

CA 1 Mini PBLD 1.1: History and Physical

Authors:

Corinna Yu MD, Assistant Professor, Anesthesiology, University Hospital, Indiana University School of Medicine, Indianapolis, IN

Philip Stoller MD, Assistant Professor, Anesthesiology, University Hospital, Indiana University School of Medicine, Indianapolis, IN

Disclosures: None

Learning Objectives:

Upon completion of this learning activity, participants will be able to:

- Describe appropriate preoperative anesthesia evaluation and testing for patients with past medical history of cerebrovascular accident, hypertension, coronary artery disease, smoking, obstructive sleep apnea, and diabetes.
- Describe the neurological physical exam.
- Develop a plan to continue or discontinue medications prior to surgery in the setting of hypertension and coronary artery disease.
- Evaluate metabolic equivalents
- Describe the implications of duration of smoking cessation on perioperative pulmonary complications.
- Describe screening methods for obstructive sleep apnea.
- Evaluate end-organ damage in diabetes.

Case A

A 78-year-old woman presents for preoperative anesthesia evaluation with a history of cerebrovascular accident. She is scheduled for an open total colectomy.

1. What additional history do you want and why?

- *When was the stroke? If the case is elective, you may want to consider delaying the surgery for 9 months after recent stroke to decrease the risk of adverse cardiovascular outcomes and mortality (Jørgensen 2014).*
- *What were the presenting symptoms of her stroke? Does she have any residual symptoms? Knowing what symptoms she had previously can help establish a baseline neurological status for comparison with any symptoms she might have postoperatively. This can include mental status, speech, motor and sensory deficits, etc.*

This is the author's manuscript of the article published in final edited form as:

Yu, CJ, Stoller, P. (July 24, 2019). CA 1 Mini PBLD 1.1 History and Physical. Anesthesia Education Toolbox. <https://www.anesthesiatoolbox.com/docs/DOC-4782>.

Pre-existing sensory deficits may influence your decision to use regional anesthesia. Pre-existing motor deficits may influence your choice of neuromuscular blockade. Succinylcholine can cause hyperkalemia and cardiac arrest in patients with upregulation of neuromuscular receptors secondary to muscle weakness and disuse.

- *What type of stroke did she have (hemorrhagic vs. ischemic)? The etiology of the stroke has implications on your anesthetic management. For example, if she had a hemorrhagic stroke secondary to uncontrolled hypertension you may want to lower elevated blood pressure, whereas if she had an ischemic stroke secondary to carotid artery stenosis you may want to maintain an elevated blood pressure.*
- *What workup did she have for the stroke? If an appropriate workup has not been done to evaluate her stroke, you may want to consider delaying the case to ensure she is medically optimized.*

2. What would be some important elements of a physical exam for this patient?

- *Baseline blood pressure*
- *Mental status*
- *Speech*
- *Cranial nerve assessment including facial symmetry*
- *Motor exam of muscle strength and tone*
- *Sensory exam in extremities*
- *Balance, gait (this is not often performed but may be observed when patients arrive or learned during history-taking and is pertinent to fall risk)*

Case B

A 43-year-old man presents for preoperative anesthesia evaluation with hypertension and coronary artery disease. He is scheduled for a partial hepatectomy.

3. What additional history do you want related to his medical problems and why?

- *How long have has he had hypertension? What medications does he take? Does he take them regularly? Have there been any recent changes to his medications? What is his blood pressure normally? The goal is to determine hypertensive control and to consider postponing a case if the patient is non-compliant on medications or not medically optimized.*
 - *For example, if he has elevated blood pressure and was recently started on one anti-hypertensive medication a month ago and the case is elective, he may benefit from a second anti-hypertensive medication and closer follow up with his primary care physician.*
 - *If he is already taking 4-5 medications for blood pressure for the past year and sees his primary care physician regularly, delaying the case is unlikely to improve his blood pressure control.*

