiac arrest. Management: Intubate the trachea and begin mechanical ventilation. Increase FiO2 to maintain adequate oxygenation. Attempt to assess the level of dermatomal blockade if time permits. Patients treated with hyperbaric spinal solutions should be taken out of Trendelenburg position. Aggressively treat hypotension and bradycardia with fluids, vasopressors (epinephrine), and atropine. Begin ACLS if cardiac arrest occurs. The rapid onset of bradycardia or asystole combined with the loss of sympathetic tone caused by spinal blockade may explain why subsequent cardiac arrest may be refractory to treatment. Dilated pupils indicate a high level of blockade, not CNS injury. Intrathecal blockade with lidocaine has a faster onset and resolution, while bupivacaine or bupivacaine plus epinephrine have a delayed onset and much longer duration of action.**

11. Risk for nerve injury D/T hematoma	**11. Based on patient, verify lab work (H&H, coags). Relative contraindication to spinal placement chronic thrombocytopenia (plts. 80,000-90,000), use 25G Whitacre spinal needle. Absolute contraindication (plts. < 25,000). Utilize careful placement of spinal needle. Decreases the probability of hematoma.**
12. Risk for hypothermia	**12. Utilize blankets to decrease probability of hypothermia. Want to avoid hypothermia D/T increases SNS activity with increased epi and norepi levels, elevates peripheral vascular resistance and decreases venous capacitance. This in turn results in risk of MI. Vasoconstriction interferes with monitoring such as pulse ox and intra-arterial pressure monitoring. Hypoperfusion promotes tissue hypoxia & metabolic acidosis. Coagulopathy, hyperglycemia, accentuation of residual sedation D/T a decrease in the MAC of IA's, cardiac dysrhythmias**
13. Risk for PDPH	**13. Utilize 25 G Whitacre or Sprotte spinal needle to decrease probability of PDPH. To slightly lower risk of PDPH as low as 0.1% from 1% (25G Whitacre), you can utilize a 27G Whitacre.**
14. Risk for hemorrhage D/T uterine atony	**14. Administration of Pitocin 20-40 units/ 1 L of fluid after infant is delivered (depending on provider some give after cord clamping, others give after placental delivery to prevent placental retention). Pitocin stimulates uterine smooth muscle (uterine contraction). If Pitocin does not work, consider Methergine IM 0.2 mg if patient is not hypertensive, Hemabate IM 0.25 mg if patient is not asthmatic or does not have pulmonary HTN, Misoprostol SL 600-1000 mcg**
15. Risk for late respiratory depression up to 8-12 hours D/T PF Duramorph rostral spread	**15. Patient in PACU & post op area. Make nurse aware of the administration of Duramorph and educate nurse if needed on the possibility of respiratory depression to prepare nurse to identify respiratory depression as soon as possible and be prepared to intervene and call for help. Adequate trained nursing staff and a protocol for treatment of complications are mandatory if intraspinal opioids are used.**
16. Risk for respiratory difficulty D/T Neuraxial anesthesia too high	**16. When patient C/O SOB or difficulty breathing ask the patient to blow air into your hand or squeeze your fingers as hard as possible. To assess if either response is weak. Patient may need to receive a GA with OETT to maintain adequate oxygenation.**
17. Risk for LA toxicity	**17. Presentation: CNS Toxicity, including seizures, and myocardial depression, dysrhythmias, and CV collapse. Low blood concentration: Tongue numbness, tinnitus, lightheadedness, and visual disturbances. Higher blood concentration: Convulsions, coma. CV toxicity: impaired electrical conduction in the myocardium and myocardial depression. V-Tach, V-fib. Immediate Management: Halt injection of LA. Hyperventilate the patient. Administer a benzodiazepine (i.e. midazolam 2 mg IV) for seizures. Prepare to secure airway. If bupivacaine toxicity is suspected administer 20% Intralipid 1.5 ml/kg IV bolus followed by 0.25 ml/kg/min for 30-60 minutes. Bolus or infusion of 20% IL should be continued if symptoms persist. If CV toxicity is present, obtain a series of cardiac troponin levels to rule out MI. Parturients are at risk for intravascular placement of epidural catheters due to dilation of epidural veins.**

18. At risk for embolism (Thrombus, Amniotic Fluid, Air) **BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED** **(Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)**	**18. Embolism is the leading cause of maternal mortality in the U.S. Emboli become lodged in the pulmonary vascular bed. This can produce right ventricular HF and ventilation/perfusion mismatch with resulting hypoxemia. The most common cause of embolism in pregnancy is thrombus. Presentation: Dyspnea, chest pain, tachypnea, tachycardia, increased CVP, dilated external jugular veins. Amniotic fluid includes all plus anaphylactoid reaction and coagulopathy with hemorrhage can occur (bleeding, DIC). Management for all types of embolism: Increase FiO2, to maintain oxygenation. Consider endotracheal intubation if respiratory failure is imminent. Hemodynamic support with fluids, inotropes, or vasopressors. Management of specific emboli: Thrombus=> Anticoagulation with unfractionated heparin. For episodes with profound hemodynamic compromise, consider thrombolysis or surgery. If event occurs prior to delivery; the parturient is anticoagulated with LMWH, warfarin is a teratogen. Amniotic fluid=> Consider placement of an arterial catheter and establishing central venous access. Correct coagulopathy with FFP, cryoprecipitate, and platelets. Air=> Inform the obstetrician and position the patient with surgical site below the level of the heart. Request irrigation of the surgical field with NS to cover open venous sinuses. Air embolus rarely requires intubation. Consider placement of a multi-orifice central venous catheter to aspirate air from the right atrium. Consider hyperbaric oxygen after the event in severe cases if available. RISK FACTORS: Thrombus=> Age > 35, obesity (BMI > 30), cesarean delivery, current infection, parity >3, immobility, thrombophilia. Amniotic Fluid: AMA, multiparty, tumultuous labor, trauma, multiple gestation, polyhydramnios, fetal macrosomia, and augmentation of labor. Air=> Cesarean delivery (usually between delivery of infant to closure of hysterotomy), uterine exteriorization.**

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STUDENT NAME: Safety Stanley	CARDIAC	SURGICAL PROCEDURE: CABG x 2	
BRIEF DESCRIPTION OF SURGICAL PROCEDURE: ***(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)*** • CPB • Skin incision and sternal saw most stimulating • I stat and ACT • Back up pacing available	**PREOPERATIVE / PRE-INDUCTION VS** **HR:** 73 **spO2:** 98% on ra **RR:** 16 **BP:**142/62 **TEMP:** 98 **AGE:**67 (***Do NOT give specific age if less than 1 year or more than 89 years of age***)	**GENDER:** Male **HEIGHT: (*in CM*)** 177 **WEIGHT: (*in KG*)** 77 **IBW:** 77 Cm in height – 100 for men Cm in height – 105 women **BMI:** 30 Kg/height in m 2	**AIRWAY ASSESSMENT** **MALLAMPATI:** 3 **THYROMENT. DIST:** 2 finger breadths **MOUTH OPENING:** 3 finger breadths **TMJ PROBLEMS:** none **NPO SINCE:** 10 hours

TODAY'S ANESTHETIC PLAN (*What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?*)	ALLERGIES	PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS	REVIEW OF SYSTEMS
PREOPERATIVE MEDS & DOSES: Versed 5 mg (slowly titrated, 2mg prior to a-line, 3 mg on the way into OR) ANTICIPATED PATIENT POSITION: Supine INDUCTION MEDS & DOSES: (see rationale for Jaffe recommendations) Fentanyl 250 Mcg Propofol 100 mg Versed 5 mg Lidocaine 80 mg Vecuronium 10 mg MAINTENANCE MEDS & DOSES:(see rationale for Jaffe recommendations) Fentanyl 10- 15 ml (500-750mcg) prn prior to sternotomy and titrate with increases in BP. Sevo 1% or Isoflurane 0.5% (per Hana, use Sevo) Ntg gtt for coming off pump. Precedex for coming off pump 0.4mcg/kg/h gtt. Phenylephrine 100mcg or Ephedrine 2.5mg boluses for hypotension. EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES: (see rationale for Jaffe recommendations) Keep intubated, to ICU. No reversal. Place and secure OGT after TEE out Don't remove eye tape prior to transfer. Gas off when vent off, transport full monitors. Careful with moving- lines also, this is a susceptible time for cardiac events!! Know where push line is.	1 caudet (leg pain) 2. lipitor (leg pain) 3. 4. 5. 6. PAST SURGICAL HISTORY: T&A, cardiac stent x 5	1.HCTZ/lisinopril 2.prevacid 3.metformin 4.asa 5.carvedilol (this am) 6.clonidine 7.clopidogrel (last week) 8.Simvastatin 9.valsartan	CV:s1s2, rrr, denies swelling, edema. Able to climb a flight of stairs without being short of breath. RESP: resp r/u lungs clear to ausc. Denies smoking CNS:aa & o x 3. MAE with equal strength. PERRLA. HEP: etoh2-3 beers/night. Denies liver problems GI/GU: well controlled GERD. Able to pass urine and stool without difficulty. EXTREMITIES: able to articulate all joints without difficulty. Does admit to lumbar spine pain. Denies paresthesias. OTHER: PAST MEDICAL HISTORY: CAD,chol, HTN, BPH, kidney stones, DM, etoh, GERD, well controlled, lumbar spine pain

BLOOD AND BODY FLUID REQUIREMENTS

- Estimated blood volume 6975ml
  - Adult Female: 65ml/kg
  - Adult Male: 75ml/kg
  - Obese Female: 60ml/kg (50ml/kg)
  - Obese Male: 70ml/kg (50 ml/kg)
- Allowable blood loss (kg x 20%): 1395ml
- Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule 133mml/h
- Deficit = maintenance x hrs of NPO time: 1330ml
  Replacement 1st hr- 50%
  2nd hr- 25%
  3rd hr- 25%
- Insensible Intraoperative loss usually 2ml/kg/hr
- 3rd space = Surgery:
  - Minimum: 2 – 4ml/kg/hr
  - Moderate trauma 4 - 6ml/kg/hr
  - Severe trauma: 6 – 8 ml/kg/hr
- Blood Loss: 3 : 1 crystalloid up to 20% (4185ml)
  1 : 1 > 20%

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	133	133	133	133
NPO	665	335	330	
3RD SPACE/ insensible	558	558	558	558
BLOOD LOSS				
OTHER				
TOTAL	1356	1056	1051	691

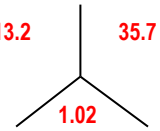
DIAGNOSTIC & LAB STUDIES

EKG: SB 59

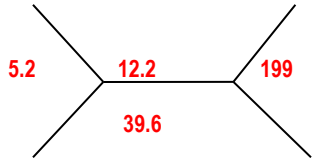
C x R: cardiomegaly

HCG:

COAGS:



CBC & CHEMISTRIES:



OTHER DIAGNOSTIC STUDIES:
Heart cath: LM 50%, LAD diffuse dz patent stent prox LAD and 2nd diag, LCx widely patent stent prox OM RCA widely patent stent prox mid portion. EF 60%.

POTENTIAL PATIENT-SPECIFIC OR CASE- SPECIFIC CONSIDERATIONS/ PROBLEMS	
1. Equipment necessary a. Standard Monitoring b. A-line c. Central line d. Oral gastric tube (x2) e. Pacemaker (with battery) f. 2-3 IV pumps g. Flotrac h. ISTAT i. ACT j. TEE 2. Medications necessary	1. Equipment necessary. a. Standard monitoring: i. ECG lead II and V5 or area more at risk for ischemia ii. Pulse Ox- (If this is placed on the opposite side of the arterial line, it can be used in conjunction to assess adequate flow, un-impinged by retraction) iii. NIBP- (compare to arterial line for accuracy, then reset timing to every 4 hours) iv. Central core tempuratures obtained with bladder, nasopharynx, rectal or thermistor probes 1. Mild hypothermia provides some cerebral protection during CPB. Best monitoring options hypothesized to closest reflect brain temp include tympanic membrane, esophagus, nasopharynx and pulmonary artery. But these have much variability. Nonblood prime and moderate hemodilution for CPB (reduction of HCT from 40% to 20% allows cooling to 22degrees Celsius without increase in blood viscosity b. A-line- (if on the same side as mammary take down, can detect internal mammary artery dissection- or may monitor on opposite side to avoid problems with dissection of mammary artery from forceful retraction of the sternum that could cause tenting of the subclavian artery leading to reduction in flow causing erroneous arterial line readings on that side). c. Central line or PA CVP- standard of practice for pressure measurement and for vasoactive gtts. PA catheter may be indicated if EF<40%, CHF, known elevated LVEDP, IABP, severe MR d/t ischemia, VSD after MI, high risk for intraoperative ischemia (large mi or unstable angina, poor revascularization targets), severe comorbidities (renal failures, severe COPD), Combined procedures that lengthen surgery (ex. CABG-carotid) d. Oral gastric tube (x2)- this is inserted right before TEE to decompress stomach and at the end of surgery it is placed, secured and left in for transfer to ICU e. Pacemaker (with battery)- If the pacemaker will be used, the surgeon will place epicardial leads. They will hand these leads over the drape to be hooked up. Be sure that the Pacemaker is in the room, functioning, with a spare battery. f. 2-3 IV pumps-Be sure there is tubing as well. g. Flotrac- Directions for set up http://ht.edwards.com/resourcegallery/products/mininvasive/pdfs/ar02702.pdf h. ISTAT- Ensure the ISTAT is in the room and functioning. If you are having a hard time locating it, it is often found with the perfusionist's equipment. Or it can be retrieved from the lab in the OR which is right next to the back elevator. Labs will be drawn from the arterial line after central line is placed for a baseline. There is a lab sheet to document on. i. ACT- Ensure the ACT is in the room and the machine test is done (this takes 5 minutes- do it before surgery, NOT during!!) j. TEE- Performed by the MDA, do not attempt to handle the TEE when it is inside of the patient unless under direct approval and supervision by the MDA.. Using the TEE, we are able to recognize the earliest signs of myocardial ischemia (systolic segmental wall motion abnormalities), assess volume status (best used if ECG monitoring cannot be used to diagnose ischemia – pts with LBBB, extensive Q waves, or ST-T abnormalities 2. Medications necessary a. Versed - 0.05-0.2mg/kg for induction. 20% decrease MAP, 15% increase HR. CI is maintained. Does

