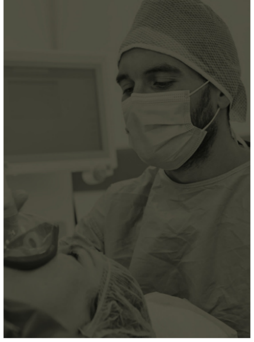

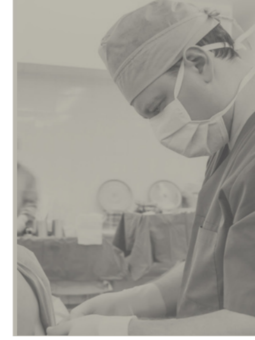

PENNSYLVANIA
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Spring 2023 NEWSLETTER

SENTINEL

Gordon Morewood, MD, MBA, FASE, FASA
PSA President

Scan to Register for PSA's President's Townhall

President's Message

“May you live in interesting times.”

Scholars now agree that the phrase above is not, as is often claimed, a Chinese curse. Rather, its' origins are likely found amongst the members of the British political dynasty, the Chamberlain family, during the early 20th century. Nonetheless its meaning is clear. Periods of rapid change carry the promise of great advancement but also uncertainty, discomfort, anxiety and the risk of loss. As anesthesiologists we are indeed living in “interesting times”.

An unexpected confluence of forces has combined to create a looming crisis in our workforce. The US population is aging. Healthcare systems are investing heavily to expand their capacity to provide procedural care. A disproportionate number of anesthesiologists will reach retirement age over the next 10 years. Even if a surge in the production of anesthesiologists, certified registered nurse anesthetists, and certified anesthesiologist assistants could be engineered in the short term, our discipline would be severely challenged to meet demand.

At the same time, the institutions and healthcare systems in which we care for patients are facing unprecedented financial pressures. An unanticipated reduction in inpatient admissions nationally has had a major impact on financial balance sheets. Expensive infrastructure is underutilized. Supply and staffing costs are escalating rapidly. Revenue streams from outpatient care cannot support the existing systems. The American Hospital Association reports that half of all US hospitals lost money in 2022.

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Editor Richard P. O'Flynn, MD, FASA

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PENNSYLVANIA *society of* ANESTHESIOLOGISTS

President's Message

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The impairment of institutional fiscal health unfortunately coincides with a reduction in direct payments for anesthetic care. The Medicare conversion factor has now begun to fall in real dollar terms, in stark contrast to the general US inflation rate. The No Surprises Act was intended to protect patients from unanticipated costs. It was thoughtfully constructed by Washington, D.C. lawmakers with considerable input from many physician groups, including the American Society of Anesthesiologists. Despite this fact, regulators have repeatedly attempted to implement interpretations of the law that would allow commercial insurers to unilaterally dictate draconian rate cuts. Only aggressive court challenges by the Texas Medical Society have held the insurers at bay so far.

These economic constraints provide an opening for growing corporate oversight of anesthesiologists' practices. The Corporate Practice of Medicine is a legal doctrine which has either been enshrined in statute or established through case-law in nearly every US state. It stipulates that an employer may not interfere with a physician's fiduciary duty to their patient. Although simple in concept, adherence to this principle is increasingly challenged by both public and private corporate entities who wish to insert themselves into the physician-patient relationship. It is a legal requirement that the practice of medicine, and medical decision making, remain solely the domain of licensed physicians. The struggle to defend this principle continues to intensify.

Finally, the entire system of value and compensation in healthcare is being reconfigured. Both government and commercial insurers are abandoning fee-for-service in favor of payment systems that they hope will align better with patient needs. As this transformation occurs, the practice of anesthesiology will need to pivot from managing discrete elements of care to optimizing and overseeing entire systems. Improving the care of procedural patients in a manner that reduces complication rates and inpatient hospital admissions will deliver enormous value to healthcare systems. This value will be critical in shaping the perception of our specialty in the future and determining how we are paid.

A central tenet of the profession of medicine is the physician's role as advocate. Dramatic information asymmetry in the marketplace for medical care requires that physicians faithfully and selflessly champion their patients' needs as they navigate the healthcare system.

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President's Message

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However, this advocacy does not end 5 feet or 100 feet from the bedside, nor at the operating room or hospital doors. Our unique understanding of biomedical science, and of our patients, mandates that we participate in constructing better and safer systems of care; in governing the organizations in which that care is delivered; in regulating and advancing our profession; and in ensuring that the necessary systems and workforce will be available in the future. This responsibility falls to every one of us and is no less important than the hands-on life sustaining care that we provide daily.

Over the coming months I will be writing about many of these subjects in more detail. I will also be meeting with as many PSA members as possible for live discussions of these and other issues. I look forward to many vibrant conversations. I urge each of you to ponder your role in shaping the future of our healthcare system. These are “interesting times”. Yet I maintain an unshakable faith that our system of liberal democracy and free markets will produce a better system of healthcare, as long as our physicians are engaged and contribute to the process.

Register Now for Dr. Morewood's Virtual Townhall

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Join PSA Today!

Selected Topics in Basic Physiology - A Review

Jonathan Roth, MD

Can you answer these three questions?

1. From where does the formula for pulmonary compliance derive?
2. Why does anesthesia and paralysis decrease functional residual capacity (FRC)?
3. What role does the calculation of systemic vascular resistance (SVR) have in guiding hemodynamic management?

From where does the formula for pulmonary compliance derive?