- *Perioperative hypertension increases the risk of cardiovascular disease, cerebrovascular events, and bleeding (Charlson 1989). Patients with hypertension may have labile blood pressure and higher set points for cerebral autoregulation. Careful titration of antihypertensive medications intraoperatively is necessary to avoid relative intraoperative hypotension and subsequent stroke.*
- *Which blood pressure medications did he take today?*
 - *ACE-inhibitors and angiotensin receptor blockers (ARBs) are occasionally held on the day of surgery due to increased risk for refractory intraoperative hypotension (vasoplegia). Certain patient populations may benefit from continued ACE-inhibitors or ARBs. Hypotension may still occur despite holding medications on the day of surgery and treating hypotension may be preferable to treating hypertension. This is an area of ongoing debate and decisions are best individualized to the patient (Mets 2013).*
 - *Diuretics such as furosemide and hydrochlorothiazide are occasionally held to avoid preoperative intravascular volume depletion, which, in combination with NPO status, can lead to intraoperative hypotension.*
 - *Clonidine may cause rebound hypertension if not continued the day of surgery.*
 - *Beta blockers should be continued in all patients taking them. Routine prophylactic perioperative beta blockade is not recommended (Poise 2008).*
 - *Clinical judgment must be used based on the patient's medical comorbidities, the nature and duration of the surgery, and risks and benefits of taking or holding various anti-hypertensives.*
- *How was he diagnosed with coronary artery disease? Has he ever had a heart attack? What symptoms did he have at that time? Some patients may be asymptomatic and were diagnosed with myocardial infarction on a routine ECG. If they have had a "silent MI" increased vigilance is necessary as the patient may have atypical symptoms and may not complain of chest pain.*
- *Does he have any chest pain? Does it occur with activity or at rest? What is his activity level? Can he walk two blocks without stopping? Can he climb two flights of stairs without stopping? Even if the patient has had a prior cardiac work up or medical optimization note from a primary care physician or cardiologist, it is important to reassess their symptoms as their clinical status can change after those clinical visits prior to surgery. It is important to establish if they have angina, and if so, if it is stable or unstable. If they have a sedentary lifestyle, it may be difficult to assess their metabolic equivalents (METs, see table below) and a stress test may be warranted (Fleischer 2014). 1 MET is the resting or basal oxygen consumption of a 40-year-old, 70-kg man. Decreased self-reported exercise tolerance is associated with increased perioperative risk (Reilly 1999). In addition to ischemia, low exercise tolerance may be indicative of congestive heart failure (CHF) or pulmonary disease. CHF may increase rates of perioperative complications including perioperative pneumonia, prolonged intubation, reintubation, sepsis, extended length of stay, mortality, and return to the operating room (Amdur 2016).*
- *Examples of metabolic equivalents include:*

1 MET: Can you:
• Take care of yourself?
• Eat, dress, or use the toilet?
• Walk indoors around the house?
• Walk a block or 2 on level ground at 2 to 3 mph?
4 METs: Can you:
• Climb a flight of stairs or walk up a hill?
• Walk on level ground at 4 mph?
• Run a short distance?
• Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?
• Do light work around the house like dusting or washing dishes?
• Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
Greater than 10 METs: Can you:
• Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?
<i>Fleisher, et al. ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery. Circulation. 2007; 116:e418-e500. Table 3.</i>

- *Does he have any shortness of breath? Does it occur with activity or at rest? Does he have any trouble breathing when he lies flat? How many pillows does he sleep with? Does he have any swelling in his legs? If the patient has significant coronary artery disease and prior history of myocardial infarction, they are at risk for congestive heart failure. Assess the patient for evidence of fluid overload, dyspnea, orthopnea, and lower extremity edema.*
- *Has he ever seen a cardiologist? When was the last visit? Has he ever had an ECG? Echocardiogram or ultrasound of the heart? Stress test? Has he ever had an abnormal heart rhythm? Determine what preoperative cardiac testing the patient has already had to discern if further testing or consultation will change management. Recommendations include (Fleisher 2014):*
 - *Preoperative resting 12-lead ECG in patients with: known coronary heart disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease (except in low-risk surgery)*
 - *Preoperative echocardiogram to assess LV function in patients with:*
 - *No history of heart failure, presenting with dyspnea*
 - *History of heart failure, with worsening dyspnea or other clinical symptoms*
 - *History of heart failure, clinically stable, no echocardiogram in past year*

- *Evaluation of echocardiogram should include assessment of ejection fraction for systolic dysfunction, regional wall motion abnormalities for ischemia, valvular function, and evidence of diastolic dysfunction. There is a higher rate of major adverse cardiovascular events, length of stay, and postoperative heart failure in patients with diastolic dysfunction (with and without systolic dysfunction) (Fleisher 2014).*
- *Exercise stress test in patients with: elevated risk and poor (less than 4 METs) or unknown functional capacity, if it will change management.*
- *Pharmacologic stress test in patients with: elevated risk and poor (less than 4 METs) functional capacity, if it will change management.*

4. On exam, his blood pressure is 220/116 and surgery is schedule for tomorrow. What will you do next?

- *I would delay elective major surgery for hypertensive urgency (diastolic >110 mmHg and/or systolic > 180 mmHg). Preoperative hypertension is associated with a 35% increase in cardiovascular complications. Patients with DBP>110 mmHg have an increased risk of dysrhythmias, myocardial ischemia or infarction, neurological complications, and renal failure (Howell 2004).*

Case C

A 36-year-old woman with 15-pack-year smoking history presents for laparoscopic tubal ligation. Her surgery is scheduled for next week.