a. Versed b. Fentanyl c. Propofol d. Vecuronium e. Volatile Anesthetics f. Amicar g. Heparin h. Protamine	not attenuate the SNS response to DL. If given with fentanyl, significant hypotension may occur. Rapid on, short duration, water soluble, no pain on injection b. Opioids- produce bradycardia (except meperidine) related to central vagal stimulation. ○ Morphine provides protection against ischemia-reperfusion injury however doses required for anesthesia produce untoward effects. Morphine may cause tachycardia in unpremedicated pt as well as hypotension r/t decreased SVR, likely d/t histamine release. ○ Fentanyl group of opioids most reliable and effective for anesthesia for pts with valvular disorders and CABG. Lacks cardiac depression. c. Propofol modest negative inotropic in supra optimal dosing, reversible with Beta adrenergic stimulation. 15-40% drop in blood pressure. Decreased SVR, CI, SV, LVSWI d. Vecuronium- (0.08 mg/kg)- see below, induction. e. Volatile anesthetic dose dependent depression of contractile function, decreases in systemic blood pressure, decrease SVR, lessened baroreceptor reflex, decreased arrhythmogenic property of EPI, mild direct coronary vasodilation, lessens effects of ischemia, anesthetic preconditioning- short periods of ischemia prior to prolonged ischemia shown to lessen infarct size f. Amicar100-150 mg/kg followed by 10-15 mg/kg/h can reduce bleeding after bypass(p515) g. Heparin • Loading dose for CPB 200-400 units/kg (p578) • Exerts its anticoagulant activity via antithrombin III (ATIII)(p578). It increases ATIII effect by 100-2000fold (p581). ATIII is the major inhibitor of thrombin, and factors IXa, and Xa (p578). • "The idea behind using heparin for CPB is that by creating a large circulating concentration of activated antithrombin, whenever a thrombin molecule is produced, an antithrombin molecule will be there to immediately bind to it before it can have any further activating effect. • If the patient is resistant to hepain, adminstraion of FFP, which contains ATIII, should correct ATIII depletion and suitable prolong the ACT • Heparin's ATIII effect is neutralized by protamine. • May decrease BP by 10-20% Heparin chelates calcium. With a large bolus, there is a slow and steady decline in blood pressure, probably due to decreased vascular resistance and decreased preload. Both arterial and venous vessels are dilated by the decrease in the calcium level. (p581) • ACT measured 3-5 minutes after bolus, should be >400 seconds before it is safe to proceed with CPB For South Cardiac, goal is 450s • Heparin rebound may be due to late release of heparin sequestered in tissues, delayed return from lymphatics, clearance of an unrecognized endogenous heparin antagonist, and more rapid clearance of protamine r/t heparin. Bleeding does not always occur. Supplemental protamine is helpful. (p581) • Heparin is cleared through active tubular secretion in the kidneys. (p578) h. Protamine • Anaphylactic reaction very rare. Increased airway pressure, decreased SVR with hypotension and skin flushing • Anaphylactoid responses can be immediate or delayed. • Those at risk for reaction- those already exposed to protamine from prior surgery or neutral

	protamine Hagedorn (NPH) insulin, Fin fish allergy, vasectomized men • Peripheral infusion site is advisable • Heparin reversal dose = 1-1.3mg protamine per 100 Units of heparin, but may result in over dose. • May cause thrombin inhibition in large doses or may inhibit platelet aggregation from the heparin-protamine complex. • Reaction types: ○ Type I- rapid administration ---may cause ↓BP, ↓SVR, decreased venous return, ↓ cardiac filling. (Given over 5 minutes or longer will rarely cause CV changes) p 590 ○ Type IIa- anaphylaxis --response can occur at any infusion speed ○ Type III- catastrophic pulmonary vasoconstriction-- If sudden pulmonary HTN and systemic hypotension, stop protamine and stop any cardiovascular depressants. Consider heparin administration to decrease size of heparin protamine complex 70 units/kg first, and then 300 units/kg if that fails. Inotropic support for pulmonary HTN includes isoproterenol 0.1-0.2 mcg/kg bolus then 0.1-0.3 mcg/kg/min gtt). This type of reaction can be lessened also with slow administration • PLT count decreased by 10% within 10-15 minutes of administration
i. Nitroglycerin	i. Nitroglycerin at high doses reduces afterload and BP, reduction in cardiac dimension and pressure reduce myocardial oxygen consumption and improves ischemia. Vasodilation of pulmonary arteries and veins, decreased RAP, PAP, PCWP. Potent epicardial coronary artery vasodilator. Stenotic lesions dilate with NTG, reversing or preventing coronary artery vasospasm. If hypotensive, phenylephrine can be used to augment coronary perfusion pressure so ntg can maximize subendocardial blood flow. P 121
j. Antibiotics	j. Antibiotics
3. Medications Anticipated	3. Medications Anticipated
a. Phenylephrine	a. Phenylephrine50-100 mcg bolus pure alpha agonist. Reflex bradycardia secondary to baroreceptor stimulation. Immediate onset, duration 5-20 minutes.
b. Ephedrine	b. Ephedrine- noncatecholamine sympathomimetic.5-10 mg doses for hypotension prn. Alpha 1 and Beta 1 & 2 direct and (predominately) indirect agonist. Increases CO, Inotropy, HR. Risk for tachyphylaxis. Caridac effects are nearly identical to Epinephrine, but less potent and 10 x longer acting. Venoconstriction >Arteriolar constriction.
c. Precedex	c. Dexmedetomidine- dose dependent sedation, analgesia, sympatholysis and anxiolysis without significant respiratory depression. Side effects are hypotension, bradycardia, oversedation and delayed recovery. Infusion 0.2-0.7 mcg/kg/hr.
d. Blood	d. Blood- Type and Cross match with Blood available, place blood bank number on anesthesia record
e. Milrinone	e. Milrinone enhanced myocardial contractility and peripheral vasodilation improve CO. Loading dose 50 mcg/kg/min followed by 0.375-0.75 mcg/kg/min. Dose adjustment necessary for renal pt. Effective inotrope in pt. receiving beta blockade. May increase risk of arrhythmia and necessitate implantable defibrillator. P 356
4. Emergency medications available	4. Emergency medications available
a. Levophed	a. Levophed alpha and beta agonist but less beta1 than epi. Potent vasopressor, has little b2 activity at low dose. Mostly has unopposed alpha stimulation. Increase diastolic pressure may increase coronary artery perfusion. Generally used in pts with adequate CO but low SVR. But may cause problems with peripheral tissue perfusion and oxygenation d/t intense vasoconstriction. Decreases insulin production

b. Dopamine	b. Dopamine dose dependent stimulation dopamine, beta and alpha receptors. Less than 2 mcg/kg/min= dopamine receptors. 2-5 mcg/kg/min = beta effects. >10 mcg/kg/min = alpha effects. Also inhibits aldosterone resulting in an increase in sodium excretion and urine output. Metabolized by monoamine oxidase enzymes, careful administering to pt. on mao inhibitor
c. Vasopressin	c. Vasopressin potent nonadrenergic vasoconstrictor. It is exogenous ADH. May produce larger increases in SVR, CPP, and coronary perfusion pressure than EPI. More effective vasoconstrictor than EPI in presence of hypoxia and acidosis. Does not seem to increase myocardial oxygen consumption or lactate production. P 355 Dose by infusion pump starting at 0.04 IU/min. (in vasodilated sepsis)
d. Dobutamine	d. Dobutamine synthetic catecholamine. Direct b1 agonist, weaker b2 agonist effect, and weak alpha 1 agonist (may be unmasked by beta blockade as a prompt and dramatic increase in BP). Increases HR. may decrease diastolic coronary filling pressure d/t vasodilation. Produces coronary vasodilation. Half-life 2 minutes (p 353)
e. Glucagon	e. Glucagon IV dose 1-5 mg increases cardiac index, MAP and contractility, enhanced AV nodal conduction. Positive inotrope and chronotrope not inhibited by beta blockade or by catecholamine depletion. Rarely causes dysrhythmia. Action dissipates in 30 minutes. Common S/E nausea and vomiting. Hypokalemia, hypoglycemia and hyperglycemia also seen. This is an underutilized resource.(p356)
f. Epinephrine	f. Epinephrine alpha and beta agonist. B1 effects cause increase in O2 consumption which can lead to arrhythmia. B2 effects can decrease airway resistance with improved oxygenation. Low doses, B2 stimulus promoted redistribution of blood flow to skeletal muscles and a decrease in SVR. With increasing doses, alpha effect predominates causing vasoconstriction as well as renal and splanchnic VC and increased systemic pressure. Potassium derangements can occur from beta stimulation. Decline in insulin production and increase in gluconeogenesis and glycogenolysis. Mix 1 mg in 250 ml = 4 mcg/ml. 1 ml can be used for refractory hypotension. For gtt, mix 4 mg in 250 ml = 16 mcg/ml. Gtt dose 0.01-0.03 mcg/kg/min (Beta effects are more prominent. A rate of 0.1 mcg/kg/min would have predominantly alpha response
g. Calcium	g. Calcium increases myocardial contractility and enhances ventricular automaticity. CaCl recommended because it produces higher and more consistent levels of ionized calcium than other salts. Usual dose is 2-4 mg/kg of the 10% soln administered slowly IV. (Calcium gluconate contains 1/3 less calcium than CaCl and requires metabolism of gluconate in the liver.) (p1544)
h. Bicarbonate	h. Bicarbonate- Treatment for metabolic acidosis. Dosage calculation: $\frac{\text{wt in kg} \times 0.3(24 \text{ mEq/L-actual } HCO_3^-)}{2}$
i. Potassium	i. Potassium- Replete if K<3.5
j. Solumdrol, Pepcid, Benadryl	j. Solumedrol, Pepcid, Benadryl- At South, this is used if any reaction to protamine may be suspected
5. HTN Lisinopril	5. HTN Lisinopril Most antihypertensive drugs should be continued to ensure optimal control of BP. Determine adequacy of blood pressure control. Evaluate for evidence of end organ damage. Induction and maintenance, anticipate exaggerated BP responses. Limit duration of DL, it can cause severe elevation of BP. Suppress tracheal reflexes and blunt ANS with deep inhalational anesthesia, opioids, Lidocaine, beta blocker or vasodilator before laryngoscopy. Monitor for myocardial ischemia. Pt is likely volume contracted, profound hypotension can occur with induction agents. It may be prudent to dc ACEI and ARBS 24-48 hours preop as hypotension may be refractory to conventional VC such as ephedrine and phenylephrine, necessitating the use of vasopressin. Inhalational agents are helpful to tx intraop

6. DM- metformin	HTN. Hypotension can be tx with volume, ephedrine, phenyl or vasopressin. TEE to monitor volume status. Post op tx, control HTN to decrease risk of MI, dysrhythmia, CHF, stroke and bleeding. 6. DM- metformin Am glucose covered, check glu prior to surgery. Treat as indicated. (p345) DC metformin preop d/t association with severe lactic acidosis during episodes of hypotension, poor perfusion or hypoxia. However… in patients having cardiac surgery who did not stop metformin, a recent study did not show an increase in morbidity and mortality. (p1297)
7. Plavix	7. Plavix : When to stop antiplatelet drugs prior to surgery (Per class notes, Dr. Tolosa): a. Ticlid (ticlopidine) – 14 days b. Plavix (clopidogrel)- 7 days c. Reopro (Abciximab)- 72 hours d. Integrilin (eptifibatide)- 24 hours e. Aggrastat (tirofiban)- 24 hours
8. ETOH	8. ETOH consider risk for withdrawal manifestations as early as 6 hours after a substantial decrease in blood alcohol concentration, most pronounced between 24-36 hours. (p544 Stoelting coexisting) If acute, will decrease mac (Barash p 425), if chronic will increase mac (p 424). Risk for elevated liver enzymes (chem 20 not performed on this patient) and altered drug metabolism. These patients are often started on an alcohol gtt in ICU as well as B12 and Thiamine(clinical experience shared). Propofol, benzodiazepines, alpha 2 agonists, beta blockers and IV alcohol (10% IV ethanol at initial infusion rates of 50–100 mL/h) are all considered effective treatment for alcohol withdrawal syndrome (Stern, Gross, Stern, Nejad, & Maldonado 2010).
9. Beta blocker	9. Beta Blocker: continue carvedilol as beta blockers have been shown to decrease myocardial ischemia. However, if EF < 30%, a trend toward increased mortality has been observed (p307)
10. EF	10. EF 60%. >50%= low risk, < 50 % =intermediate risk, <25%=high risk (p 300). Consider LV function- If strong, pt may require ↑ dose of induction plus addition of beta block with or without vasodilators to control SNS response. IF poor LV function, may not tolerate normal doses leading to a drop in CO.
11. Position	11. Position- Supine: Head in neutral position. Heels elevated without hyperextending the knees. Arms are tucked. If the elbow hangs over the edge of the bed, ulnar damage can occur. Avoid pronation of arms as that also can cause ulnar damage.
12. Induction, Maintenance, Emergence	12. Induction, Maintenance, Emergence Pre-med: Anxiolysis with midazolam 1-2mg IV (up to 5 mg in Cardiac South) can decrease risk of myocardial ischemia r/t stress response. Admin prior to vascular access in preop. Admin O2 after dosing. Fentanyl 50-75 mcg (no more than 50 mcg at South d/t risk of hypoventilation) for analgesia during radial artery cannulation. Scopolamine 0.2-0.4 mg IM or IV for amnestic effect (avoid in elderly d/t delirium) (the pre op fentanyl and scopolamine are not routinely practiced in South cardiac) Avoid cool room, it stimulates SNS response. IF very high risk pt, may admin PA cath prior to induction. Sternotomy and dissection around aorta are very stimulating- treat to avoid SNS response in pts with good EF. Poor EF may need to be supported with vasopressors at this time (Ephedrine, phenylephrine or if refractory, Epinephrine 0.01 – 0.02 mcg/kg/min) Induction options: p 346 • High dose narcotic (fentanyl 10-100 mcg/kg) supplemented by Etomidate 0.1-0.3 mg/kg (Note: Cardiac South is moving away from Etomidate due to increased morbidity and mortality 3 months post surgery) or midazolam 50-350mcg/kg. ~~Pancuronium 0.1 mg/kg~~ (Pancuronium is not available

	at South, Vecuronium is used) slowly to avoid tachycardia or Vecuronium 0.08 mg/kg (risk for bradycardia esp if on b block) To ablate SNS response on DL: high dose narcotics or any of the following alone or in combination- esmolol 100-500 mcg/kg over 1 minutes followed by infusion 40-100 mcg/kg/min, Lidocaine 1-2 mg/kg, SNP 0.5-3 mcg/kg/min, NTG 0.5-2 mcg/kg/min Maintenance: • Usually narcotic (fentanyl 10-100 mcg/kg) with midazolam (50-350 mcg/kg) for amnesia. If good LVEF, decreased myocardial O2 demand with IA d/t decreased contractility. Avoid N2O. Propofol infusion for rewarming and post bypass. **Precedex for coming off pump 0.4mg/kg/h gtt.** Emergence: To ICU sedated, intubated, ventilated.
13. CPB	13. CPB a. End organ effects i. Cardiac injury from ischemia (see ischemia treatment options below), aortic cross clamping, hyperthermia ii. Brain injury iii. Renal dysfunction iv. Rare GI complications associated with significant morbidity and mortality (gastroesophagitis, upper and lower gi hemorrhage, hyperbilirubinemia, hepatic and splenic ischemia, colitis, pancreatitis, cholecystitis, diverticulitis, mesenteric ischemia, intestinal obstruction, infarction and perforation) v. Endocrine Stress Response: - elevated Catecholamines, hormones, vasopressin, glucose control 80-120 mg/dl is ideal vi. Immunologic inflammatory response by activation of complement- activated but not completed d/t heparinization. It may also be activated by the heparin protamine complex. Corticosteroids may limit inflammatory response b. Anticoagulation is required prior to cannulation. c. Drainage of venous blood d. by cannula in RA. Rate of drainage is passive and can be affected by cannula diameter, intravascular volume status, hydrostatic pressure gradient (height of RA above venous reservoir). To alter, raise height of OR table or apply suction. e. From suction scavenge off surgical field f. From vents in LV, left superior pulmonary vein or LV apex to de-air or the aortic root via the antegrade cardioplegia g. Blood enters venous reservoir, then oxygenator/heat exchanger, then is returned to arterial circulation via large arterial cannula place in ascending aorta, femoral or axillary artery
14. Ischemia	14. Ischemia a. O2 balance of supply and demand is essential. Factors to control • Supply related to coronary blood flow: Perfusion pressure (DBP-LVEDP), diastolic filling time (HR), blood viscosity (optimal is hct 30) • Supply related to coronary vasoconstriction: spasm, PaCO2 (hypocapnia leads to constriction), alpha-sympathetic activity • Supply related to O2 delivery: O2 sat, HCT, Oxyhgb dissociation curve • Demand r/t O2 consumption: BP (afterload), ventricular volume (preload), Wall thickness (decreased subendocardial perfusion), HR, contractility b. Detecting ischemia