During inspiration the lungs and the thoracic cavity expand and increase their internal volumes. The caudal excursion of the diaphragm increases the height dimension of the thoracic cavity while anterior elevation of the down sloping ribs increases the anterior-posterior dimension as the posterior attachments of the ribs pivot on the spinal column. The diaphragm at end expiration is dome shaped with its concavity caudally directed. During spontaneous inspiration, the muscle of the diaphragm contracts and shortens. The diaphragm will thus become less dome shaped and more flattened. Maximum contraction occurs when the diaphragm is flat. Hence patients who have disease states with flattened diaphragms have less potential diaphragmatic excursion available (and less mechanical advantage) and thus are more dependent on the accessory muscles of respiration which serve to elevate the ribs.

Elastance (E), defined as change in pressure divided by change in volume ($E = \Delta P / \Delta V$), describes how much pressure is required to expand the lungs and chest wall.

As it is necessary to overcome the elasticity of both the lungs (E_L) and chest wall (E_{cw}), the total elastance (E_T) is their sum:

Formula #1: $E_T = E_L + E_{CW}$

Compliance (C) is defined as change in volume divided by change in pressure ($C = \Delta V / \Delta P$). Compliance is the reciprocal of elastance, i.e., $E = 1 / C$. The higher the elastance, the lower the compliance, and vice versa. Substitution of elastance by 1/C in formula #1 results in the familiar formula for total pulmonary compliance:

Formula #2: $1/C_T = 1/C_{CW} + 1/C_L$

Mathematical manipulation by inverting both sides of the equation and then multiplying the left side of the equation by 1 in the form of $C_T \div C_T$ and multiplying the right side of the equation by 1 in the form of $(C_{cw} \times C_L) \div (C_{cw} \times C_L)$ results in a simpler to use formula:

Formula #3: $C_T = (C_{cw} \times C_L) \div (C_{cw} + C_L)$

Just like the total elastance of the pulmonary system is greater than the higher of either the chest wall or lung elastance (formula #1), this product over sum formula makes it apparent that the total compliance is always less than the lower of either C_{cw} or C_L. If you rewrite the right side of formula #3 as $(C_{cw}) \times (C_L \div (C_{cw} + C_L))$, the factor $(C_L \div (C_{cw} + C_L))$ must be less than one which means C_T must be less than C_{cw}. The same logic can similarly demonstrate that C_T must also be less than C_{cw}. Inspection of Figure 1 shows that both the chest wall and lung compliance curves have steeper slopes (i.e., greater compliance) than the slope of the total system.

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Selected Topics in Basic Physiology - A Review

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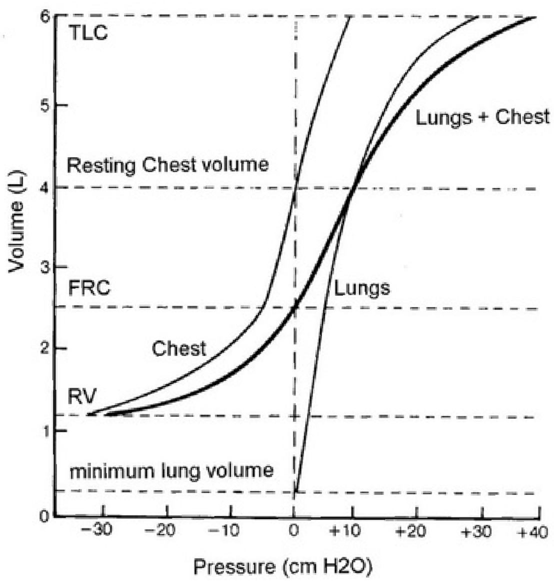
Figure 1 Compliance curves of the lunch, chest well, and total compliance (lungs + chest)



The Y axis represents lung volume. The X axis represents recoil pressure. At FRC, the pressure difference from the lung curve to 0 pressure (contracting pressure) is equal and opposite to the pressure difference from the chest wall curve to 0 pressure (expanding pressure). At lung volumes below FRC, there is a greater in magnitude pressure difference from the chest wall than the lungs to the 0 pressure point. The net pressure difference makes the lungs and chest wall expand. At lung volumes above FRC, there is a greater in magnitude difference from the lungs than the chest wall to the 0 pressure point. The net pressure difference makes the lungs and chest wall contract.

Why does anesthesia and paralysis decrease functional residual capacity (FRC)?

The normal FRC is approximately 40% of the total lung capacity (TLC).

If there were no lungs, the chest wall would expand until the thoracic volume increased to approximately 70% of the TLC. This point is where the chest wall compliance curve crosses the point of 0 recoil pressure (resting chest volume) in Figure 1. This helps explain why it is relatively easy to take a deep breath up to a point but extra effort to pass that point and fill the lungs completely. If you eliminate the chest wall, the lung will tend to collapse. Both the tendency of the chest wall to want to expand and the lung wanting to collapse creates a negative pressure in the pleural space. When these forces are equal and opposite, the system is in equilibrium at FRC (Figure 1). When the lung volume is greater than FRC, the system “wants” to collapse as the collapse of the lung force (or pressure) is greater than the expansion of the chest wall force. When the lung volume is less than FRC, the system “wants” to expand as the expansion of the chest wall force is greater than the collapse of lung force. The decrease in muscle tone resulting from anesthesia and/or neuromuscular paralysis decreases the forces that make the chest wall want to expand. The chest wall compliance curve shifts to the right and the expanding and collapsing forces come into balance at a lower lung volume resulting in a decreased FRC.

If the FRC decreases, there is decreased lung compliance, increased airway resistance, increased work of breathing, decreased tidal volume, increased respiratory rate, decreased oxygen reserves, increased atelectasis, increased shunt, increased pulmonary vascular resistance, and increased right ventricular afterload. Application of positive end-expiratory pressure (PEEP) increases FRC.

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Selected Topics in Basic Physiology - A Review

Jonathan Roth, MD

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What role does the calculation of systemic vascular resistance (SVR) have in guiding hemodynamic management?