5. What advice should you give her about smoking?

- *Smoking cessation for 12-24 hours decreases nicotine and carboxyhemoglobin levels.*
- *Smoking cessation for 1-2 weeks can decrease sputum volume.*
- *Smoking cessation for 4-8 weeks can reduce respiratory complications and improve wound healing.*
- *Some studies show that short-term (< 4 weeks) smoking cessation before surgery can increase pulmonary complications (Bluman 1998), while other studies have not shown any increase in pulmonary complications with short-term cessation (Barerra 2005).*
- *I would encourage her to quit smoking since surgery is a strong motivator for patients to change health behaviors. I would inform her that since her surgery is scheduled in a week, smoking cessation may not affect her risk for pulmonary perioperative complications and poor wound healing now. However, it will improve her health for future potential surgeries. Since it is an elective case, she can also consider re-scheduling her surgery for 4-8 weeks after she quits smoking.*

Case D

A 58-year-old man with a BMI of 45 kg/m² presents for preoperative anesthesia evaluation. He is scheduled for an outpatient knee arthroscopy.

6. How can you screen for obstructive sleep apnea?

- *The STOP-BANG questionnaire can be used to screen for the presence of OSA. The risk factors include: Snoring, Tired, Observed not breathing, high blood Pressure, BMI>35 kg/m², Age>50, Neck Circumference > 40 cm or 17 inches, Gender male.*
 - *Low risk for OSA=0-2 risk factors.*
 - *Intermediate risk for OSA=3-4 risk factors.*
 - *High risk for OSA=5-8 risk factors.*
- *The Berlin questionnaire can also be used to screen for the presence of OSA. It consists of 10 questions in 3 categories.*
 - *Patients are low risk if there is only 1 or no categories with a positive score*
 - *Patients are high risk if there are 2 or more categories with a positive score.*
 - *Scores are considered positive in categories 1 and 2 if there are 2 or more points, and positive in category 3 if patients have hypertension or BMI>30 kg/m². See suggested reading for more information.*
- *Polysomnography confirms the diagnosis by determining the apnea-hypopnea index (AHI).*
 - *AHI 5-15=mild OSA*
 - *AHI 15-30=moderate OSA*
 - *AHI>30 is severe OSA.*

7. His polysomnogram results include an apnea-hypopnea index of 55. What other information would you like to know?

- *Was he prescribed a CPAP machine? Does he use it? Did he bring it with him for surgery? If he brought his CPAP machine with him it can be used in recovery. Patients with home CPAP should be advised to bring their machine with them on the day of surgery; otherwise, a new machine will need to be provided by respiratory therapy and will require optimization of mask fit. Patients should be advised to use their CPAP for several days postoperatively (whether inpatient or at home) while on opioids due to potential OSA exacerbation and decreased arousal. Patients noncompliant with CPAP use after discharge may not be appropriate for ambulatory surgery (Joshi 2012).*
- *The presence of OSA is associated with an increased risk of postoperative complications, including respiratory failure and postoperative intubation and ventilation (Opperer 2016). Patients with an AHI>30 have severe OSA. Given the diagnosis and potential need for opioid pain management based on the surgery, consideration should be made regarding duration of post-operative monitoring, including the possibility of 23-hour observation or inpatient admission. Factors to consider include nature of surgery, comorbid conditions, type of anesthesia (sedation, regional, general), need for postoperative opioids, CPAP compliance, and PACU course such as hypoxemic events.*

- *Has he had any history of difficult airway or problems with anesthesia? Mask ventilation, direct laryngoscopy, endotracheal intubation and fiberoptic visualization of the airway are more difficult in patients with OSA.*
- *Does he have any other medical problems associated with OSA? Patients with OSA have increased prevalence of hypertension, atrial fibrillation, bradyarrhythmias, ventricular ectopy, stroke, heart failure, pulmonary hypertension, dilated cardiomyopathy, and coronary artery disease. History and physical exam should focus on these potential associated comorbidities.*

Case E

A 52-year-old man with diabetes type II presents for preoperative evaluation. He is having a ventral hernia repair.