Clinical pearls:

- Art line placed preop. Verify side preference of sx (make sure he is not harvesting radial)
- Central Line placement after intubation
- Place pt trendelenberg / prep right neck
- Use large bore for Blood tubing, CVP to distal of slic, Amicar gtt to proximal lumen of the slic
- Suction stomach for TEE
- Obtain Baseline ACT & ABG, lytes, h/h
- Ask the nurse when it is a good time to give antibiotics: Ancef 2g IV
- Amicar slow push depends on provider you are with when to admin

STERNOTOMY

- Lungs down, vent off before sternotomy, **pay attention.** When you hear the trial saw say, **"LUNGS DOWN**" & switch vent off. When sternotomy is complete and the saw is off the field, say, **"LUNGS UP"**. Change the ventilator settings to a **decreased TV** and **increased RR** (provides better visualization for mammary takedown) and then, put the **vent back on**.
- For cannulation of the **aorta** keep the **SBP 95-105** AVOID HTN to avoid dissection while working on aorta
- For Cannulation of the **IVC**, maintain **SBP 105-120.**

PREPARING FOR BYPASS

HEPARINIZE

- Heparinize 33,000 units (this pt)- (dose is 300-400 units/kg),Give via central line, aspirate first
- Tell perfusionist how much you are giving and when
- Check ACT 3 min after administration
- Announce when ACT crosses 250, 400, and final ACT. Goal = > 450 sec
- Give ACT and I-stat machines to perfusionist

CANNULATION

- Pay close attention to BP & heart rhythm
- VF or VT is common when the right heart is being manipulated
- If retrograde cannula is placed (coronary sinus), the scrub will hand you the tubing during their prep. Hook this tubing to the transducer for the PA/CVP line. She will ask you to flush at this time. When surgeon places the retrograde catheter he will ask you to "purge the line." Then, you can flush through the line again while he connects. Open transducer to monitor the retrograde catheter pressure
- Cannula in
  - **ECG, PA catheter (elevated PCWP or new V wave on PCWP tracing), TEE (most sensitive indicator)**

c. Treating ischemia

- **Caused by tachycardia: esmolol 100-500 mcg/kg, increase ane depth, verapamil 2.5-10 mg IV Beta blockers decrease heart rate and myocardial metabolism. HR goal pre bypass < or = 80 bpm. Metoprolol 1mg titrations are used at South.**
- **Caused by HTN: NTG 0.5-4mcg/kg/min, increase ane depth. (Side note, Cardene 5-15 mg/h is an excellent choice for AVR to prevent valve inversion with HTN.)**
- **Caused by hypotension: Phenylephrine (0.2-0.75 mcg/kg/min) Initiation of CPB can cause hypotension which should be treated with vasoconstrictive drugs (phenylephrine) to maintain coronary perfusion pressure(p 522), though it is not usually necessary (p531)**
- **Caused by severe bradycardia: AV pace**
- **Preop optimization with rehydration and prevention of hypoglycemia can help the heart tolerate ischemic arrest.**

ON PUMP

- Redose sedatives/narcotics/muscle relaxants for on-pump run (not all providers)
- Withdraw PA cath if in place 3-5 cm to prevent wedging in collapsed pulmonary artery (PA rupture can occur with cooling of the body if not pulled back)
- Write time went on pump at the top right hand corner of the anesthesia chart
- draw a line down the anesthesia chart and write on-pump time
- Turn off vent/alarms, turn off all vasopressors, turn off Inhalational Agent (IA) on vent. The perfusionist will administer the IA while on pump.
- Only Amicar gtt continues on Pump

REWARMING

- Listen for "rewarm" cue
- Give perfusionist narcotics/sedatives/and possibly muscle relaxants to give
- Notes should have aortic cross clamp on/off times along with CPB on/off times
- Protamine: 1 mg per every 100 units of heparin is prepared and set aside until patient is off pump. Put this is a place where you will not accidentally infuse while pt is on pump (=death).
- Given when coming off pump. Dose 330 mg IV through peripheral line.

GENERAL ANESTHESIA MED PLAN

- Premed: Versed 5 mg (slowly titrated, 2 prior to art, 3 on the way into or)
- Induct: Fentanyl 250 Mcg, Propofol 100 mg, versed 5 mg, Lidocaine 80 mg, Vecuronium 10 mg
- Maintain: Fentanyl 15 ml (=750mcg) prior to sternotomy and y also titrate in if increases in BP. The IA is not usually titrated for BP. Sevo at 1%. Rarely, Isoflurane 0.4-0.9% will be used instead. Ntg gtt for coming off pump. Precedex for coming off pump 0.4mg/kg/h gtt. Phenylephrine 100mcg or ephedrine 2.5mg boluses for hypotension.
- Emerge: Keep intubated. Keep the eyes taped for transfer. Place OGT after tee out. Gas off, transport full monitors. Careful with moving- lines and susceptible time for cardiac events.

Stoelting coexisting
Jaffe
Barash

BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED **(Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)**	**Kaplan: Essentials of Cardiac Anesthesia** **Nagelhout** **Clinical information or explanation** **Stern, T.A., Gross, A.F., Stern, T.W., Nejad, S.H., & Madlonado, J.R. (2010). Current Approaches to the Recognition and Treatment of alcohol withdrawal delirium tremens: "Old wine in new bottles" or "New wine in old bottles". *The Primary Care Companion to the Journal of Clinical Psychiatry. 12(3).* doi: 10.4088/PCC.10r00991ecr**

Surgical Procedure: Pediatric Tonsillectomy

BRIEF DESCRIPTION OF SURGICAL PROCEDURE:
(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)
Patho: T & A entails excision of the palatine tonsils and or nasopharyngeal tonsils (adenoids). **Tonsillar hypertrophy** affects the child's ability to sallow due to pain or tonsillar enlargement whereas **adenoid hypertrophy** affects the child's ability to breathe through the nose with the mouth closed.
Clinical indications: upper airway obstruction, OSA with snoring, massive hypertrophy, and chronic URI.
Procedure: A tonsil is grasped, and the mucosa is dissected free, preserving the posterior tonsil pillar. The capsule of the tonsil is separated from its bed. A snare loop is passed over the free portion of the tonsil, and the tonsil is amputated and removed. The fossa may be packed with a tonsil sponge and should be removed before extubation. Bleeding may be controlled with cautery, ties, and or suture.
Special: MR may not needed (In south, rarely uses MR) and spontaneous respirations during GA with ETT acceptable. The surgeon may place a throat pack at the end (In south, no throat pack in most case).

PREOPERATIVE / PRE-INDUCTION VS
HR: 135

RR: 38

BP: 80/44

TEMP: 36.8

AGE: 2
(*Do NOT give specific age if less than 1 year or more than 89 years of age*)

GENDER: F
HEIGHT: (*in CM*) 30. ½ inch

WEIGHT: (*in KG*) 20kg

IBW:
Cm in height – 100 for men
Cm in height – 105 women

BMI:
Kg/height in m 2

Table 10.2 Preprocedure fasting guidelines

Ingested material	Minimum fasting period (h)
Clear liquids	2
Breast milk	4
Infant formula	6
Non-human milk	6
Light meal	6

Adapted from American Society of Anesthesiologists task force on sedation and analgesia by non-anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology* 2002; 96: 1004–17.[Ref 20]

AIRWAY ASSESSMENT

MALLENPATTI: 1

THYROMENT. DIST: normal

MOUTH OPENING: normal

TMJ PROBLEMS: none

NPO SINCE:MN

TODAY'S ANESTHETIC PLAN (What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?) **GETA size microcuff tubing 4**(in south, we prefer this) or regular ETT 4.5(OETT or oral RAE/ nasal RAE per surgeon's preference). Premed in **preop with oral versed**. Induction via **IA with N20/O2 70/30**. Start IV. **Propofol** IV to help intubation. Maintainance with **Sevo.** Consider **Antimetic/ Pain meds.** Extubate fully awake or deep (physician preference). Blow by O2 to PACU. **PREOPERATIVE MEDS & DOSES:** Peds> 7-9months, consider **versed 0.5mg/kg PO or 1-2mg IV.** Preop-versed(benzodiazepine) to relieve pt's anxiety and produce amnesia-follow anesthesiologist preferences. **Have appropriate equipments** Face mask- 2 sizes(one size up & one size down), IV equipment for after IA induction, emergency drug(succ dart), ETT 2 sizes, LMA 2 sizes, Warming devices- lights and / or bair hugger(Peds are more susceptible to cold than adults), suction catheter, LR on buratrol: NO AIR BUBBLES!! , Blade -2 sizes(1.5 Miller and 1 miller), Bag 0.5 liters	**ALLERGIES** **1.none** **2.** **3.** **4.** **5.** **PAST** **SURGICAL** **HISTORY:** **Asthma**	**PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS** **1.**Albuterol - PRN: last use 3 months ago **2.** **3.** **4.** **5.** **6.** **7.**	**REVIEW OF SYSTEMS** **CV:** SR for his age 135 **RESP:** Lungs clear bil. There is no smoking in the home. No recent cold/flu symptoms. **CNS:** Crying. Alert. Makes appropriate eye contacts. Playing with family\ **HEP:**none **GI/GU:**none. no reflux problem, passes urine and stool without difficulty. **EXTREMITIES**: MAE.IV obtained after induction with Nitrous/ sevo. Right forearm IV. 22G **OTHER:** **NO recent cold/ flu symptoms.** **PAST MEDICAL HISTORY:**

ANTICIPATED PATIENT POSITION:
Supine, shoulder roll, head extended, table turned 90 degree. Surgeon at Head of table.

INDUCTION MEDS & DOSES:
N2O/ O2 70/30- Preoxygenation for denitrogenation and building FRC in lungs prior to intubation- 4 VC breaths 30 sec or 8 VC breaths 60sec. SX at bedside @ all time. Maintain spontaneous breathing & augment the breaths as needed.
Obtain IV
Lidocaine 1mg/kg IV to block the SNS response from DL and decreases pain from injection of propofol.
Propofol3-4mg/kg IVP. Induction agent used For sedation and amnesia within 30-60 sec. It can cause apnea and decrease airway reflexese.MOA: increases inhibitory effects of GABA and has antiemetic effects as a bonus point.
Tape the eyes before intubation to prevent corneal abrasion.
Intubate with4.0 microtubing ETT. choose ETT based on wt and age (You can also use Nasal Rae/ oral RAE)
Check the ETT placement by auscultation of breath sounds bilaterally.
Check the air leak @ 20- 30. Positive airway pressure 20-30cmH2O is appropriate.

Patient age/Size	LMA	Largest ET (ID)	Largest FOB (OD)
Neonate (< 5 kg)	1	3.0	2.8
Infant (< 10 kg)	1.5	3.5	2.8
Child (10−20 kg)	2	4.5	3.6
Child (20−30 kg)	2.5	5.5	3.6
Small adult (≥ 30 kg)	3	6.0 cuffed	5.0
Adult	4	6.5 cuffed	5.0

Age Group	Resp	Heart Rate	SBP	Weight (kg)	Weight (lb)
Newborn	30 - 60	100 - 180	50 - 70	2 - 3	4.5 - 7
Infant 1-12 months	20 - 50	80 - 160	70 - 100	4 - 10	9 - 22
Toddler 1-3 yrs.	20 - 35	70 - 150	80 - 110	10 - 14	22 - 31
Preschooler 3-5 yrs.	20 - 30	60 - 120	80 - 110	14 - 18	31 - 40
School Age 6-12 yrs.	15 - 30	60 - 110	80 - 120	20 - 42	41 - 92
Adolescent 13+ yrs.	12 - 20	55 - 110	110 - 120	>50	>110

None

MAINTENANCE MEDS & DOSES: **Sevo**(in adults, its 2 % MAC but in peds, they require **high MAC**3-4%) to maintenance of sedation/ amnesia throughout case. **Reduce Fio2 to 30%** to reduce a risk of airway fire. **Antiemetics: Decadron** 0.25mg/kg right after induction. **Zofran** 0.15mg/kg 30 min before emergence **Pain meds**: **Acetaminophen** 30-40mg/kg PR or 15mg/kg IV right after induction. Consider **Precedex** 0.5 mcg/kg IV starting right after intubation as an adjunctive agent for sedation/ analgesia. **Fentanyl** 1-2mcg/kg PRN or **Morphine** 01.mg/kg PRN (titrate to RR) **Gylcopyrrolate 0.01mg/kg,** which will decrease secretion and decrease the chance of aspiration upon emergence **EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES:** **Turn off Sevo and increase O2 fresh gas flow** to aid in pt. blowing off agent .(Also change Vent setting like decrease RR to increase Co2- the goal is to promote hypercarbia to aid in stimulating to breath) In most T & A cases, pt maintains spontaneous breathing. **Extubate fully awake with lateral position/ head down.** Verify removal of throat packs(in south, most surgeons do			

not put throat packs). (With certain preceptor preferences, deep extubation is also possible to prevent coughing, bucking, laryngospasm) **Sx – blood and secretions should be suctioned** from oropharynx and stomach (surgeons will ask you for sx catheter at the end of surgery) **Apply Blow by O2** Take pt. to PACU and give report to PACU RN.			

BLOOD AND BODY FLUID REQUIREMENTS

- **Estimated blood volume**
  - **Adult Female: 65ml/kg**
  - **Adult Male: 75ml/kg**
  - **Obese Female: 60ml/kg (50ml/kg)**
  - **Obese Male: 70ml/kg (50 ml/kg)**
- **Allowable blood loss (kg x 20%):**
- **Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule**
- **Deficit = maintenance x hrs of NPO time:**
  Replacement 1st hr- 50%
  2nd hr- 25%
  3rd hr- 25%
- **Insensible Intraoperative loss usually 2ml/kg/hr**

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	60	60		
NPO	60x8/2 = 240	120	(short procedure)	
3RD SPACE	2x 20= 40	40		
BLOOD LOSS	Minimum			
OTHER (insensible)	40	40		
TOTAL	380	260		

TOTAL BLOOD VOLUME

Age	Approximate Total Blood Volume(mL/kg)[1]
Premature infant	89-105
Term newborn	78-86
1-12 months	**73-78**
1-3 years	74-82
4-6 years	80-86
7-18 years	83-90

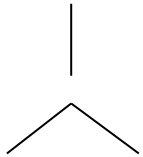
DIAGNOSTIC & LAB STUDIES

EKG:none

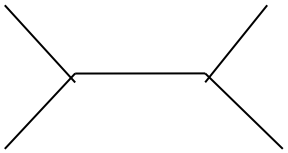
C x R: none.