The formula for systemic vascular resistance (SVR) is:

Formula #4:SVR = 80 x (MAP-CVP) ÷ CO

Where MAP is mean arterial pressure, CVP is central venous pressure, and CO is cardiac output. For simplification, since MAP is significantly greater than CVP, we can ignore the CVP term. Mathematical rearrangement of Formula #4 and dropping the constant 80 results in:

Formula #5:MAP ≈ CO x SVR

This is analogous to Ohm's law, V= I x R, where MAP and V (voltage) represent the driving force across the vascular bed or electrical load, CO and I (current) represent blood flow or current flow, and SVR and R represents the resistance or impedance to flow.

In hemodynamic management, we generally endeavor to keep blood pressure and cardiac output at satisfactory levels. To calculate SVR, measurements of MAP and CO are needed. If MAP and CO are at acceptable levels, there would be no need to calculate SVR to guide therapy. Also, there are other issues with the use of SVR.

First, an elevated SVR can be the result of either an increased MAP or a decreased CO (as well as other combinations that affect the ratio), and vice versa. In the case of an elevated MAP and a normal CO, the SVR is elevated, i.e., there is excessive vasoconstriction, and it may be appropriate to administer a vasodilator which will decrease MAP and SVR. However, if the SVR is elevated because CO is low, say due to hypovolemia, administration of a vasodilator to decrease SVR will lead to further hemodynamic deterioration by reducing preload and compensatory vasoconstriction. The appropriate treatment is to increase CO by volume infusion in this case, and SVR will then decrease. Although sometimes limited by the development of hypotension, there may be situations, e.g., decreased left ventricular contractility, where afterload reduction may increase CO. Treatment of SVR should not be the goal of therapy! Treatment of MAP and CO are the appropriate targets of therapy.

Second, it can be difficult to determine what the appropriate SVR target value is. Table 1 illustrates the SVR for 5 different patients. Patient #1 represents a normal size man. Patient #2 represents a petite woman. Patient #3 represents a professional football player. Patient #4 represents a normal term infant. Patient #5 represents the same patient as patient #1 after hemorrhage.

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Table 1 SVR calculated from formula #4 for 5 different patients.

Patient #	Weight kg	CO L/min	BP mm Hg	MAP-CVP mm Hg	SVR (Formula #4) dynes/sec/cm^5
1	70	5	130/70	85	1,360
2	50	3.5	130/70	85	1,943
3	130	9	130/70	85	756
4	3	0.4	67/42	45	9,000
5	70	3.8	110/50	70	1,474

SVR reflects the cross-sectional area of the vascular bed (and the viscosity of blood*). As cross-sectional area increases, resistance to flow decreases. A larger person has a larger vascular bed and consequently a larger total cross-sectional area and thus should have as his/her normal a lower SVR (Patient #3). Another way to look at this is to realize that normal MAP in adults is confined to a relatively narrow range whereas CO increases with increasing body size. From formula #5, with a constant MAP, SVR must decrease as CO increases, and vice versa (compare patients #1, #2, and #3).

One source stated the normal range of SVR is 700 to 1,500 dynes/sec/cm^5. ** This wide range limits its clinical utility. A patient may have a SVR outside of this range and be normal (e.g., patients #2 and #4), or a SVR within this range and be in a pathologic state (e.g., patient #5). The SVR of a hypovolemic vasoconstricted man (patient #5) can be lower than that of a normal petite woman (patient #2). Efforts have been made to use cardiac index instead of cardiac output to normalize the differences in the size of patients. However, the resultant indexed SVR values also had too wide of a "normal" range to be clinically useful.

* The viscosity of blood is affected by temperature, hematocrit, and fibrinogen levels. These factors can confound the interpretation and meaning of the SVR value. For example, with a given cardiac output and degree of vasoconstriction, a patient with a lower hematocrit will tend to have a lower SVR and thus lower MAP than if the hematocrit was higher. In this case, transfusion of blood can increase SVR (and MAP). The increase in SVR that occurs with hypothermia is due in part to vasoconstriction and in part to an increase in blood viscosity. For the purpose of this article, viscosity will not be further considered.

** Another source says between 900 and 1,200 and still another between 900 and 1,440.

The pulmonary vascular resistance (PVR) can be calculated in a similar manner as SVR:

Formula #6: $PVR = 80 \times (MPAP - (LAP \text{ or } PCWP)) \div Qp$

where Qp is pulmonary blood flow, MPAP is mean pulmonary artery pressure, PCWP is pulmonary capillary wedge pressure, and LAP is mean left atrium pressure.Unlike SVR, PVR likely has more clinical utility.For example, in evaluating a prospective liver transplant candidate with pulmonary artery hypertension (PAH), it is important to know how much of the PAH is due to high CO and how much due to disease of the pulmonary vasculature, i.e., increased PVR. The decision to proceed with transplant can be informed by how elevated the PVR is.

Distinguished Service Award

Craig Muetterties, MD

The Pennsylvania Society of Anesthesiologists presents Dr. Craig Muetterties with the 2022 Distinguished Service Award in recognition of his long and distinguished career. The award is the highest honor that the Society bestows to a member who has actively worked to transform the specialty of anesthesiology in the Commonwealth. This award was last presented in 2016.

During his long tenure, Dr. Muetterties practiced in both the academic and private practices areas, most recently with Society Hill Anesthesia Consultants.

As a long time PSA Board member, Dr. Muetterties has admirably served the Society. He has represented the Society on a national level as both an Alternate Delegate and Delegate to the American Society of Anesthesiologists. He guided the PSA as President in 2004 and served as chairman of both the Judicial and Membership Committees. Most recently he was Treasurer of Z-PAC, the Political Action Committee of the Pennsylvania Society of Anesthesiologists.