8. What additional history do you want and why?

- *Does he take any medications for diabetes? Long-acting basal insulin (glargine or detemir) can be decreased by 50-75% the evening before (in daily dosing) or the morning of surgery (in twice daily dosing), depending on the duration of the surgery and how long the patient will be NPO. Short-acting insulin is ordinarily held on the day of surgery but understanding a patient's insulin sliding scale regimen can provide guidance to perioperative insulin needs based on blood glucose levels. Oral diabetic medications are frequently held to decrease the risk of hypoglycemia. Metformin is usually held because it can increase the risk of lactic acidosis.*
- *What does his blood sugar tend to run at home? What is his most recent hemoglobin A1c? These questions give an idea about the level of diabetic control and can assist in developing reasonable perioperative goals.*
- *Diabetes is associated with end organ damage including autonomic neuropathy, gastroparesis, retinopathy, cardiovascular disease including silent myocardial infarction, nephropathy, peripheral neuropathy, and peripheral arterial disease. History-taking should probe the extent of diabetic comorbidities in these areas.*

9. How can you evaluate end-organ damage in diabetes?

- *Autonomic neuropathy: positive orthostatic vital signs, resting tachycardia, loss of heart rate variability during deep breathing, impaired heart rate response to exercise, dysrhythmias, impaired ventilatory response to hypoxia and hypercapnia, gastroparesis*
- *Retinopathy: visual impairment*
- *Cardiovascular disease: angina, coronary artery disease, congestive heart failure, hyperlipidemia*
- *Nephropathy: hypertension, peripheral edema, albuminuria, decreased GFR*
- *Peripheral neuropathy: decreased position sense and sensation (vibration, pinprick, temperature) in toes and feet, foot infections, non-healing diabetic ulcers*
- *Peripheral arterial disease: diminished pedal pulses*

Suggested Reading:

Previous CVA

Christiansen MN, Anderson C, Gialason GH. et al. Risks of Cardiovascular Adverse Events and Death in Patients with Previous Stroke Undergoing Emergency Noncardiac, Nonintracranial Surgery: The Importance of Operative Timing. *Anesthesiology*. 2017; 127: 9-19.

Jørgensen, M.E., Torp-Pedersen, C., Gislason, G.H., et al. Time elapsed after ischemic stroke and risk of adverse cardiovascular events and mortality following elective noncardiac surgery. *JAMA*, 312, 269–77.

<https://jamanetwork.com/journals/jama/fullarticle/1887763>

Ng, J., Chan, M., & Gelb, A. Perioperative Stroke in Noncardiac, Nonneurosurgical Surgery. *Anesthesiology*, 2011; 115, 879-890.

<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1933989>

Rivera-Lara, L., Zorilla-Vaca, A., et al. Cerebral Autoregulation-oriented Therapy at the Bedside: A Comprehensive Review. *Anesthesiology*, 2017; 126, 1187-1199.

<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=2618829>

Williams, M., & Lee, J.K. Intraoperative blood pressure and cerebral perfusion: strategies to clarify hemodynamic goals. *Paediatric Anaesthesia*, 2011;24 (7): 657-667.

Wong, G.Y., Warner, D.O., Schroeder, et al. Risk of Surgery and Anesthesia for Ischemic Stroke. *Anesthesiology*, 2000; 92, 425.

<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1946026>

<https://meded.ucsd.edu/clinicalmed/neuro2.htm>

HTN and CAD

Amdur, R.L., Ashby, B., et al. The effect of congestive heart failure on perioperative outcomes in patients undergoing lower extremity revascularization. *Journal of Vascular Surgery*, 63 2016 (5), 1289-95.

Charlson, M.E., MacKenzie, C.R., et al. The preoperative and intraoperative hemodynamic predictors of postoperative myocardial infarction or ischemia in patients undergoing noncardiac surgery. *Annals of Surgery*, 1989;210, 637–648.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1357801>

Fleisher, L.A., Fleischmann, K.E., et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *Journal of the American College of Cardiology*, 2014;64(22), e77-137.
<https://www.ncbi.nlm.nih.gov/pubmed/25091544>

Howell, S.J., Sear, J.W., & Foex, P. Hypertension, hypertensive heart disease and perioperative cardiac risk. *British Journal of Anaesthesia*, 2004;92 (4), 570-83.