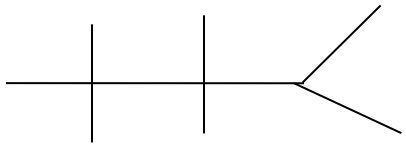
HCG:n/a

COAGS: none



CBC & CHEMISTRIES: none





OTHER DIAGNOSTIC STUDIES:

POTENTIAL PATIENT-SPECIFIC OR CASE-SPECIFIC CONSIDERATIONS/ PROBLEMS	**INTERVENTIONS & RATIONALS**
1. Inappropriate airway leak 2. Traumatic intubation with Nasal Rae 3. ETT dislodgement/kinking 4. Bleeding 5. Aspiration 6. Laryngospasm 7. Risk of airway fire 8. Barotrauma 9. Anxiety/ fear of surgery 10. Risk of air embolism 11. Nausea/vomiting 12. Post op pain 13. Nerve damage/ skin breakdown 14. Risk of Hypothermia 15. Maintain hemodynamic stability. 16. Postop hypoxemia 17. Include Preop assessment for recent cold/flu symptoms	1. Airway leak- Positive **pressure leak between 20-30cm H2O is desirable.** Leaks < 20cmH2O may result in volume loss and difficulty in providing appropriate ventilation during critical phase intraop or postop. Conversely, leak > 30cm H2O may carry a higher risk of subglottic edema and/ or stenosis. In south, you will notice the use of **Microcuff tubing ETT**. This Tube is designed specifically for the pediatric anatomy, offer the advantages of a cuffed tube, reducing tracheal trauma and providing a sealed airway that allows minimal and low flow anesthesia use. Its short and cylindrical cuff membrane compensates for different sized and shaped pediatric airways, reducing the need for replacing oversized tracheal tubes, and resulting in lower re-intubation rates. 2. Traumatic intubation with Nasal Rae- In south, we use microcuff tubing for intubation. However, you can also use **oral RAE or nasal RAE** based on surgeon's preference. Care must be taken during laryngoscopy with intubation to avoid trauma to the enlarged tonsils. The OETT is secured to the lower lip. If you are using Nasal Rae, Nasal rae can provide better surgical access. Tape the tube so that it does not press against nares (risk of necrosis). Turn the plastic connector so that it does not have the pokey part sticking into forehead. Put on an accordion extension to free of movement of the tube so that it doesn't dislodge. Pad under the circuit to protect the face. Nasal spray nares to decrease risk of bleeding. Use **red rubber tip catheter to guide ETT**. Make sure to lubricate the tip of catheter. Use Afrin spray to prevent bleeding of nose. Make sure not to spray Afrin in the eyes (taped the eyes prior). Soak the catheter in the warm saline for easy ETT insertion. 3. ETT dislodgement/kinking- usually caused by insertion/manipulation of mouth gag. **Check the ETT placement by auscultation of breath sounds bilaterally.** Check the depth of carina by auscultation over left axilla as ETT is slowly advanced. Withdraw and secure ETT 2cm from position where diminution of breath sounds was first noted. (rule of

BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED **(Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)**	thumb: depth of ETT insertion: ETT size x 3) 4. Bleeding -Give adequate fluid replacement intra op using 4-2-1 rule, also accounting for insensible losses and NPO status. Hang 500ml LR with minidrip tubing or a Buretrol chamber. Bleeding may occur in the immediate postop period or several days later. In case of bleeding, pt present with anemia and hypovolemia,as well as airway compromise and a full stomach secondary to swallowed blood. IV fluids, including blood, should be given before induction.RSI should be performed with cricoids pressure in preparation for surgical tx. 5. Aspiration- Upon emergence, blood and secretions should be **suctioned from the oropharynx and stomach** following the completion of surgery. The pt should **be fully awake before tracheal extubati**on, which may be performed supine or in the lateral position with the head down. **Do not extubate during stage 2.** Check the eyes for regular size with midline placement (not pinpointed and conjugated eyes). **Gently Sx** the mouth with soft catheter. Verify removal of throat packs (in south, most surgeons do not put throat packs) Alternatively, extubating under deep anesthesia decreases coughing, but requires vigilance to void airway obstruction and aspiration at emergence and during transport to PACU(follow the anesthesiologists/ CRNAs preferences). You can also give **Gylcopyrrolate 0.01mg/kg,** which will decrease secretion and decrease the chance of aspiration. Also, following the **NPO guideline** is imperative. 6. Laryngospasm- Peds are susceptible to laryngospasm. Laryngospasm is common in Ped: therefore, it is usual to extubate them when they are wake, moving all limbs, and breathing adequately. Infants and children with full stomachs of difficult airways must be extubated when they are fully awake. Draw Succs dart in the am when you are preparing the RM:2cc Succs+ 1cc atropine = 3 cc "**succs dart syringe IV**"):. You can treat laryngospasm with **100% O2, jaw thrust, positive pressure, Propofol IV, and SuccsIV/IM**. If IV is present, first deepen the level of anesthesia with propofol. If necessary, give succs 1-2mg IV in addition to atropine 0,02mg/kg IV. If there is no IV, then give IM dose Succs

	4mg/kg IM and atropine 0.02mg/kg IM (you need to be ready in case there is no IV). Atropine is to treat the bradycardia that is likely to occur with Succs. Pediatrics desats quickly and easy to laryngospasm. Prepare for the worst case. consider reintubation if hypoxemia fails to resolve quickly. 7. Risk of airway fire- **Reduce Fio2 to 30%** to reduce a risk of airway fire. If cautery or laser is used, airway fire is a risk. Decrease FiO2 to 30% and maintain good communication with the surgeon. If the pt's o2 sat falls, notify the surgeon, who can stop the laser. Increase the FiO2 and manually ventilate the pt to increase the O2 sat. The surgeon can begin to use the laser again when the delivered FiO2 returns to 30%. Laser T &A is associated with a higher risk of airway fire. Communicate with circulating RN to find out what the surgeon uses like snare, bovie, coblator..etc. 8. Barotraumas- Peds are susceptible to barotraumas if the anesthetist does not pay attention. Make sure to have **pediatric size tubing/resoirvoir bag**. **Ventilation setting for appropriate age**. Prepare to have difference size of oral airway, nasal airway, different sizes of blade, LMAs, ETTs. 9. Anxiety- Preop versed PO helps anxiety / crying. Especially if peds are down syndrome or > 5yrs with excessive separation anxiety. **Versed 0.5mg/kg PO or 1-2mg IV** works for peds in preop. In general, pt < 9 months of age do Not need sedative premeds. Older children (9 month-10years) can be premedicated with PO midazolam 0.5mg/kg with syrup or grape Kool-aid. 10. Risk of air embolism-Be careful with air embolism. **Get rid of air bubbles** out of IV catheter or any IVP. It is really important because of possible PFO with peds patient. **11.** Risk of N/V- Give Antiemetics. **Decadron 0.25mg/kg right after induction. Zofran 0.15mg/kg 30 min before emergence** 12. Post op Pain- Peds **with severe OSA, consider Precedex 0.5mcg/kg IV instead of Narcotics** right after intubation as an adjunctive agent for

	sedation and analgesia. Give **acetaminophen 30-40mg/kg PR or 15mg/kg IV** right after induction. PR typrenol is well tolerated by Peds after mask induction for the quality of anti-inflammatory and pain control. Narcotic choices are fentanyl or morphine. **Fentany5mcg IV intermittently** throughout the surgery or **morphine 0.1mg/kg given as needed**. Remember this is a short case, **so titrate to RR**. Monitor pt when awaking from sedation. It is imperative to **discuss pain control plan with surgeon** since many surgeons have different preferences. Discuss with post- op RN pain control verbally and via post anesthesia orders. 13. Nerve damage/ skin breakdown -Make sure to **protect pressure points** with foams and pillows – prevent from possible skin break down and nerve injuries. Check **eye trauma.** Make sure arms tugged or < 90 degrees. Again, it's usually real short case but make sure to protect baby's skin/ nerves. 14. Hypothermia -Warm IV fluids if long case. **Heating blanket on bed and forced air warming blanket** to be used. Peds are particularly prone to heat loss because they have very little SQ fat, an inability to shiver (to increase their metabolism), and a relatively large body surface to total weight ratio. Therefore, prior to the induction of anesthesia, children should be covered with warm blankets (or other warming measures used). Even after short procedures, a child's temperature may be markedly reduced. Thus heat loss must be countered by warming through conduction, radiation, and convection. Warm the OR to 70-75 degree., use warming lamps or warming mattress, use a heated humidifier or warm fluids, wrap the child's extremities and head in plastic, and use neonatal/pediatric warming blankets. 15. Hemodynamic stability- In case if you have to use sympathomimetics. Use ephedrine (not causing bradycardia). **Know the emergency medication dose**. Atropine 0.001- 0.02mg/kg with IV. Epi 0.01mg/kg IV.(how to make this? ; take 1ml of 100mcg/ml and dilute it into 9ml preservative free NS to make a 10mcg/ml solution). **Most often, cardiac events in the child are attributed to respiratroy events.** When the

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hypoxia is corrected, the cardiac event is resolved.

16. Postop hypoxemia- Postop hypoxemia may occur in the pediatric population due to upper airway obstruction. Children should be given **supplemental oxygen (face mask or blow- by O2**) and oxygen saturation should be monitored continuously during surgery, transfer to the surgical stretcher, and transport to recovery. Peds should be **positioned on their sides with the HOB lifted slightly**, if possible. Many practices maintain portable pulse ox throughout the transfer of the peds pt to the recovery room (not in South).
17. Recent cold / flu- Ask any recent cold/ flu symptoms in preop. Listen lung sounds and observe any s/sx of Lower respiratory tract infection. **Fever accompanied by productive cough and wheezing are symptoms of lower respiratory tract involvement** and should prompt rescheduling of the procedure 2-3 wks after these symptoms have abated. On the other hand, surgery in patients with URI symptoms referable to the extrathoracic airway alone is generally not delayed. These symptoms include nasal congestion and/ or discharge and mild conjunctivitis. In borderline cases (e.g., those with rales ausculated on chest exam but no other lower tract Symptoms), O2 sat may be measured by pulse oximetry. Procedures in pt with SpO2< 95% should be deferred. Follow anesthesiologists/ CRNAs preferences.

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SURGICAL PROCEDURE: Craniotomy for brain tumor			
BRIEF DESCRIPTION OF SURGICAL PROCEDURE: ***(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)*** Patho: Intracranial masses may be congenital, neoplastic (benign or malignant), infectious (abscess or cyst), or vascular (hematoma or arteriovenous malformation). Common presentations include headache, seizures, a general decline in cognitive or specific neurological functions, and focal neurological deficits. Some craniotomy procedures may utilize the intraop CT to reach the precise location within the brain. Indication: Surgical debulking or removal of a brain tumor. Procedure sequences: craniotomy is done and a flap of bone is lifted-> durotomy -> surgeon carefully frees the lesion of interest from the surrounding brain tissue-> removing the specimen-> obtain hemostasis-> the site is closed in reversed order. Consideration: pain control during maximal stimulation with head pinning, scalp incision, cranial opening, and emergence.	**PREOPERATIVE / PREINDUCTION VS** **HR: 77** **RR: 19** **BP: 115/78** **TEMP: 36.5** **AGE: 65** **(*Do NOT give specific age if less than 1 year or more than 89 years of age*)**	**GENDER: M** **HEIGHT: (*in CM*) 175** **WEIGHT: (*in KG*) 70** **IBW: 75** **Cm in height – 100 for men** **Cm in height – 105 women** **BMI: 24** **Kg/height in m 2**	**AIRWAY ASSESSMENT** **MALLENPATTI: 3** **THYROMENT. DIST: > 3** **MOUTH OPENING: very small** **TMJ PROBLEMS: problematic in right side.** **NPO SINCE: MN**

TODAY'S ANESTHETIC PLAN	ALLERGIES	PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS	REVIEW OF SYSTEMS
(What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?) OETA with NMR, Possible SSEP / MEP. Remi gtt with 0.5 MAC Sevo. Glidescope for difficult airway **PREOPERATIVE MEDS & DOSES:** Midazolam (benzo)2mg IV- decrease anxiety and produce amnesia. Titrate to effect. Be careful with hypoventilation which increases PaCO2 and vasodilates cerebral arteries- will affect neuro eval. **ANTICIPATED PATIENT POSITION:** May be supine, lateral, seated, or prone depends on the location of tumor. Both arms tucked at the sides. HOB increased 15-30degrees (venous drainage). Head of the table may be turned away 90 degrees from anesthetist. Surgeon or PAC will be in the HOB during pinning/ positioning. Assist surgeon but do not interfere his/her work. **INDUCTION MEDS & DOSES:** The goal is smooth induction with minimal changes in BP. 100% O2 by Face Mask 3-5 min to Preoxygenate for providing denitrogenation and building FRC in lungs prior to intubation.10L/min x 3 min or 4 VC breaths 30 sec or 8 VC breaths 60sec. SX at bedside @ all time. Lidocaine 1mg/kg IV to blunt SNS outflow, which causes HTN	**1. NKDA** **2.** **3.** **4.** **5.** **PAST** **SURGICAL** **HISTORY:** Hernia repair Shoulder surgery Wisdom teeth	**1.pepcid** **2.omeprazole** **3. metoprolol (took today 5 am with sip of water)** **4. metformin**	**CV: NSR from EKG, S1 and S2 . no murmur** **RESP: lungs clear bil.** **CNS: (the most important to review in preop). Intermittent headache and photophobia. (pt is wearing a sunglasses in the preop) . Numbness and tingling in right leg up to thigh level. Weakness in right side> left side. Right arm motor strength 3/5. left arm motor strength 4/5. Right leg motor strength 3/5. Left leg motor strength 4/5. Blurred vision right side.** **HEP: no problem** **GI/GU: preop blood sugar 112. GERD well controlled with meds.** **EXTREMITIES: MAE. Bil. Right side weakness greater than left side** **OTHER:none**

Fentanyl 1-2mcg/kg IV to control pain and to blunt SNS response to DL
Instead of Fentanyl, you can also use Remifent. 0.5-1mcg/kg IV)for induction followed by Remi gtt. Or Sufentanil gtt. (follow preceptor preference based on surgical time/ pt condition)
Propofol2-3mg/kg IV for sedation and amnesia. Propofol decreases CBF, CMRO2, and ICP.
Zemuron 0.6mg/ kg IV NMR(if MEP used, give minimum dose required for DL or do not give at all).
Tape the eyes before intubation to prevent corneal abrasion.
Intubate with 7.5ETT using Glidescope . Tape ETT to opposite side of surgical area.
A line, 2nd PIV, CVP, Foley
Check ABG .
Check IV patency before tucking arms
Reinforcement of ETT placement with tegaderm/ benzoin(especially in Prone)
Extension tubing with ETT.
Extension tubing with IV(pt is 90 degree away from us)
Bair hugger LE
Consider Dedadron/ mannitol per surgeon request.