In addition to his contributions to the PSA, Dr. Muetterties also found time for overseas volunteer service. He has participated in Project Hope and Dominican Dreams. Most recently, he has volunteered as an anesthesiologist on the Mercy Ships in Madagascar (2016), Benin (2017), Cameroon (2018), and Guinea (2019).

Dr. Muetterties represents the best of Pennsylvania anesthesiologists and is extremely deserving of this award.

Propofol for Trauma Patients: Whose Sandbox?

James Lamberg, DO, FASA, CPPS

Editor's Note: *In a previous edition of the Sentinel (Propofol for Trauma Patients and Other Myths and Fairy Tales, Spring 2022), Dr. Answine opined about an institutional policy restricting use of Propofol for intubation in the trauma bay. Dr. Lamberg presents a different point of view.*

Being told how to provide clinical care within your area of expertise by another department can appear very confrontational. Why would another department choose such a strong action, like eliminating the use of a common induction drug in the trauma bay? As a trauma liaison for an anesthesia department at a Level 1 trauma center, here are my thoughts as to why such a policy may exist. Understanding where the other department is coming from can help both teams work together to benefit patient outcomes and can reduce hostility between departments.

The Pennsylvania Trauma Systems Foundation (PTSF) is the organization responsible for accrediting trauma systems in the state. This is a rigorous process that involves validating compliance with standards and evaluating clinical care via performance improvement. Standards are based on the American College of Surgeons Committee on Trauma (ACS COT) and they are available online. (Ref 1)

Here are some highlights related to our specialty:

- There is a designated primary anesthesia liaison and secondary liaison.
- They are required to attend certain trauma-related meetings, specifically performance improvement (i.e. quality/case review).
- At Level I and II centers, both liaisons must be a physician.
- The anesthesiologist involved in emergency O.R. cases must be immediately available, defined as within 15 minutes.
- Trauma Resuscitation Management guidelines must be in place and must include, at a minimum, Advanced Trauma Life Support (ATLS) principles.
- "The attending surgeon's participation in the major therapeutic decisions, presence in the emergency department for major resuscitations and presence at operative procedures is mandatory."

Following resuscitation guidelines, specifically ATLS, is a requirement to maintain hospital accreditation as a trauma center. Let's put ourselves in the shoes of the trauma surgeon as a patient arrives at the trauma bay. ATLS dictates that "hemorrhage is the predominant cause of preventable deaths after injury." (Ref 2) Specifically, "hypotension following injury is due to blood loss until proven otherwise." (Ref 2) Now, if intubation is needed and significant hypotension occurs, what is the trauma surgeon supposed to do? Did the induction agent simply unmask hypovolemia, or is it transient? If it's transient, how long are you going to wait and what if you're wrong?

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Propofol for Trauma Patients: Whose Sandbox?

James Lamberg, DO, FASA, CPPS

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If the patient remains hypotensive and the ultrasound FAST exam is positive, the ATLS algorithm prompts immediate transfer to the operating room without CT scan. Ongoing hypotension may prompt initiation of a massive transfusion protocol (MTP). The use of Propofol in this setting, particularly with an incorrect dose, can dictate resuscitation and surgical management. How sure are you as a provider that the hypotension was caused by your induction agent and not hypovolemia? If it were your family member, would you bet an MTP or a xiphoid-to-pubis exploratory laparotomy on that? (Ref 3)

Dr. Cliff Reid, an emergency medicine physician, coined the phrase Propofol Assassins referring to anesthesia providers who use Propofol to intubate critically ill patients. During a podcast he made the comment, "Which induction agent then would be the most consistently stupid choice for critical care RSI? That's right, [Propofol]." (Ref 4) This view is a little extreme, but it isn't without merit.

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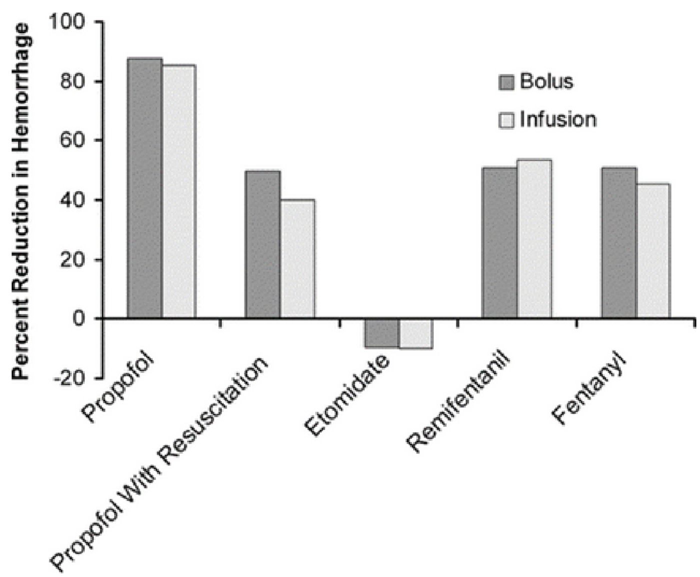
Like most anesthesiologists I primarily use Propofol in the operating room, and I use it for almost every cardiac induction as well. But it can be very difficult to hit the "Goldilocks" dose in a shock patient because it is a drug with such a narrow therapeutic index. The figure below comes from an article titled "Shock Values" by Shafer SL. (Ref 5)



In hemorrhagic shock, Propofol dosing is 20% of normal. In resuscitated shock, it is 50 % of normal.