Mets, B. Management of Hypotension Associated with Angiotensin-Axis Blockade and General Anesthesia Administration. *Journal of Cardiothoracic and Vascular Anesthesia*, 2013; 27, 156-167.
<https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S1053077012003187?returnurl=https%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS1053077012003187%3Fshowall%3Dtrue&referrer=>

POISE study Group. Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomized controlled trial. *Lancet*, 2008; 371, 1839-47.
[https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(08\)60601-7.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(08)60601-7.pdf)

Reilly, D. F., McNeely, M.J., et al. Self-reported exercise tolerance and the risk of serious perioperative complications. *Archives of Internal Medicine*, 1999;159(18), 2185-92.
<https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/485137>

Rubens, Melvyn. 2017 Guideline for High Blood Pressure in Adults.
<https://www.acc.org/latest-in-cardiology/ten-points-to-remember/2017/11/09/11/41/2017-guideline-for-high-blood-pressure-in-adults>

Varon, J., & Marik, P.E. Perioperative hypertension management. *Vascular Health and Risk Management*, 2008; 4(3), 615-627. doi: 10.2147/vhrm.s2471
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2515421>

Whelton, P.K, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the American College of Cardiology*, 71, e127-e248.
http://www.onlinejacc.org/content/71/19/e127?_ga=2.92118298.1098422949.1562857850-2145280854.1562857850

Preoperative Cardiac Evaluation – Preop Lecture 2
<https://www.anesthesiatoolbox.com/docs/DOC-3134>

Smoking

Bluman, L.G., et al. Preoperative smoking habits and postoperative pulmonary complications. *Chest*, 1998; 113(4), 883-9. doi: 10.1378/chest.113.4.883

Barerra, R., et al. Smoking and timing of cessation: impact on pulmonary complications after thoracotomy. *Chest*, 2005; 127(6), 1977-83. doi: 10.1378/chest.127.6.1977

Warner, D.O. Preoperative Smoking Cessation: How Long Is Long Enough? *Anesthesiology*, 2005; 102, 883-884.

<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1942246>

https://www.openanesthesia.org/smoking_cessation_and_anesthesia

Obstructive Sleep Apnea

Chung, F., Yegneswaran, B., et al. STOP Questionnaire: A Tool to Screen Patients for Obstructive Sleep Apnea. *Anesthesiology*, 2008;108, 812-821. doi: 10.1097/ALN.0b013e31816d83e4
<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1932315>

Chung, F., Abdullah, H.R., & Liao, P. STOP-Bang Questionnaire: A Practical Approach to Screen for Obstructive Sleep Apnea. *Chest*, 2016;149(3), 61-638.
<https://www.sciencedirect.com/science/article/pii/S0012369215000185?via%3Dihub>

Grewal, G., & Joshi, G.P. Obesity and Obstructive Sleep Apnea in the Ambulatory Patient. *Anesthesiology Clinics*, 2019; 37(2), 215-224. doi: 10.1016/j.anclin.2019.01.001

Joshi, G.P., et al. Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery. *Anesthesia & Analgesia*, 2012;115, 1060-8. doi: 10.1213/ANE.0b013e318269cfd7

Opperer, M., et al. Does Obstructive Sleep Apnea Influence Perioperative Outcome? A Qualitative Systematic Review for the Society of Anesthesia and Sleep Medicine Task Force on Preoperative Preparation of Patients with Sleep-Disordered Breathing. *Anesthesia & Analgesia*, 2016; 122, 1321-34.

<http://www.stopbang.ca/patient/screening.php>

<https://www.sleepapnea.org/wp-content/uploads/2017/02/berlin-questionnaire.pdf>

https://www.openanesthesia.org/obstructive_sleep_apnea_diagnosis

Obstructive Sleep Apnea In-hospital considerations – Airway Lecture 11
<https://www.anesthesiatoolbox.com/docs/DOC-2107>

Perioperative Pulmonary Risk Assessment: OSA – Preop Lecture 3
<https://www.anesthesiatoolbox.com/docs/DOC-3514>

Diabetes

Duggan, E.W., Carlson, K., & Umpierrez, G.E Perioperative Hyperglycemia Management: An Update. *Anesthesiology*, 2017; 126, 547-560.
<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=2599856>

Sudhakaran, S., & Surani, S.R. Guidelines for Perioperative Management of the Diabetic Patient. *Surgery Research and Practice*, 2015, 284063.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4452499>

Wall, Russell T. “Endocrine Disease.” *Stoelting’s Anesthesia and Co-Existing Disease*. Philadelphia: Elsevier. 2018;Pages 449-475.