MAINTENANCE MEDS & DOSES:

Iso or sevo 0.5MAC if EP(Evoked potential monitoring) is used. Propofol gtt(50-100mcg/kg/min) can be used to further decrease cerebral blood volume, metabolism, and CMRO2.
Remi gtt (0.15-0.25mcg/kg/min) or Sufentanil(0.1-0.2mcg/kg/hr) can be used to supplement the

Rating	Observation
0	No muscle contraction is detected.
1	A trace contraction is noted in the muscle by palpating the muscle while the patient attempts to contract it.
2	The patient is able to actively move the muscle when gravity is eliminated.
3	The patient may move the muscle against gravity but not against resistance from the examiner.
4	The patient may move the muscle group against some resistance from the examiner.
5	The patient moves the muscle group and overcomes the resistance of the examiner. This is normal muscle strength.

PAST MEDICAL HISTORY:

HTN
DM
GERD

anesthetic agents without interfering with EP monitoring. During Head pinning & intubation, HTN can cause increased ICP. Be ready with IV bolus of Propofol , short acting Beta blocker (Esmolol), or Fentanyl(or Remi) to blunt the SNS response. Nicardipine or SNP IVgtt can also be used.(follow preceptor preferences) Pre-connect the vasopressor (Neo gtt) since you want to have access to arms. Maintain hyperventilation to decrease ICP. **EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES:** You can wake up with IA or Remi. (follow preceptor preference) but the main goal is smooth emergence. If you are using IA for pt. wake up, Turn off Remi gtt/ propofol gtt and Increase IA to 0.8-1 MAC when close to closing and EP test is over. While the surgeon is suturing(communicate with Surgeon), turn off IA and increase O2 fresh gas flow . Decrease IA and increase FGF to aid in pt. eliminating agent. Titrate long acting pain med like Dilaudid 0.2-2mg IV as pt. respiratory status permits (pt should maintain at least > 8 RR). If MR is used, give reversal agent Robinul 0.01mg/kg and Neostigmine 0.05mg/kg(usually give 0.2 mg of Robinul for each 1.0 mg of neostigmine) Suction pt gently.Extubate and applied NC 2L Take pt. to neuro ICU and give report to RN			

BLOOD AND BODY FLUID REQUIREMENTS

- **Estimated blood volume 75ml x 70kg-= 5250 ml**
  - **Adult Female: 65ml/kg**
  - **Adult Male: 75ml/kg**
  - **Obese Female: 60ml/kg (50ml/kg)**
  - **Obese Male: 70ml/kg (50 ml/kg)**
- **Allowable blood loss (kg x 20%): 5250 x 0.2= 1050 ml**
- **Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule 70kg +40= 110ml.**
- **Deficit = maintenance x hrs of NPO time: 110mlx8hr= 880ml**
  Replacement 1st hr- 50% 440ml
  2nd hr- 25% 220ml
  3rd hr- 25% 220ml
- **Insensible Intraoperative loss usually 2ml/kg/hr 2x 70kg= 140ml**
- **3rd space = Surgery:**
  - **Minimum: 2 – 4ml/kg/hr**
  - **Moderate trauma 4 - 6ml/kg/hr 4x 70kg= 280ml**
  - **Severe trauma: 6 – 8 ml/kg/hr**
- **Blood Loss: 3 : 1 crystalloid up to 20%**
  1 : 1 > 20

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	110	110	110	110
NPO	440	220	220	
3RD SPACE	280	280	280	280
BLOOD	Minimal			
OTHER	140	140	140	140
TOTAL	970ml	750ml	750ml	530ml

DIAGNOSTIC & LAB STUDIES

EKG: NSR 77

C x R: atelectasis base

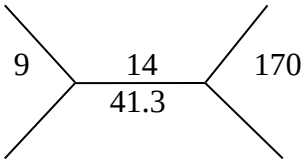
HCG: N/A

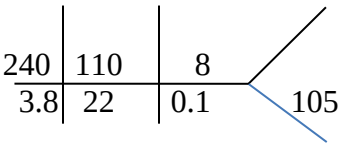
COAGS:

PT 13.4 PTT 22

INR 1.05

CBC & CHEMISTRIES:





OTHER DIAGNOSTIC STUDIES:
Echo 65% with No valve diseases.

POTENTIAL PATIENT-SPECIFIC OR CASE- SPECIFIC CONSIDERATIONS/ PROBLEMS	**INTERVENTIONS & RATIONALE**
1. HTN-> increased ICP 2. Neurologic deficits 3. Difficult intubation 4. Risk of SZ 5. Cerebral edema 6. Cerebral ischemia- disturbance of cerebral autoregulation 7. Anesthetic effects on CMRO2, CBF, CBV, ad ICP. 8. Interference with Neuro monitor during case 9. Risk of air embolism 10. Hemodynamic instability 11. Risk for post op infection 12. Dehydration D/T NPO stats 13. PONV 14. Post-op pain 15. Nerve injury 16. ETT displacement/ IV line disconnect/ kink 17. Hypothermia 18. Corneal abrasion 19. Hyperglycemia	1. **HTN with Increased ICP**- HTN after brain tumor dissection is detrimental b/c it increases the chance the bleeding into the empty space where the tumor was. Avoid increased venous pressures and maintain the BP control. If have ICP or CVP monitoring, maintain the CPP approximately 20% lower than the normal level to decrease blood volume and loss. Know CPP= MAP- ICP (CVP). During closing, maintain a minimum of 65mmHg MAP. The specific pressure depends on the case and the surgeon's preference. If ICP increases sufficiently to cause herniation of the brain stem, pt develop the "Cushing 's triad" of HTN, bradycardia, and respiratory irregularity. These changes will resolve when ICP is reduced. Also anticipate HTN with intubation (stimulation) and head pinning (very painful). Be ready with IV bolus of propofol, short acting beta blocker (Esmolol), or fentanyl to blunt the SNS response (follow preceptor preference). Upon emergence/ extubation, it is important to control BP as well. Smooth intubation/ emergence are vital in this case. Be prepare to mitigate SNS effect of on intubation/extubation. 2. **Neuro deficits** -Sustained increase in ICP> 25-30mmHg is associated with severe neurologic injury and poor outcome. So, make sure to decrease ICP with beta- blockers to control BP. Document the preop neurologic assessment thoroughly. Pt. may c/o numbness/ tingling, HA, N/V, visual changes, recent onset of SZ, or any neuro deficits from compression of motor area. Read about CT/ MRI which will delineate the site and size of the tumor, especially if IV contrast material, such as gadolinium, is administered to enhance the margins of the tumor. For intracranial mass effects: midline shift, decrease ventricular volume, decreased peribrainstem CSF space, obstructive hydrocephalus. Perform a neuro assessment as soon as the pt can follow commands. The goal is to assess the neuro status while the pt is still in the OR. The surgeons would like to evaluate the pt in the

	immediate postop period for complications so they can intervene if needed. 3. **Difficult intubation-** use Glidescope. Use HELP (head elevated laryngoscopy position). Preop assessment including small mouth opening, Mallampati 3, thyromental distance > 3, TMJ problem indicate possible difficult intubation. 4. **Risk of seizure** -SZ prophylaxis Phenytoin. Know the type/ dose/last time given of seizure meds (phenytoin, carbamazepine, or valproate). The surgeon may ask you that information in the OR. Craniotomies, especially supratentorial ones, are associated with a high risk of subsequent seizures 5. **Cerebral edema-** Tx for cerebral edema are Decadron(decadron) 8-12mg IV, Mannitol(osmotic diuretic) 0.5- 1g/kg IV or furosemide(loop diuretic) 10-2mg IV. Vigorous dieresis will commence in about 30 min and brain shrinkage will follow and it often can cause hypokalemia. Monitor electrolytes levels and replace K as PRN. If mannitol is used too rapidly, profound hypotension will occur, probably from peripheral vasodilation. Brain tumors can be highly vascular. To minimize postop cerebral edema, limit OR fluid to < 10ml/kg + replacement of UO. If volume is needed, administer albumin 5% as required. 6. **Cerebral ischemia-** Hyperventilation to keep PaCO2 25-30. This will decrease PaCO2 -> cerebral vasoconstriction. It will decrease CBV(cerebral blood volume) to provide better surgical access and decrease ICP. Make sure to check ABG post induction and calculate ETCO2 to PaCO2 gradient and document it. The surgeon may ask this. Both Iso and sevo are good choices. Although these IAs cause dose dependent increases in CBF and volume, and hence increased ICP, these effects can be mitigated by the prior use of propofol, hyperventilation, and by < 1 MAC. At these concentrations, CBF responses to changes in PaCO2 are maintained, and cerebral autoregulation remains intact. 7. **Anesthetic effects on CMRO2, CBF, CBV, ad ICP.**

	1) **Iso-** considered the best choice of IA in neuro procedures, as it maintains CBF and reduces CMRO2. 2) **Sevo-** if use in < 1MAC, you can minimize the effect of increased CBF, ICP. 3) **N2O-** increases CBF and CMRO2. It is best to avoid in neuro surgery. 4) **Succs-** may increase ICP transiently, but is still appropriate for emergency airway manganment. A defasciculating dose of NDMR may attenuate the increase of ICP. 5) **NMR-** nondepolarizing MR may not directly affect CBF, but may have important secondary effect (such as histamine-mediated vasodilation) that may increase ICP. Know that MR that do release histamine such as rocuronium, atracurium, and pancuronium. 6) **Propofol-** it is a reasonable alternative although its use has been associated with a decreased CBF and CMRO2, therefore increased potential fort ischemia. It is a potent cerebral vasoconstrictor. 7) **Etomidate-** it decreases CBF, CMRO2, and ICP (it is a potent cerebral vasoconstrictor). It increases EEG activity. 8) **Ketamine-** increases CMRO2 and CBF by dilating cerebral vasculature. It is best to avoid in neuro case. 9) **Opioids (Fentanyl/ Remi fentanyl)-** progressively decrease CBF and CMRO2. They depress respirations, which can increase PACO2, which in turn increase CBF and ICP. Therefore it will balance it out. 8. **Interference with EP monitoring-** Evoked potentials can be monitored in the presence of IA with < 1MAC(usually 0.5MAC). In case of SSEP only, MR is ok to use. If MEP is used, avoid long acting NMBD or avoid NMBD at all if possible. If giving NMBD give short acting in minimum dose (Follow preceptor preference). Communicate with monitoring person and the surgeon to clarify. Sometime the surgeon wants base motor in the beginning and

	completes relaxation during surgery. 9. **Air embolism-** If in sitting position (in South, usually not sitting), venous air embolism is high risk. Watch out s/sx of air embolism such as decreasing BP, CO, O2 sat, ETCO2, and Mill wheel murmur. Know how to response in case of air embolism. In case of air embolism, lateral decubitus position to trap air into right atrium, aspirate air with CVP, 100 % FiO2. Use a Precordial Doppler to monitor for venous air embolism when the pt is in a sitting position. 10. **Hemodynamic instability-** Reduced CO which leads to hypotension. Have sympathomimetics ready to tx. hypotension. Tx unwanted hypotension with Neo, a direct acting alpha adrenergic agent. Be cautious not too give too much. Keep close regulation of BP. There is a possibly marked blood loss. Blood transfusion to keep Hct> 30. Minimize postop cerebral edema by limiting crystalloid volume to < 10ml/kg+ replacement of UO. Glucose containing solutions should be avoided: blood glucose levels should be maintained between 80-180. Maintain normovolemia. Have large bore IVx 2, A line, CVP, foley catheter in place. Consider PAC if pt has a cardiac hx or is hemodynamically unstable. T/C the pt's blood in preop. Have blood tubing with normal saline and an additional IV access available for giving blood products. 11. **Infection-** Ancef 1g IV (if > 80kg, give 2g Ancef) for preventing postop infection. Carefully monitor head dressing and be careful of bone flap on transfer. 12. **Dehydration-** Give adequate fluid replacement intra-operatively using 4-2-1 rule, also accounting for insensible losses & NPO status. However, use fluid replacement judiciously to prevent cerebral edema. Avoid glucose containing solution to minimize cerebral edema. 13. **PONV-** PONV risk increased with surgery > 45-60 min. Propofol (antiemetic) & maintaining adequate fluid will help. Administered

BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED (Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)	Zofran4-8mg IV antiemetic 30 min before emergence. Decadron 8-12 mg IV at beginning of procedure for antiemetic+ decreasing cerebral edema property. Usually do not give decadron with DM, but the priority in this pt is to prevent cerebral edema. (communicate with surgeon) 14. **Postop pain-** Administer longer acting analgesic if pt. respiratory status permits to provide adequate analgesia such as dilaudid 0.2-2mg IV prior to d/c of Remi. 15. **Nerve injury-** Position pt. appropriately to prevent nerve injury. Do your best to maintain head in neutral position (no extension). HOB is usually increased 15-30 degree to help venous drainage. Ensure proper alignment with padding. 16. **ETT displacement/ IV line disconnect/ kink-** Reinforce the ETT placement with Tegaderm and benzoin. Put extension tubing on all IVs. All monitor line will be 90degrees away from you. Make sure to check the patency of all lines before tucking the arms. Upon emergence, avoid coughing, bucking, N/V or retching. Smooth emergence is imperative. Again, be careful with HTN with extubation. Suction pt gently before extubating pt. 17. **Hypothermia-** Use bair hugger LE. Hypothermia is related to increasing SNS activity with increased epi and norepi levels, elevating peripheral vascular resistance, and decreasing venous capacitance. This in turn results in risk of MI. Hypothermia induced -vasoconstriction interferes with monitoring such as pulse ox and intra-arterial pressure monitoring. Hypoperfusion can also promote tissue hypoxia & metabolic acidosis. Finally, coagulopathy, hyperglycemia, accentuation of residual sedations can occur with hypothermia. 18. **Corneal Abrasion**- Paper tape is used to close the eyes to prevent corneal drying or abrasions. Eye ointment can be instilled before taping for pts who will remain intubated postoperatively. Be aware that pts who have ointment in their eyes will sometimes rub

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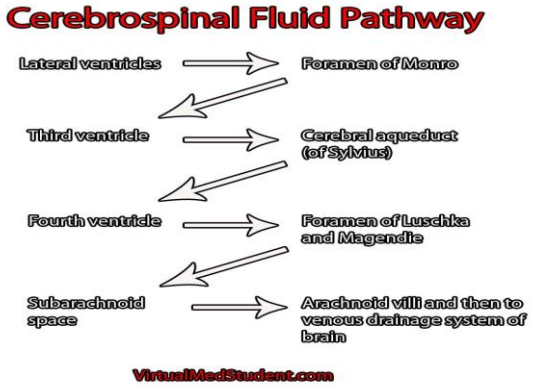
their eyes (to clear their vision postoperatively) and accidentally scratch their eyes.

19. **Hyperglycemia-** neuro injury is associated with a stress response that includes hyperglycemia, which has been shown to worsen neurological outcome during cerebral ischemia and hypoxia. Hyperglycemia will increase neural apoptosis.