Let's take the example of a 70 kg multi-trauma patient with penetrating abdominal injury and SBP ~90 mmHg. Without resuscitation, the appropriate RSI Propofol dose for this patient is 0.4 mg/kg, or 28 mg, which is 3 mL of Propofol. For those who were not familiar with this dosing study, would you now feel comfortable performing an RSI on this awake adult with 3 mL of Propofol? Even with resuscitation of shock, the dose would be 7 mL of Propofol for RSI. Ketamine, on the other hand, does not require dose adjustment and thus provides a larger margin of safety. Etomidate is another option, but it is worth noting that dosing should not be reduced in shock patients (see above figure).

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Propofol for Trauma Patients: Whose Sandbox?

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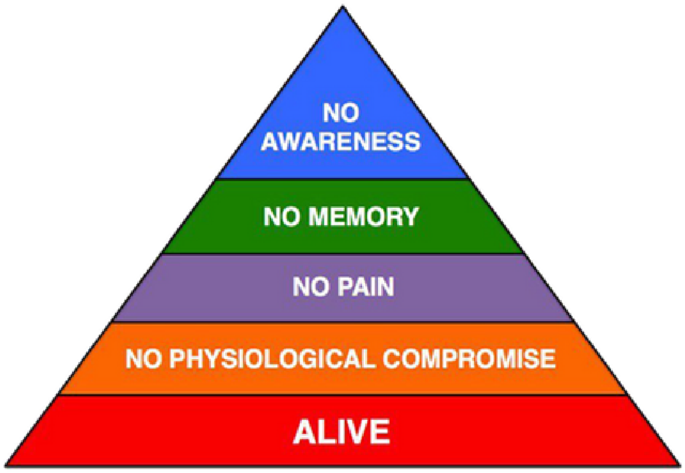
In the operating room during non-emergent procedures, there is an expectation that the anesthesia team will prevent awareness. There was a large UK National Audit Project (NAP5) dedicated to learning more about awareness during surgery. (Ref 6) However, the same does not hold true for critical situations and emergencies. Dr. Chris Nickerson, an emergency medicine physician and intensivist, created a hierarchy of emergency intubation needs to highlight goals during critical intubations, shown below. (Ref 7)



We can save the discussion about vasopressor use in trauma patients for another article. Without getting into the weeds about induction agents in trauma, etomidate is probably fine, and ketamine is probably the agent of choice in most settings. Studies comparing mortality outcomes for these agents are going to miss the issue here, which is that acute hypotension in the trauma bay drives surgical management. Retrospective studies may show selection bias given providers who avoid Propofol in critically ill patients.

Now let's say you're sitting at a round table with providers from different departments discussing induction agents in trauma. You recognize that you will have providers at different levels of training, maybe residents, maybe temporary locums. If ketamine is the default agent, there is less variability, less need to ensure each unique provider chooses the right dose, and less need for ongoing education. For an agent like Propofol, the dose varies widely with age and resuscitation status. Choosing the wrong dose can result in unnecessary blood transfusion or even emergency surgery.

When a system issue is found, we can use system engineering principles and human factors analysis to improve the safety and reliability of the system. When trying to find the best error reduction strategy, a hierarchy of controls framework is used. The Institute for Healthcare Improvement (IHI) has a more generalized Action Hierarchy Tool to help with finding effective solutions to system problems identified through peer review and safety event analysis, as seen below. (Ref 8)

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Propofol for Trauma Patients: Whose Sandbox?

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	Action Category	Example
Stronger Actions (these tasks require less reliance on humans to remember to perform the task correctly)	Architectural/physical plant changes	Replace revolving doors at the main patient entrance into the building with powered sliding or swinging doors to reduce patient falls.
	New devices with usability testing	Perform heuristic tests of outpatient blood glucose meters and test strips and select the most appropriate for the patient population being served.
	Engineering control (forcing function)	Eliminate the use of universal adaptors and peripheral devices for medical equipment and use tubing/fittings that can only be connected the correct way (e.g., IV tubing and connectors that cannot physically be connected to sequential compression devices or SCDs).
	Simplify process	Remove unnecessary steps in a process.
	Standardize on equipment or process	Standardize on the make and model of medication pumps used throughout the institution. Use bar coding for medication administration.
	Tangible involvement by leadership	Participate in unit patient safety evaluations and interact with staff; support the RCA[a] process; purchase needed equipment; ensure staffing and workload are balanced.
Intermediate Actions	Redundancy	Use two RNs to independently calculate high-risk medication dosages.
	Increase in staffing/ decrease in workload	Make float staff available to assist when workloads peak during the day.
	Software enhancements, modifications	Use computer alerts for drug-drug interactions.
	Eliminate/reduce distractions	Provide quiet rooms for programming PCA pumps; remove distractions for nurses when programming medication pumps.
	Education using simulation-based training, with periodic refresher sessions and observations	Conduct patient handoffs in a simulation lab/environment, with after action critiques and debriefing.
	Checklist/cognitive aids	Use pre-induction and pre-incision checklists in operating rooms. Use a checklist when reprocessing flexible fiber optic endoscopes.
	Eliminate look- and sound-alikes	Do not store look-alikes next to one another in the unit medication room.
	Standardized communication tools	Use read-back for all critical lab values. Use read-back or repeat-back for all verbal medication orders. Use a standardized patient handoff format.
	Enhanced documentation, communication	Highlight medication name and dose on IV bags.
Weaker Actions (these tasks require more reliance on humans to remember to perform the task correctly)	Double checks	One person calculates dosage, another person reviews their calculation.
	Warnings	Add audible alarms or caution labels.
	New procedure/ memorandum/policy	Remember to check IV sites every 2 hours.
	Training	Demonstrate correct usage of hard-to-use medical equipment.

This template has weaker actions towards the bottom, which represent solutions that rely on humans and memory. Towards the top are stronger actions, which typically involve engineering controls. An example of a weaker action for the Propofol issue would be to email the department telling everyone to be careful with Propofol. An example of a stronger action would be a forcing function, such as elimination of Propofol in the trauma bay.