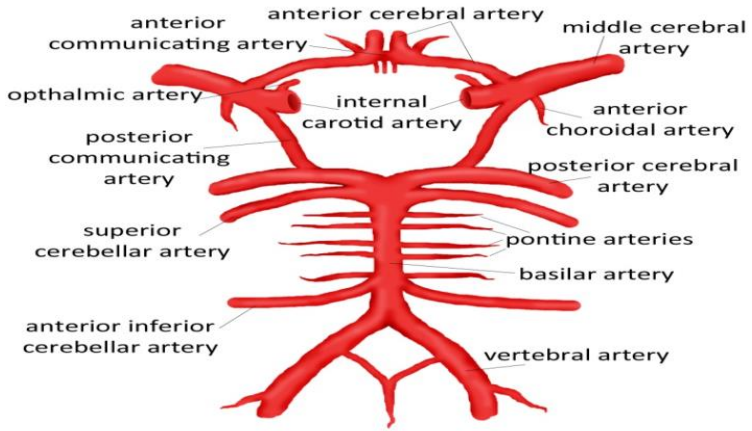
1. **Review of Neuro lecture**
   1) **Normal ICP 5-15mmHg**
   2) **Normal CSF ph 7.3, specific gravity of 1.003- 1.008.**
   3) **Normal CPP 80-90mmHg. How to calculate?**
      CPP= MAP- ICP



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

The Cranial Nerves

Nerve Number and Name		Composition	Some Functions
I	Olfactory	Sensory only	Olfaction (smell)
II	Optic	Sensory only	Vision
III	Oculomotor	Motor and sensory	Serves muscles of the eye
IV	Trochlear	Motor and sensory	Serves the superior oblique eye muscle
V	Trigeminal	Motor and sensory	Sensory from face and mouth; motor to muscles of mastication (chewing)
VI	Abducens	Motor and sensory	Serves the lateral rectus eye muscle
VII	Facial	Motor and sensory	Serves the muscles of facial expression, lacrimal glands, and salivary glands
VIII	Vestibulocochlear	Sensory only	Equilibrium and hearing
IX	Glossopharyngeal	Motor and sensory	Serves the pharynx (throat) for swallowing, posterior third of tongue, parotid salivary gland
X	Vagus	Motor and sensory	Sensations from visceral (internal) organs, and parasympathetic motor regulation of visceral organs
XI	Accessory	Motor and sensory	Serves muscles that move head, neck, and shoulders
XII	Hypoglossal	Motor and sensory	Serves muscles of the tongue



STUDENT NAME: Safety Stanley	ENT	SURGICAL PROCEDURE: Total Laryngectomy	
BRIEF DESCRIPTION OF SURGICAL PROCEDURE: *(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)* Total removal of the larynx. Reinforced tube. Risk of airway fire. Endo tracheal tube removed and reinforced tube placed during surgery, then stoma created. Alternatively, the stoma may be performed first and then a reinforced tube is placed into the stoma and sutured in place. Be prepared to make airway changes during surgery	**PREOPERATIVE / PRE-INDUCTION VS** HR: 76 spO2: 97% on ra RR: 16 BP:134/77 TEMP: 98.2 AGE:61 (*Do NOT give specific age if less than 1 year or more than 89 years of age*)	GENDER: Male HEIGHT: (*in CM*) 183 WEIGHT: (*in KG*) 82 IBW: 83 Cm in height – 100 for men Cm in height – 105 women BMI: 24 Kg/height in m 2	**AIRWAY ASSESSMENT** MALLAMPATI: 3 THYROMENT. DIST: 3 finger breadths MOUTH OPENING: 3 finger breadths TMJ PROBLEMS: none NPO SINCE: 10 hours

TODAY'S ANESTHETIC PLAN (*What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?*)	ALLERGIES	PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS	REVIEW OF SYSTEMS
PREOPERATIVE MEDS & DOSES: Versed 5 mg IV (titrate)	none 3. 4. 5. 6.	1. none 2. 3. 4. 5. 6. 7. 8. 9. 10.	CV:s1s2, rrr, denies edema. Able to climb a flight of stairs without being short of breath. RESP: resp r/u lungs clear to ausc. Current smoker. CNS:aa & o x 3. MAE with equal strength. PERRLA. HEP:denies current etoh, last drink 2 weeks ago, though he does drink 1-2 x month now, has prior history of daily drinking, states that stopped in 2010. Denies liver problems. GI/GU denies GERD. Able to pass urine and stool without difficulty. EXTREMITIES: able to articulate all joints without difficulty. Denies paresthesias OTHER: PAST MEDICAL HISTORY: Smoker: 40 pack years
ANTICIPATED PATIENT POSITION: Supine			
INDUCTION MEDS & DOSES: Lidocaine 80 mg Fentanyl 200 mcg Propofol 200 mg Rocuronium 50 mg Decadron 10 mg			
MAINTENANCE MEDS & DOSES: Sevoflurane 2% Fentanyl 50 mcg prn Dilaudid 0.4-1 mg titration	PAST SURGICAL HISTORY: Left arm ORIF		
EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES: Neostigmine 4 mg Robinul 0.8 mg Ondansetron 4 mg			

BLOOD AND BODY FLUID REQUIREMENTS

- Estimated blood volume 6150ml
  - Adult Female: 65ml/kg
  - Adult Male: 75ml/kg
  - Obese Female: 60ml/kg (50ml/kg)
  - Obese Male: 70ml/kg (50 ml/kg)
- Allowable blood loss (EBV x 20%): or EBV (Hi-Hf)/Hi: 1345ml
- Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule 120mml/h (rounded down from 122)
- Deficit = maintenance x hrs of NPO time: 1200ml
  Replacement 1st hr- 50%
  2nd hr- 25%
  3rd hr- 25%
- Insensible Intraoperative loss usually 2ml/kg/hr
- 3rd space = Surgery:
  - Minimum: 2 – 4ml/kg/hr
  - Moderate trauma 4 - 6ml/kg/hr
  - Severe trauma: 6 – 8 ml/kg/hr
- Blood Loss: 3 : 1 crystalloid up to 20% (4035ml)
  1 : 1 > 20%

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	120	120	120	120
NPO	600	300	300	
3RD SPACE	410	410	410	410
BLOOD LOSS				
OTHER				
TOTAL	1130	830	830	530

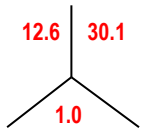
DIAGNOSTIC & LAB STUDIES

EKG: SR 72

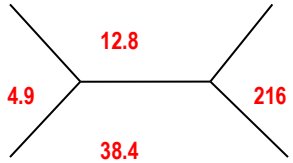
C x R: negative

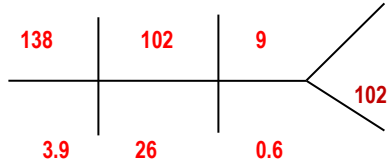
HCG:

COAGS:



CBC & CHEMISTRIES:





OTHER DIAGNOSTIC STUDIES:

CT neck: trachea is midline, no airway anomalies noted

POTENTIAL PATIENT-SPECIFIC OR CASE- SPECIFIC CONSIDERATIONS/ PROBLEMS	INTERVENTIONS & RATIONALE
	GETA and MR are essential. Check with surgeon prior to giving further MR.
1. Tracheal anatomy may be affected	1. Preop assessment of the airway, review CT neck and chest if available. Have emergency equipment available. If compromised, also use premedication judiciously. consider awake intubation or tracheotomy.
2. Many pts are often smokers, ETOH abuse with liver dysfunction, COPD, chronic bronchitis.	2. Preoperative ABG, PFT, saturation, CBC, LFT, Coags, chem 7
3. Antisialagogues	3. to decrease secretions (scopolamine or robinul), or antihistamines can be given to decrease oral secretions (Benadryl or Tigan)
4. Surgeon working close to head	4. Eye care: ointment, paper tape, eye pads, goggles
5. Positioning	5. Supine with shoulder roll to slightly extend head. Arms are tucked, slight reverse Trendelenburg. 90 or 180 degrees turned away from anesthesia. Will need extensions for all tubing, including IVs & invasive lines.
6. Some surgeons like having OGT in place to better feel the esophagus	6. Placement of OGT
7. Risk of airway fire	7. Use caution when providing O2, communicate with the surgeon especially when the trachea is being entered and bleeding will need to be cauterized by bovie. Decrease O2 to 30% before cautery . The surgeon will request the ETT to be pulled back slowly as the incision for the tracheotomy is made. There is risk of airway fire at this point if electrocautery is used above the exposed ETT. Despite this, 100% oxygen should be used because of the possibility of desaturation. *** note conflicting information!! Discuss with surgeon!! The surgical tech will have a bottle of sterile NS on the field as back up to extinguish an airway fire.
8. Risk of swelling	8. administer steroids (Decadron 10mg IV per surgeon)
9. Improve connection to ventilator	9. Use a flex tube extension
10. Risk of bleeding, hematoma, suture line disruption	10. Type and CM, MAP goal 60-70mmg, drastic blood loss is not common, but patients are anemic to start. EBL may be as high as 1000ml. Typical EBL:200-1,000 mL depending on procedure & whether neck dissection is included, Can be massive if any large vessels are damaged.Tissues of neck are highly vascular. Emergence must be smooth. Avoid coughing, bucking, n/v . If pt does cough, have team member hold gentle pressure over suture line. Antiemetics (Decadron at the beginning as above for swelling, Zofran 4 mg 30 minutes prior to emergence)
11. Monitors and IV access	11. art line (possibly) and 2 large bore IVs
12. IV fluids and volume req's	12. NS or LR, keep normovolemic or slightly dry.
13. Risk of drying of secretions and mucous plugs	13. use warmed, humidified gases
14. Risk of bradycardia from surgical manipulation around the carotid baroreceptors. Surgery may trigger vagal reflexes as well as dysrhythmias, prolonged Q-T interval (from effects on the carotid sinus & stellate ganglion).	14. notify surgeon. Surgeon may infiltrate area with Lidocaine. Atropine can be admin
15. Surgical concerns	15. Case generally starts w/ ETT, which surgeon will manipulate & eventually remove when tracheotomy or tracheostomy is placed.There may be times when the ETT/trach is not in the pt.This can last several minutes.Vigilance is required as well as good communication w/ surgeon to prevent desaturation
16. Procedure	16. Total laryngectomy includes excision from posterior third of tongue (or vallecula) to first or second tracheal rings. A tracheotomy is placed for surgery, but then the trachea is usually placed end to skin & the trach tube may no longer be needed. Thyroid gland is spared unless it is part of specimen. Supraglottic/hemi/near-total laryngectomies are all variations of the procedure. Frequently

17. Complications

18. Muscle relaxation to be determined by surgeon
19. Venous air embolism is possible from large open veins in neck.

Clinical Pearls:

- These pts most often have a history of smoking and alcohol use. Check cardiac history
- Dr. Ho says for him it is Ok for us to intubate with regular tube, but tape the tube north (like we do in peds for oral surgery)
- Use a glidescope especially if the tissue is friable
- When we are switching tube for stoma, use reinforced tube.
- Decrease O2 to 30% when approaching the airway
- At the end of surgery, apron sutures- stoma- he extubates. 2 drains with be in the lateral sides. NGT will be sutured in place.
- Premed with robinul 0.1mg
- Indigo is used in the oropharynx at the end to test the sutures.
- Suction the back of the throat at the end of the case (performed by PA)
- Note manufacture and size of tracheostomy, have obturator on transport to ICU Use trach collar for O2

BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED
(Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)

accompanied by neck dissection, pharyngectomy.

17. Fistula formation (5-20%), Bleeding, hematoma, Infection, Nerve injury: facial n. (facial droop), phrenic n. (ipsilateral diaphragmatic paralysis), Parathyroid damage, Pneumothorax, Subcut. emphysema
18. Neuro monitoring may be needed for facial nerve. If so, avoid muscle relaxants
19. Monitor $ETCO_2$ (may also use precordial Doppler)

Cameron, A. G. (2013). *Laryngectomy*. Retrieved from http://anesth.unboundmedicine.com/anesthesia/ub/view/The-Manualof-Anesthesia-Practice/102543/4/laryngectomy

Macksey, L. F. (2012). *Surgical Procedures and Anesthetic Implications*. Sudbury, MA: Jens & Bartlett Learning.

SURGICAL PROCEDURE: Right total knee replacement (OA)			
BRIEF DESCRIPTION OF SURGICAL PROCEDURE: *(i.e. highlights of case, such as most stimulating part of case, tourniquet, vessel clamping, OLV, etc.)*	**PREOPERATIVE / PRE-INDUCTION VS** **HR: 69** **RR: 13** **BP: 119/54** **TEMP: 98.2** **AGE: 67** (*Do NOT give specific age if less than 1 year or more than 89 years of age*)	**GENDER: Female** **HEIGHT: (*in CM*) 157 cm** **WEIGHT: (*in KG*) 55 kg** **IBW:** Cm in height – 100 for men Cm in height – 105 women **60 kg** **BMI:** Kg/height in m 2 **22.31**	**AIRWAY ASSESSMENT** **MALLENPATTI: 2** **THYROMENT. DIST: 3 fingerbreadths** **MOUTH OPENING: > 3 fingerbreadths** **TMJ PROBLEMS: patient denies** **NPO SINCE: 1900**

TODAY'S ANESTHETIC PLAN (***What meds you plan to give, how much of each you plan to give to this patient. If something is titrated to effect, what is the effect/goal?***)	**ALLERGIES**	**PRESCRIPTION AND HERBAL MEDICATIONS – AND ANY POTENTIAL DRUG/ANESTHETIC INTERACTIONS**	**REVIEW OF SYSTEMS**
PREOPERATIVE MEDS & DOSES: **Versed 2 mg for block placement in preop** **Fentanyl 100 mcg titrated for block placement in preop** **Femoral catheter placed after Marcaine 0.2% 20 ml's placed** **Sciatic block Marcaine 0.5% 20 ml** **ANTICIPATED PATIENT POSITION** **Starting in sitting for spinal placement then placed immediately supine after spinal placement** **INDUCTION MEDS & DOSES:** **Spinal** **Bupivacaine 0.75% in Dextrose 8.25%; 1.4ml=10.5mg** **Propofol 100 mcg/kg/min titrated per pt's response** **MAINTENANCE MEDS & DOSES:** **Propofol 100 mcg/kg/min titrated per pt's response** **EMERGENCE PLAN, INCLUDING ANY "REVERSAL" MEDS & DOSES:** **Propofol infusion discontinued**	**1. PCN** **2.** **3.** **4.** **5.** **6.** **PAST SURGICAL HISTORY:** **Tonsillectomy/Adenoidectomy** **Hip surgery** **Hysterectomy** **Cholecystectomy** **PONV with previous surgeries**	**1. Lisinopril** **2. Simvastatin** **3. Metformin** **4. Mulitivitamin** **5. Calcium** **6. Fish Oil (Last dose 1 week ago)** **7.** **8.**	**CV: S1S2, RRR, SR, no murmurs noted, denies edema** **RESP: RA Sats 99%, No signs of distress, CTA bilaterally, H/O of smoking 1 PPD X 20 years, Quit 30 years ago, Denies recent URI, Denies asthma & OSA** **CNS: A&O X3, Denies neuromuscular issues, No deficits/limitations noted, MAE's freely, no ROM limitations except right knee limited** **HEP: Denies liver insufficiency, ETOH social** **GI/GU: Denies GERD, denies H/O renal insufficiency** **EXTREMITIES: MAE's freely, no ROM limitations, 18 G IV in left hand** **OTHER: N/A** **PAST MEDICAL HISTORY:** **OA** **HTN** **DM II**