In a clinical environment where hitting the exact right dose of Propofol depends both on human memory and assessing resuscitation status, which may not even be possible, I can see why some institutions choose to remove Propofol all together. At our institution, Propofol is allowed but cases are monitored very closely. Allowing Propofol in this high-risk area involves mutual trust between departments, an expectation for anesthesia providers set by the anesthesia department, cognitive aids Propofol dosing listed on a poster in trauma bay and trauma O.R. and ongoing departmental education. Choosing the wrong Propofol dose can create a false positive (e.g., hypotension mimicking hemorrhage) and thus a negative result for the patient (e.g., MTP, ex-lap).

So, let’s work with other departments and build some sandcastles together.

My Sandbox Of Course

A Response to "Propofol for Trauma Patients: Whose Sandbox?"

Joseph Answine, MD, FASA

First, I know Dr. James Lamberg well. I know him well enough not to go into a battle of wits with him as I truly would be woefully unarmed. However, I think I can make my point in defense of my article without disagreeing too much with his opinions.

I agree that Propofol when compared to etomidate or ketamine will more likely cause a decline in systemic vascular resistance especially in the hemodynamically compromised patient. However, it also is the most utilized and therefore most understood induction agent among practicing anesthesiologists today. Even Dr. Lamberg's hospital system allows its utilization on any patient, including trauma patients, based on a nearly universal understanding among anesthesiologists of its benefits and risks. As quoted in his response: "At our institution, Propofol is allowed but cases are monitored very closely. Allowing Propofol in this high-risk area involves mutual trust between departments, an expectation for anesthesia providers set by the anesthesia department, cognitive aids (Propofol dosing listed on a poster in trauma bay and trauma O.R.), and ongoing departmental education." I couldn't agree more. So, where is the trust if it is forbidden based on a protocol? Of course, there is variability in anesthetic knowledge with differing levels of training. However, to restrict an anesthesiologist as to what he can utilize during a patient's care is no different than not allowing the trauma surgeon to choose the surgical intervention due to variability in skill sets among practicing trauma surgeons.

If we restrict Propofol, is the patient safer? There are situations where Propofol should not be used as is true for etomidate and ketamine.

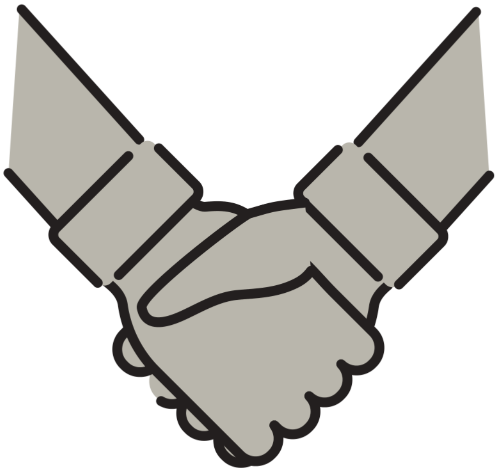
And a less seasoned anesthesiologist may not be as cognizant of the risks of each. That same individual, however, could also develop a false sense of security when using ketamine or etomidate in a hemodynamically unstable patient based on the assumption that they will not cause further hemodynamic compromise. As I witnessed during my internship, a critically ill patient with severe aortic stenosis can die after one milliliter of fentanyl.

As for awareness during the care of a trauma patient, it is a known risk regardless of the agent used. Furthermore, with our vast experience with sub-hypnotic doses of Propofol, we can more likely predict or avoid awareness when varying the dose than when attempting to use other hypnotics. The least comfortable we are with an induction agent, the more likely a complication such as awareness will occur.

I also understand the potential benefits of protocols, however, I am concerned with fixation error, especially in less trained individuals, when relying on a protocol during care of a severely compromised patient assuming it is incapable of failure, or not knowing when it's time to utilize another care plan.

ZPAC, the political action committee of the Pennsylvania Society of Anesthesiologists, is your voice in Harrisburg.

The PAC supports candidates for office who champion safe anesthesia care.



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Traveling Nurse and Surgical Technician Deployment and Efficiency in the Operating Room

Cantees, Kimberly MD/MBA; Yin, Wu MD/MBA; Kim, Justine MD; Beaman, Shawn MD; Hudson, Mark MD/MBA
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In 2020, the World Health Organization (WHO) celebrated the "Year of the Nurse and Midwife" to encourage students to pursue education in Nursing to fill the anticipated need for 9 million nurses and midwives to achieve universal health coverage by 2030. (1) The COVID-19 pandemic significantly amplified this pre-existing need. Survey studies have shown that burnout, pandemic-related stress, alternative job opportunities, financial hardship, and early retirement have contributed to the plummeting nursing work force. The American Association of Critical Care Nurses performed a survey study that demonstrated a loss of 6,500 critical care nurses in September 2021. (2)

After COVID-19 was declared a public health emergency in March of 2020, hospital employment precipitously declined. The American Hospital Association data brief found that job vacancies for nursing personnel increased to 30% between 2019 and 2020 while staff turnover increased from 18% to 30%. (3)

The use of traveling nurses has grown 35% in 2020 compared to the previous year to mitigate the high vacancy rates seen in surgical services. The use of the traveling nurse and surgical technologist staff is expected to grow an additional 40%.

The University of Pittsburgh Medical Center (UPMC) experienced a similar vacancy rate for surgical technologists and surgical services registered nurses. In January 2022, an internal traveling nursing (RN) and surgical technologist program, named University Travel Services, was formed as an "in-institution" traveling nurse/surgical technologist agency to alleviate staff shortages within the UPMC Health Care System. The traveling staff are assigned for 6 weeks to a given facility.

Usage of OR traveling staff in the UPMC health care system started gradually. In January 2022, 7.6% of ORs were staffed with a traveling RN/surgical technologist. By March 2022, 22.5% of all ORs were staffed with a traveler. While this staffing strategy was expected to be associated with a planned increase in surgical volume, total case volume remained the same with an average of 29.85 ORs/day in January 2022 and 29.22 ORs/day in March 2022. The stable OR case volume can be attributed to a persistent attrition of regular staff that matched the influx of agency talent. Additionally, we found that most surgical services were unable to schedule backlogged cases on short notice.

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At UPMC, traveling staff were most frequently assigned to cases performed by general surgery (31.8%), orthopedic surgery (19.3%), and neurosurgery (14.2%). Travelers were never assigned to cases performed by cardiac surgery, ophthalmology, or urgent trauma surgery.

When we compared OR efficiency between rooms with and those without traveling staff, ORs with travelers spent less time in surgery, had longer turnovers, and decreased OR utilization.

The operating rooms staffed by traveling nurses and surgical technologists had decreased OR efficiency. The three main metrics analyzed were total surgical time, turnover time, and OR utilization during weekdays from 7AM-3PM. The minutes in surgery were less in total compared to rooms not staffed by agency staff. Interestingly, utilization of available surgical time increased from 66.6% to 70.3% in those rooms staffed by UPMC employed staff while traveling staff OR utilization remained unchanged at 62.2%.

Of note, many of the ORs would have been closed and no operations performed without the traveling staff. Whatever the efficiency metrics, performing important and time-sensitive operations improves patient care when the alternative is further delay. Despite the decreased OR efficiency associated with travelers, an overall 62% OR utilization was achieved during prime operating times.

Hiring traveling staff can help to ease staffing shortages. However, there must be a detailed approach to hiring travel staff as the flexibility and efficiency of these individuals are lower than that of regular staff. Simply hiring traveling staff and expecting the ORs to perform at their previous state is impractical. Traveling staff cannot be expected to work in all surgical service lines and perform at the same level as regular staff given the lack of familiarity with the new hospital system. Analysis of which surgical specialties have the need for additional OR time can help prevent hiring of traveling staff that cannot work in these surgical specialties. Furthermore, review and potential streamlining of perioperative processes and procedures may improve traveler integration into a new OR environment.

Traveling staff can be a valuable tool to combat staffing shortages, however, their high employment costs mandate careful and thoughtful hiring and deployment within a hospital system.

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3. American Hospital Association. "Data brief: health care workforce challenges threaten hospitals' ability to care for patients." AHA Advocacy Fact Sheets. October 2021.

QUICK LESSONS FROM A RESIDENT MOM

Genevieve Pourzan, MD

Here are some lessons that I learned as a resident who became a mother in the first months of anesthesia residency and how I apply them to motherhood and the OR. I hope this short essay serves as a reminder to faculty mentors who are essentially raising baby anesthesiologists and those in residency (with and without children) that these same lessons apply to many pivotal life experiences.

IT TAKES A VILLAGE

As anesthesia residents we will encounter thousands of people over the course of our training. What we may not realize is that all these people, the good and the bad, become a part of raising us from fledgling interns to attendings. This village includes not only our attendings, but also other residents, CRNAs, techs, RNs, and our patients. What I've found is that they all contribute in different ways, some big and some small, to shaping how we will care for our patients outside of residency.

Obviously, we all know the phrase, "it takes a village to raise a child." But this adage rings especially true as a resident. To find any sort of balance between parenthood and residency, you need to rely on your 'village' for help. For us, that includes myself and my husband, as well as my daughter's daycare teachers and classmates, and our family and friends who generously help us manage my resident lifestyle and family.

So, although we may only recall a few key mentors (or want to take 100% of the credit for raising our children), make sure you take time to appreciate all the people you encounter because every day and interaction is shaping your future.

YOU BUILD RESILIENCE

As a new mom, you hear that the shift to motherhood is difficult. And it's true. Why? Because it's new. It's a transition. You haven't done this before. Plus, you aren't sleeping. And now you're responsible for a baby! The same is true for starting anesthesia residency. It's new; it's a transition; you haven't done this before. Plus, now sleep may not be as long as it once was, and you're responsible for someone's life! But as we know in parenthood and residency… It gets better.

Eventually, as a parent you learn how to troubleshoot blow outs, illnesses, and meltdowns because they will happen. As a resident, you learn to troubleshoot bronchospasms, difficult surgeons, and IVs. You build resilience as a parent and a resident after repetition, asking for advice, and trusting in your own abilities. Daily challenges don't go away, but you do become more resilient. So yes, the transition is difficult, but it gets better.

GROWTH IS NOT LINEAR

When I watch my daughter eagerly learn to drink from a "big girl cup," I know she will spill - a lot. Even if she successfully connects mouth to cup on a Friday, it doesn't mean we won't have spills on Saturday. The same trajectory applies to anesthesia, particularly procedures. The more we do a procedure, the muscle memory improves and the better we get, but the beginning is usually a struggle.

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QUICK LESSONS FROM A RESIDENT MOM

Genevieve Pourzan, MD

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As a parent now I can empathize with the attendings who watched me fumble through my first arterial lines knowing I would likely miss, take forever, or forget a key component. The lesson is that unfortunately learning a new skill comes with failures, and it is the repetition that gives us skills over time. Like a graphical representation of my daughter's gross motor development, anesthesia residents won't always have a linear learning trajectory.

SOAK IT UP

Children and residency require energy, active involvement, sleepless nights, and are frankly exhausting. However, as a new parent everyone will tell you to "soak up" as much time with your kids as possible before they inevitably hit puberty. The same is true of residency. Attendings remind you that one day you won't have the same resources or attending safety net that residency affords. There are days that both residency and having young children feel endless, but it's not. So much happens in such a short period of time, it will go quickly. Remember it is a time and experience we will never get back, so enjoy it while you can.