BLOOD AND BODY FLUID REQUIREMENTS

- Estimated blood volume
  - Adult Female: 65ml/kg 3,575 ml
  - Adult Male: 75ml/kg
  - Obese Female: 60ml/kg (50ml/kg)
  - Obese Male: 70ml/kg (50 ml/kg)
- Allowable blood loss (kg x 20%): 715 ml
- Maintenance IVF (> 40kg) = kg + 40ml or 4-2-1 Rule
- Deficit = maintenance x hrs of NPO time:
  Replacement 1st hr- 50%
  2nd hr- 25%
  3rd hr- 25%
- Insensible Intraoperative loss usually 2ml/kg/hr
- 3rd space = Surgery:
  - Minimum: 2 – 4ml/kg/hr
  - Moderate trauma 4 - 6ml/kg/hr
  - Severe trauma: 6 – 8 ml/kg/hr
- Blood Loss: 3 : 1 crystalloid up to 20%
  1 : 1 > 20%

	1st HOUR	2ND HOUR	3RD HOUR	4TH HOUR
MAINT.	95 ml	95 ml	95 ml	
NPO	570 ml for 12 hours	285 ml	285 ml	
3RD SPACE	220 ml	220 ml	220 ml	
BLOOD LOSS	Not replaced, EBL minimal			
OTHER	0			
TOTAL	885 ml	590 ml	590 ml	

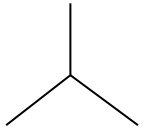
DIAGNOSTIC & LAB STUDIES

EKG: SR

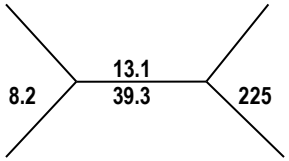
C x R: negative

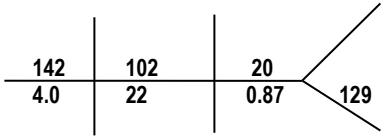
HCG: N/A

COAGS: N/A



CBC & CHEMISTRIES: N/A





OTHER DIAGNOSTIC STUDIES: Blood Sugar 135

POTENTIAL PATIENT-SPECIFIC OR CASE- SPECIFIC CONSIDERATIONS/ PROBLEMS	INTERVENTIONS & RATIONALE
1. Risk for intraop & postop pain D/T tissue disruption and tourniquet pain	1. Ultrasound guided, peripheral nerve stimulator guided femoral block and catheter placement. Catheter placed after injection of 0.2% Marcaine 20 mls. Peripheral nerve stimulated guided sciatic nerve block: Injection of 0.5% Marcaine 20 mls. Spinal: Administer Bupivacaine 0.75% in Dextrose 8.25%, 10.5 mg/1.4 ml. Verify spinal needle placement free flow of CSF (clear CSF, - heme, - pain, - paresthesia, + CSF swirl). Verification assists in identifying spinal needle is in the correct place (subarachnoid space). Immediately position supine. Verify level of block T10 dermatome level bilaterally waiting at least 5 minutes before assessing to allow for adequate time of onset and action. Verify level of block with temperature/synmpathectomy (alcohol swab) & sensory (sharp prick with cracked tongue depressor), confirm with negative Allis test. If it is not a good block wait approx. 20 minutes for SAB to reach highest level of block, place pt. trendelenburg, consider reattempting spinal using caution with redosing, consider epidural, CSE, or convert to general.
	2. Avoid multiple needle insertions. Do not perform nerve blocks in anticoagulated patients. When an artery or vein is punctured stop procedure and apply pressure over puncture site for 2-3 minutes.
2. At risk for Hematoma	3. Ultrasound guided femoral block: NAVL (Nerve, Artery, vein, lymph). The nerve is close to the artery and vein. Maintain a palpating finger on the femoral pulse and insert the needle just lateral and parallel to the pulse. Never redirect needle manually. If vascular puncture occurs STOP, apply pressure for 2-3 minutes. Sciatic block: Avoid deep needle insertion => pelvic vessels).
3. At risk for vascular puncture	4. Use ultrasound and a nerve stimulator. Femoral block: Once a quadriceps muscle twitch (patellar twitch) is obtained at 1 m, reduce current to 0.5 mA, continue to try to elicit a twitch response once a twitch response is reestablished inject 0.5% Marcaine 20 mls if there is not continuous catheter inserted. Inject 0.2% Marcaine 20 mls if a continuous catheter is going to be inserted. If patient complains of pain on injection, this would suggest intraneural penetration. Withdraw needle and redirect. Sciatic block: has a unique predisposition for mechanical and pressure injury. Use nerve stimulation and slow needle advancement. Never inject LA when the patient complains of pain or when abnormally high pressure is noted on injection. Never assume that the needle is obstructed with tissue debris when resistance to injection is met. Take the needle out and check it for patency (flush) before reinsertion. The intensity level is decreased to < 0.5 mA as long a motor response is still present, LA is then injected 0.5% Marcaine 20 ml.
4. At risk for Nerve Injury	
5. At risk for infection with Neuraxial placement, femoral block, sciatic block, and tissue disruption.	5. Utilize sterile/strict aseptic technique (mask, sterile gloves, surgical cap) during insertion of spinal/blocks. Sterile drapes and generous application of antiseptic technique should be used. If a continuous catheter is used, remove the catheter after 48-72 hours (risk of infection increases with time). Administer prophylactic antibiotics within 1 hour of initial surgical incision. Check with the nurse to verify the appropriate time to administer antibiotics, prior to Esmarch bandage and tourniquet application unless otherwise indicated.

6. At risk for hemodynamic instability (hypotension, bradycardia) D/T Neuraxial/ sympathectomy/ hypovolemia (NPO status), HTN	6. Check BP on a regular basis after the spinal is placed. Preload with a minimum of 500-1000 ml's of fluid prior to neuraxial placement to decrease incidence of hypotensive response to sympathectomy. Administer fluids based on 4-2-1 rule, have emergency drugs drawn up and dated (ie. Ephedrine [5-10mg IV], phenylephrine [50-100mcg IV], atropine [0.4 mg IV]) to treat hypotension and bradycardia. Consider epinephrine (50-100 mcg IV) if other pressers/fluids are unsuccessful. Apply compression stockings. All interventions reduce incidence and severity of hypotension.
7. Risk for nerve injury with spinal placement D/T hematoma	7. Based on patient, verify lab work (H&H, coags). Relative contraindication to spinal placement with chronic thrombocytopenia (plts. 80,000-90,000), use a 25G spinal needle. Absolute contraindication (plts. < 25,000). Utilize careful placement of spinal needle. Decreases the probability of hematoma.
8. Risk for hypothermia during first hour of surgery	8. Utilize BAIR Hugger, forced air warming devices, and possibly fluid warmer to prevent hypothermia!!!! Avoid hypothermia D/T increases in SNS activity with increased epi and norepi levels, elevates peripheral vascular resistance, decreases venous capacitance. This in turn results in risk of MI. Vasoconstriction interferes with monitoring such as pulse ox and intra-arterial pressure monitoring. Hypoperfusion promotes tissue hypoxia & metabolic acidosis. Coagulopathy, hyperglycemia, accentuation of residual sedation D/T a decrease in the MAC of IA's and cardiac dysrhythmias.
9. Risk for PDPH	9. Utilize 25 G Whitacre or Sprotte spinal needle to decrease probability of PDPH. To slightly lower the risk of PDPH as low as 0.1% from 1% (25G Whitacre,) you can utilize a 27G Whitacre.
10. Risk for respiratory difficulty D/T Neuraxial anesthesia too high	10. When patient C/O SOB or difficulty breathing ask the patient to blow air into your hand or squeeze your fingers as hard as possible. To assess if either response is weak. Patient may need to receive a GA with OETT to maintain adequate oxygenation.
11. Risk for diabetic complications	11. Glycemic management between 120-180. Hyperglycemia decreases WBC chemotaxis and function, increases infection rates, impairs wound healing, leads to dehydration from osmotic diuresis, & promotes a hyperviscous & possibly thrombogenic state. Metformin should be held from the day of surgery until normal post op renal function has been confirmed b/c of its association with lactic acidosis. Silent ischemia is possible if autonomic neuropathy is present, stress testing should be considered in pts. with multiple cardiac risk factors and poor or intermediate exercise intolerance. The presence of autonomic neuropathy predisposes pt. to perioperative dysrhythmias & intraoperative hypotension. Loss of sympathetic responses interferes with the detection & treatment of hemodynamic insults. If patient does not wake up during emergence consider hypoglycemia and treat appropriately.
12. Possible difficult airway D/T DM	12. Will ask pt. to do prayer sign to assess for stiff joints. Have appropriate equipment readyily available if needing to convert to general anesthesia.

13. Risk for aspiration D/T possible gastroparesis	**13. Increases risk regardless of NPO status. Insert OGT/NGT to decompress stomach if patient is intubated.**
14. At risk for CV compromise D/T HTN	**14. HTN has been associated with an increased incidence of silent MI and infarction, ventricular dysrhythmias, and lability in BP. Optimize BP.**
15. At risk for DVT's	**15. Verify sequential compression hose are in place=> decreases risk of DVT's**
16. PONV	**16. Antiemetic: Dexamethasone 4-8 mg administered. Zofran 4 mg. Propofol & fluids will help also. Factors that cause N/V=> pain (control pain), hypotension, hypoxia (prevent), hypoglycemia, surgery > 60 min, IA, postop opioids.**
17. Dehydration D/T NPO status	**17. Give adequate fluid replacement intra-operatively using 4-2-1 rule, also accounting for insensible losses & NPO status. Prior to spinal give a bolus of fluids 500 ml minimum.**
18. Risk for nerve injury D/T positioning	**18. Position pt. appropriately to prevent nerve injury. Maintain head in neutral position (no extension). Ensure proper alignment with padding. Ensure extremities < 90 degrees.**
19. Risk for bleeding	**19. Large blood loss is possible even with compression tourniquet. Blood loss can be up to 2 units. Verify type and cross-match done preoperatively. Establish 2 large bore peripheral IVs. Controlled hypotension within reason, based on patients' history of hypertension. Within 20% of baseline. Cerebral autoregulation is lost if not maintained within this range. Maintaining adequate cerebral perfusion pressure is critical.**
20. At risk for tourniquet complications D/T overpressurization such as pain at the tourniquet cuff site, muscle weakness, compression injuries to blood vessels, nerve, muscle, or skin, or extremity paralysis.	**20. Set at 50-100 mmHg above the patient's systolic BP. The maximum setting for LE is less than 400 mmHg. Tourniquet should be released after 2 hours. Any damage to vessels, nerves, and skeletal muscle is usually reversible for tourniquet inflations of 1-2 hours. If further tourniquet time is necessary, there should be a 30-minute reperfusion interval.**
21. At risk for tourniquet complications D/T underpressurization such as blood in the surgical field, passive congestion of the limb, shock, and hemorrhagic infiltration of a nerve.	**21. Set at 50-100 mmHg above the patient's systolic BP. Maximum setting for LE is < 400 mmHg. Pale coloring shows adequate exsanguination. Extensive mottling means inadequate exsanguination.**

22. At risk for tourniquet pain	**22. After inflation of the pneumatic tourniquet for 30-60 minutes, patients may experience tourniquet pain accompanied by an increase in HR and BP. A sympathetic response can occur even when under GA. Tourniquet pain frequency occurs depending on the type of anesthesia administered: IV regional > epidural> spinal > GA. Do not extend tourniquet time beyond 2 hours. Administer narcotics appropriately while being mindful of how much narcotic is administered and when tourniquet is going to be released (noxious stimulus is removed). Excessive narcotics may affect the return of spontaneous ventilation when under GA.**
23. Transient decrease of BP, increase in ETCO2, metabolic acidosis, decrease in oxygen saturation with tourniquet deflation	**23. Blood is shunted to the extremity; a 20% decrease in MAP is common with tourniquet deflation. Products of anaerobic metabolism and newly released acid metabolites enter the circulation upon deflation of the tourniquet cuff, causing transient increases in ETCO2, metabolic acidosis, and a decrease in oxygen saturation. Time for clearance of metabolites depends on the patient's physiologic status, the extremity involved, and the duration of tourniquet inflation. Give a bolus of fluids when tourniquet goes down. If patient has moderate-to-severe lung disease, controlled ventilation should be continued until after the lactic acid that has accumulated in the leg has been metabolized (3-5 minutes), because these patients may be unable to increase ventilation to buffer this acid load. GA should be considered for these patients.**
24. Complications of MMA Bone Cement	**24. Hypotension: MMA may be a direct vasodilator/myocardial depressant. Severity is usually related to volume and could also result from a PE or anaphylactoid reaction. Onset:30 sec. - 10 minutes. Termination is usually spontaneous within 5 minutes. Treatment can be adequate hydration to FULL SUPPORT. Desaturation/Hypoxia: Increase FiO2 during cementing. Fat Embolism: Result of fat embolism is arterial hypoxemia, ARDS, coagulopathy, fever confusion, coma, seizures; petechiae on the neck, shoulders, and chest. Treatment is supportive, oxygenation, corticosteroids; immobilize long bones, albumin administration for free fatty acid binding sites. Mortality: Death can occur intraoperatively or postoperatively due to PE. PE may result from the impact from surgical instrumentation and the expansion/pressure of the cement against the femoral shaft. Fall in ETCO2 may be the first indication of MMA complications. Maintain vigilance for potential problems. Use 100% oxygen when using MMA. Hypotension=> Treat with aggressive fluid resuscitation and alpha agonists.**
25. At risk for skin and subcutaneous tissue damage D/T tourniquet	**25. Verify skin is wrapped with cuff padding.**

26. LA Toxicity D/T overdose or accidental intravascular injection	**26. Presentation: CNS Toxicity, including seizures, and myocardial depression, dysrhythmias, and CV collapse. Low blood concentration: Tongue numbness, tinnitus, lightheadedness, and visual disturbances. Higher blood concentration: Convulsions, coma. CV toxicity: impaired electrical conduction in the myocardium and myocardial depression. V-Tach, V-fib. Immediate Management: Halt injection of LA. Hyperventilate the patient. Administer a benzodiazepine (i.e. midazolam 2 mg IV) for seizures. Prepare to secure airway. If bupivacaine toxicity is suspected administer 20% Intralipid 1.5 ml/kg IV bolus followed by 0.25 ml/kg/min for 30-60 minutes. Bolus or infusion of 20% IL should be continued if symptoms persist. If CV toxicity is present, obtain a series of cardiac troponin levels to rule out MI.**
27. Bupivacaine Cardiotoxicity	**27. Profound depression of HR and/or contractility caused by high plasma concentrations of bupivacaine and subsequent myocardial uptake. Cardiac effects are life threatening. Presentation: Neurotoxicity: Tinnitus, perioral numbness, tremors, seizures, lethargy, and coma. These symptoms appear first, and are rapidly followed by CV effects. Cardiac dysrhythmias: Initially widened QRS and bradyarrythmias, which may be quickly followed by V-Tach, V-Fib, and asystole. Hemodynamic changes: Hypotension, CV collapse. Immediate Management: Airway, breathing, circulation. Administer 100% O2. Intubate and initiate mechanical ventilation. Begin ACLS if indicated. Promptly treat ventricular arrhythmias: amiodarone 150 mg slow IV push (may cause hypotension). Support BP with vasopressors (i.e. vasopressin, epinephrine). Consider CaCl. Check ABG frequently. Treat acid-base disturbances aggressively. Administer lipid emulsion 20% 1.5 mg/kg over 1 minute, followed by a continuous infusions of 0.25 ml/kg/min for 30-60 minutes. Consider open chest massage and/or cardiac bypass for patients unresponsive to IV lipid emulsion. Myocardial depression may not resolve for 80-90 minutes. Do not discontinue resuscitation efforts. Accidental IV injection is the most common cause.**
BRIEF SUMMARY OF WHAT ACTUALLY HAPPENED **(Did you use your proposed anesthetic plan? If so, did it work well? If not, why and how did your plan change? Did any complications occur?)**	

Hadzic, A. (2007). *Textbook of Regional Anesthesia and Acute Pain Management.* New York: McGraw Hill Companies, Inc. .