Getting To Know You

Benjamin Park DO, D.ABA, FASA

With the progression of house bill (HB) 1956 through the legislative body of Pennsylvania, it is a good time to review and understand how certified anesthesia assistants (CAA) are trained, how they are trained to approach anesthesia, and what clinical cases they are exposed to.

The first CAA program was developed in the 1960s by several anesthesiologists who foresaw an anesthesia provider shortage looming in the future. This was around the same time (1965) that physician assistants (PAs) were getting their start at Duke University in North Carolina. By 1969 there were CAA programs in 2 different states. Many people compare CAAs to CRNAs because of a similar skill set and overlapping practice, but the training is somewhat different. Those who do not understand how the training is different may be prone to misinterpret a CAA's training.

Prior to being enrolled in a CAA program, the applicant must complete their bachelor's degree. They can complete their bachelor's degree with any major. Most commonly they complete their degree in biology or chemistry. There are also many required prerequisites in many of the sciences, like biology, anatomy and physiology, chemistry, physics, and mathematics. These requirements are very similar to premedical school requirements. The candidate will be required to have a minimum of a 3.0 GPA. In the junior year of college, the applicant will take either the MCAT or GRE and achieve a minimum score designated by the CAA school.

All CAA training programs are associated with ACGME accredited medical schools. Once enrolled in a CAA program, there are many hours of required didactic and clinical experiences. The entire schooling will take 24-28 months. Didactics courses will cover all aspects of anesthesia and vary slightly depending on the school.

Clinical time for CAAs is a minimum of 2000 hours and averages about 2500 hours. This clinical time includes all different types of anesthetic cases. The minimum CAA requirement for cases is 600 cases, but many candidates often have significantly more than the minimum number of cases. The variety of these cases are school specific but are usually somewhat like the following:

Case Type	Case #		
ASA III or IV	150	Intracranial	5
Emergent	30	Head and Neck	20
Age 65+	100	Cardiac	10
Pediatric <18	50	Lung	10
Regional	40	Obstetric	35

Adapted from CAAHEP

After having completed schooling, the CAA candidate will take a national board of medical examiners (NBME) board exam to become a CAA. As of this writing, there are 10 CAA schools with a total of 17 campuses across the country. CAAs currently practice in 19 states and the District of Colombia, with more states like ours considering legislation.

References: American Academy of Anesthesiologist Assistants. Anesthetist.org. 2022.
Anesthesiologist Assistants. American Society of Anesthesiologists. asahq.org
Standards and Guidelines for the Accreditation of Education Programs for the Anesthesiologist Assistant. CAAHEP. Revised 2016.

Legislative Update

Milliron Goodman

Now that we are a few months into the 2023-2024 legislative session, both the state House and state Senate have organized. Because of the midterm elections, there are 50+ new members of the General Assembly.

The State Senate currently has 28 Republican members, and 22 Democratic members, giving Republicans the majority. Senator Kim Ward was elected President Pro Tempore, making her the first female President Pro Tempore in state history. Senator Joe Pittman was elected Majority Leader of the Senate, and Senator Jay Costa will continue to serve as Minority Leader of the Senate.

The House got off to a chaotic start but has since settled down and is now organized. Democrats have control of the House for the first time in 12 years. However, it is a slim majority, as Democrats hold 101 seats and Republicans hold 100. Due to resignations, there are currently two vacant seats in the House. One of those vacant seats belongs to Rep. Culver who recently won a special election to become a State Senator. Special elections will take place on May 16th to fill these seats. Representative Joanna McClinton was elected Speaker of the House, making her the first female Speaker of the House in state history. Representative Matt Bradford is now the Majority Leader of the House, and Rep. Brian Cutler now serves as Minority Leader.

Budget time in Pennsylvania is quickly approaching. For the past two months the House and Senate have been in recess to hold appropriation hearings with various state agencies to help them discern what is needed for each department. With these hearings wrapped up, the House and Senate will return to session to begin the early stages of budget negotiations.

2023 Session Schedule:

HOUSE	March	1, 2 (NV), 6, 7, 8 (NV)
	April	24, 25, 26
	May	1, 2, 3, 22, 23, 24
	June	5, 6, 7, 12, 13, 14, 20, 21, 22, 26, 27, 28, 29, 30
SENATE	March	1, 6, 7, 8
	April	24, 25, 26
	May	1, 2, 3, 8, 9, 10
	June	5, 6, 7, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30

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Legislative Update

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Certified Anesthesiologist Assistants (CAAs):

The PSA continues to work with the American Academy of Anesthesiologist Assistants (AAAA) and the Pennsylvania Academy of Anesthesiologist Assistants (PAAA) regarding the licensure of CAAs in Pennsylvania. The Pandemic has created shortages of critical providers and the need for qualified, well-trained medical professionals continues to increase.

Since the beginning of the new legislative session, the PSA has been hard at work meeting with members of the administration and the legislature to help bring CAAs to Pennsylvania. As the legislative session heats up, we will be sure to keep you updated about what is happening with CAAs.

Legislation Prohibiting CAAs:

Last session two co-sponsorship memos to prohibit CAAs from practicing in Pennsylvania were circulated. As we continue through the current legislative session, we will monitor to see if these co-sponsorship memos are circulated again.

CRNPs:

Senate Bill 25 has been reintroduced this session by Senator Bartolotta (R-Washington) and Senator Boscola (D-Lehigh). This legislation would replace the title of CRNP with the title of APRN-CNP and allow the APRN-CNPs to practice as “licensed independent practitioners.” The PSA is paying close attention to this legislation and any legislation that involves the APRN model.

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