Jaffe, R., & Samuels, S. (2009). Anesthesiologist's Manual of Surgical Procedures (4th ed.). Philadelphia, PA: Lippincott Williams & Wilkens.

Macksey, L. (2012). Surgical Procedures and Anesthetic Implications. Sudbury, MA: Jens & Bartlett Learning.

Nagelhout, J. J., & Plaus, K. L. (2014). Nurse Anesthesia (Fifth ed.). St. Louis, Missouri: Elsevier.

Ruskin, K., & Rosenbaum, S. (2011). Anesthesia Emergencies. New York: Oxford University Press.

Appendix C

Questionnaire Form

Using the following scale, please rank how you feel regarding the following statements.

strongly disagree	disagree	neutral	agree	strongly agree
1	2	3	4	5

1. I am anxious to start specialty rotations.

1	2	3	4	5

2. I understand the process of utilizing the care plan to complement both didactic and clinical experience.

1	2	3	4	5

3. I am comfortable with the Cardiac information I will need to utilize in clinical practice.

1	2	3	4	5

4. I am comfortable with the Pediatric information I will need to utilize in clinical practice.

1	2	3	4	5

5. I am comfortable with the Obstetric information I will need to utilize in clinical practice.

1	2	3	4	5

6. I am comfortable with the Orthopedic information I will need to utilize in clinical practice.

1	2	3	4	5

7. I am comfortable with the ENT information I will need to utilize in clinical practice.

1	2	3	4	5

8. I am comfortable with the Neuro information I will need to utilize in clinical practice.

1	2	3	4	5

In addition to the prior questions, the following will be included post lecture:

1. The objectives of the lecture were clearly defined.

1	2	3	4	5

Please indicate any suggestions for future improvement:

Appendix D

Graphs and Charts for the pre and post test results

PreItem1 * PostItem1 Crosstabulation

Count

		PostItem1		
		Negative	Positive	Total
PreItem1	Negative	5	2	7
	Positive	2	10	12
Total		7	12	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.698[a]	1	.017		
Continuity Correction[b]	3.587	1	.058		
Likelihood Ratio	5.819	1	.016		
Fisher's Exact Test				.045	.029
Linear-by-Linear Association	5.398	1	.020		
N of Valid Cases	19				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is 2.58.

b. Computed only for a 2x2 table

PreItem2 * PostItem2 Crosstabulation

Count

		PostItem2		
		Negative	Positive	Total
PreItem2	Negative	1	4	5
	Positive	1	13	14
Total		2	17	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.647[a]	1	.421		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.578	1	.447		
Fisher's Exact Test				.468	.468
Linear-by-Linear Association	.613	1	.434		
N of Valid Cases	19				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .53.

b. Computed only for a 2x2 table

PrelTem3 * PostItem3 Crosstabulation

Count

		PostItem3		
		Negative	Positive	Total
PrelTem3	Negative	6	7	13
	Positive	1	5	6
Total		7	12	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.534[a]	1	.216		
Continuity Correction[b]	.529	1	.467		
Likelihood Ratio	1.657	1	.198		
Fisher's Exact Test				.333	.238
Linear-by-Linear Association	1.453	1	.228		
N of Valid Cases	19				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is 2.21.

b. Computed only for a 2x2 table

PreItem4 * PostItem4 Crosstabulation

Count

		PostItem4		
		Negative	Positive	Total
PreItem4	Negative	5	9	14
	Positive	0	5	5
Total		5	14	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.423[a]	1	.120		
Continuity Correction[b]	.932	1	.334		
Likelihood Ratio	3.652	1	.056		
Fisher's Exact Test				.257	.172
Linear-by-Linear Association	2.296	1	.130		
N of Valid Cases	19				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is 1.32.

b. Computed only for a 2x2 table

PreItem5 * PostItem5 Crosstabulation

Count

		PostItem5		
		Negative	Positive	Total
PreItem5	Negative	5	7	12
	Positive	0	7	7
Total		5	14	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.958[a]	1	.047		
Continuity Correction[b]	2.101	1	.147		
Likelihood Ratio	5.600	1	.018		
Fisher's Exact Test				.106	.068
Linear-by-Linear Association	3.750	1	.053		
N of Valid Cases	19				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.84.

b. Computed only for a 2x2 table

PreItem6 * PostItem6 Crosstabulation

Count

		PostItem6		
		Negative	Positive	Total
PreItem6	Negative	5	3	8
	Positive	1	10	11
Total		6	13	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.115[a]	1	.013		
Continuity Correction[b]	3.893	1	.048		
Likelihood Ratio	6.412	1	.011		
Fisher's Exact Test				.041	.024
Linear-by-Linear Association	5.793	1	.016		
N of Valid Cases	19				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.53.

b. Computed only for a 2x2 table

PreItem7 * PostItem7 Crosstabulation

Count

		PostItem7		
		Negative	Positive	Total
PreItem7	Negative	6	5	11
	Positive	1	7	8
Total		7	12	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.519[a]	1	.061		
Continuity Correction[b]	1.944	1	.163		
Likelihood Ratio	3.822	1	.051		
Fisher's Exact Test				.147	.080
Linear-by-Linear Association	3.334	1	.068		
N of Valid Cases	19				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.95.

b. Computed only for a 2x2 table

PreItem8 * PostITem8 Crosstabulation

Count

		PostITem8		
		Negative	Positive	Total
PreItem8	Negative	6	10	16
	Positive	0	3	3
Total		6	13	19

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.644[a]	1	.200		
Continuity Correction[b]	.367	1	.545		
Likelihood Ratio	2.529	1	.112		
Fisher's Exact Test				.517	.295
Linear-by-Linear Association	1.558	1	.212		
N of Valid Cases	19				

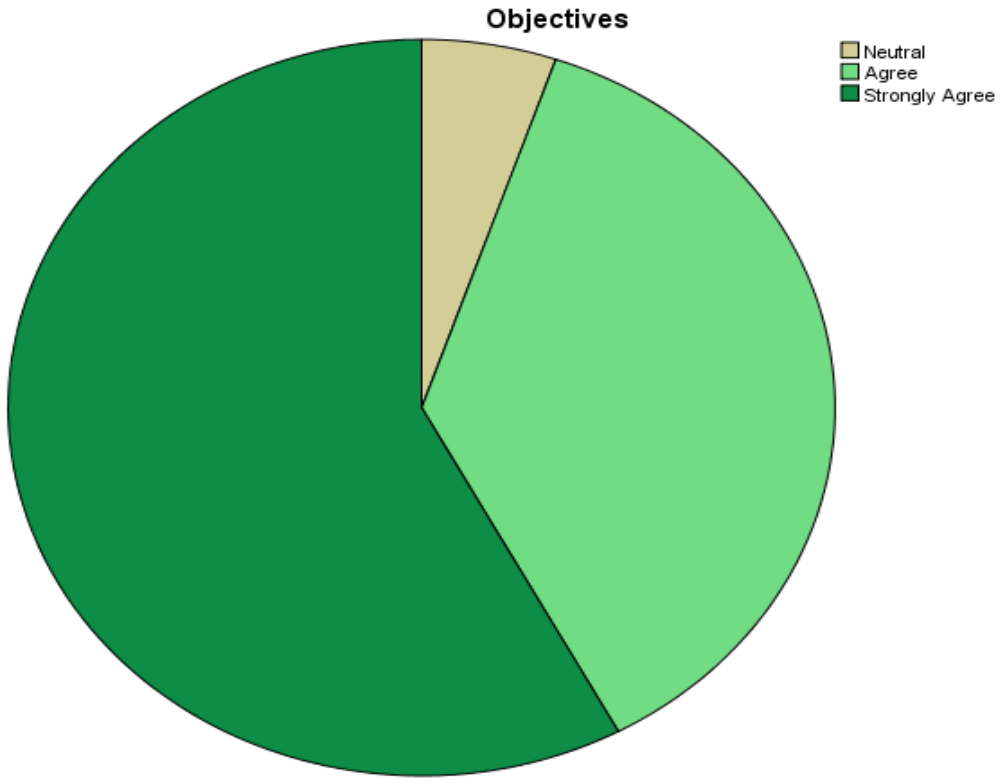
a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .95.

b. Computed only for a 2x2 table

Post-test results

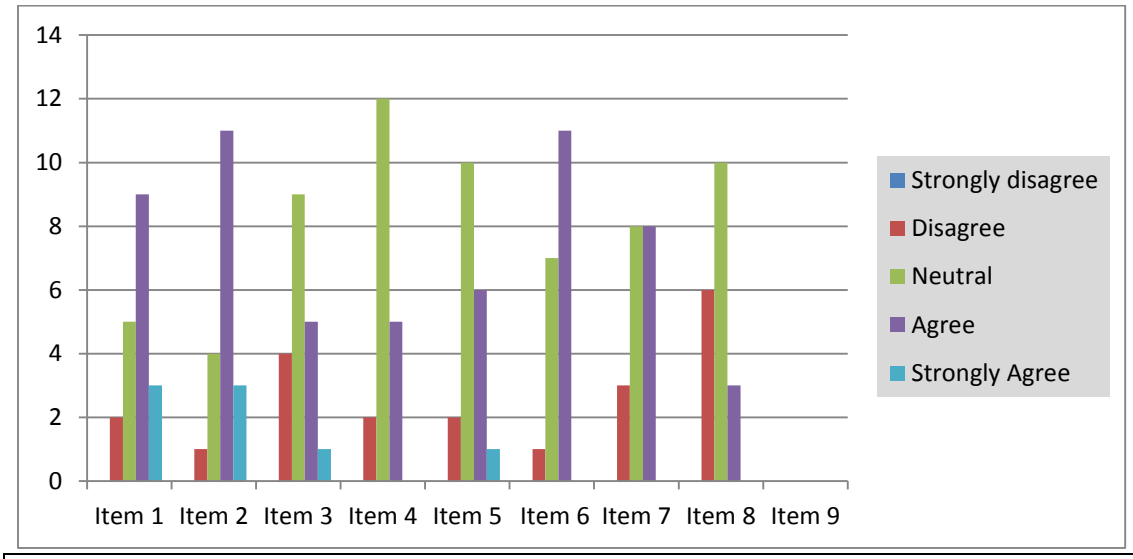
Objectives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	5.3	5.3	5.3
	Agree	7	36.8	36.8	42.1
	Strongly Agree	11	57.9	57.9	100.0
	Total	19	100.0	100.0	

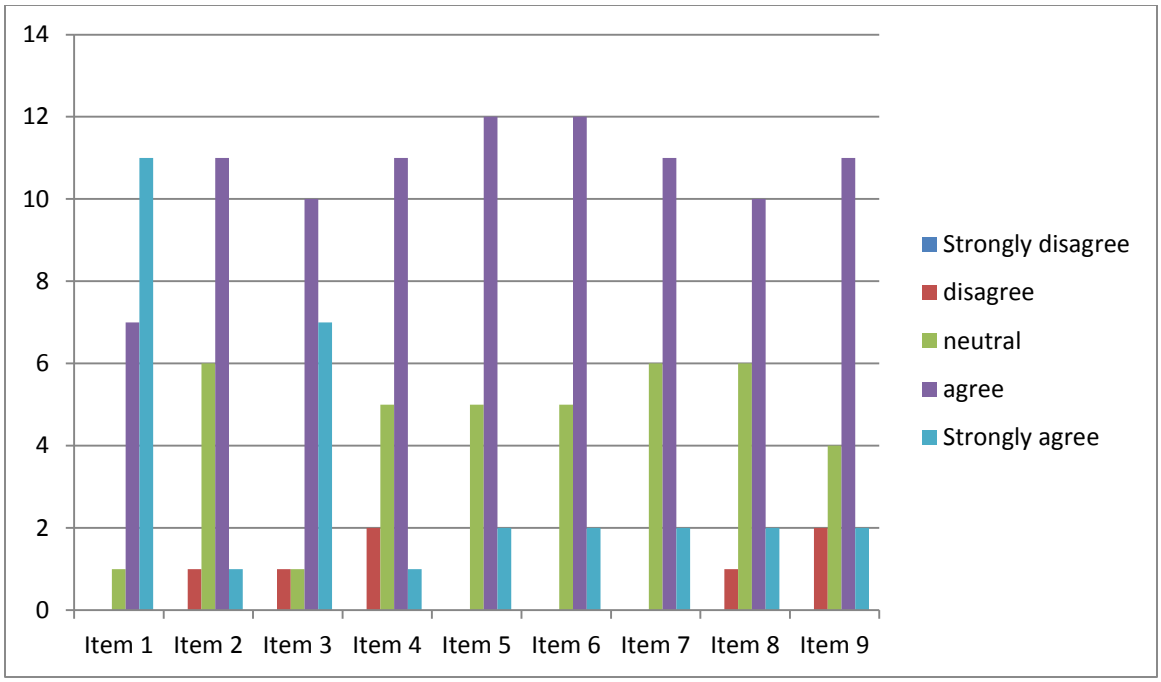


Appendix E

Pre test results					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Item 1	0	2	5	9	3
Item 2	0	1	4	11	3
Item 3	0	4	9	5	1
Item 4	0	2	12	5	0
Item 5	0	2	10	6	1
Item 6	0	1	7	11	0
Item 7	0	3	8	8	0
Item 8	0	6	10	3	0



Post test results					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Item 1	0	0	1	7	11
Item 2	0	1	6	11	1
Item 3	0	1	1	10	7
Item 4	0	2	5	11	1
Item 5	0	0	5	12	2
Item 6	0	0	5	12	2
Item 7	0	0	6	11	2
Item 8	0	1	6	10	2
Item 9	0	2	4	11	2


14
12
10
8
6
4
2
0
Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
Item 7
Item 8
Item 9
Strongly disagree
disagree
neutral
agree
Strongly agree