

# Chapter 4

## Residency Training

Daniel Katz and Alan Sim

### A Brief History of Anesthesiology Training

Formal training in anesthesiology has come a long way since the ether dome at Massachusetts General Hospital [1]. In fact, prior to our inception as a specialty in 1941 [2] there was little opportunity for structured training. Often times the role of the anesthetist fell to the surgical resident, a circulating nurse, or even medical students, with mortality rates as high as 50 % [3]. The need for formal training in anesthesiology was readily apparent.

In reality, the call for standards in anesthetic training actually predated our formal inception as a specialty with a resolution approved by the Board of Directors of the Society of Anesthetists in 1937, “It is to the best interest of the medical public that departments of anesthesia in medical schools and hospitals shall be in charge of physicians who shall have direct supervision of teaching of this subject to undergraduates and graduates. These physicians shall have devoted a satisfactory time to the study of the specialty or shall have been certified as specialists in anesthesia by a recognized national Society of Anesthetists” [4]. Since that time there has been much development by the now called American Society of Anesthesiologists (ASA) in formal residency training, with programs developing throughout the United States [5].

More needed to be done, however, as there were still major inconsistencies between different schools and programs. As such, a series of survey-based studies was undertaken in the late 1950s/early 1960s to better determine how programs were training their trainees [5]. Based on the results of the survey study, completed in 1966, the president of the ASA at that time, John J. Bonica, presented the report and its findings on how anesthesiologists were trained in the United States [6].

---

D. Katz, M.D. (✉) • A. Sim, M.D.  
Department of Anesthesiology, Icahn School of Medicine at Mount Sinai,  
KCC 8th Floor, One Gustave L. Levy Place, New York, NY 10029, USA  
e-mail: dkatz621@gmail.com

As a result, several committees were created that would report to the Society's Council on Education including committees for Medical School Residencies, Internships, Anesthesia Residencies, and Post Graduate Training. These committees would be charged with ensuring a proper educational environment for anesthesiologists. Although these committees were independently run by the ASA, it was the Accreditation Council for Graduate Medical Education (ACGME) that truly standardized the graduate medical experience for the field of anesthesiology [7].

## The Accreditation Council for Graduate Medical Education

Formed in 1981, the ACGME is an amalgam of regulatory bodies whose responsibility is the accreditation of graduate medical education (GME) [7]. It is the largest private professional accrediting agency in the United States, responsible for over 9,200 residency programs [8]. The ACGME has 28 committees (one for each of the 26 specialties, one for transitional year programs, and one for institutional review) [9]. While accreditation of a residency program by the ACGME is voluntary, accreditation is required to receive funding from the Center for Medicare and Medicaid Services (CMS). Additionally, residents must graduate from accredited programs to be eligible to take specialty boards [10]. Accreditation is granted after an application process consisting of about eight steps [11] (see Table 4.1).

## ACGME Institutional Requirements

Prior to program accreditation, institutional accreditation must take place. Depending on the specific institution this process may already be completed. Institutional requirements focus on four main areas: organizational responsibilities, responsibilities for residents, the graduate medical education committee (GMEC), and internal review [12]. It requires written statements that the institution will

**Table 4.1** Eight-step application process for ACGME accreditation

Step	Requirement	Specific for anesthesiology?
1	Determine if institutional accreditation is necessary	N/A
2	Determine if subspecialty is dependent or independent	Dependent
3	Review institutional and specialty requirements	Specialty requirements present
4	Determine deadline for submission of application	No site visit required
5	Complete the application form	Specific form required
6	Submit the application to your institutions GMEC and DIO	N/A
7	Send completed GMEC form to the RC	N/A
8	Contact your RC staff	Specific personnel for anesthesiology present

provide resources to support GME, with its own administrative system consisting of a designated institutional officer (DIO) and a GMEC who will ensure that the governing institution has the means and capabilities of overseeing GME programs. Additionally, it requires the institution to provide house staff with an appropriate appointment letter explaining responsibilities of the resident as well as the institution and benefits provided including:

- Resident responsibilities
- Duration of appointment
- Financial support
- Conditions for reappointment
- Grievance process
- Professional liability insurance
- Health and disability insurance
- Leaves of absence
- Duty hour obligations
- Moonlighting
- Counseling services
- Participation in educational and professional activities
- Safe educational and work environments

## **Program Personnel and Resident Appointments**

The anchor of any residency training program is the program director. As put forth by the ACGME the program director has “authority and accountability for the operation of the program” [13]. He/she must have administrative and specialty expertise including current board certification in his/her field. The program director must have a medical license and have an appropriate medical staff appointment. All program directors must be approved by the institution’s GMEC. The responsibilities of the program director are very broad, and include but are not limited to:

- Oversight of the didactic education material for residents
- Selection of program faculty
- Ensure proper program evaluation
- Monitor resident supervision
- Prepare and submit all paperwork to the ACGME
- Provide each resident with semiannual feedback
- Ensure compliance with grievance and due process procedures
- Implement policies and procedures consistent with program requirements (i.e., moonlighting)

In general, program directors should have an energetic personality and should be enthusiastic about resident education. The nature of this position is quite demanding, as the program director is held accountable to not only the department and the ACGME but the residents as well. As such, the average expectancy for a tenure of

program director averages about 7 years [14]. Programs that have a higher turnover rate may be subject to additional inquiries [13]. Substantial resources exist to aid new and veteran program directors alike, including a “Virtual Handbook” which provides program directors with the most current information they may need for their program [15].

The program director should be supported by a robust faculty and program personnel. Faculty physicians must have board certification in their specialty or will undergo further scrutiny by the review committee at the ACGME [16]. They should also demonstrate a dedication to resident education, with a curriculum of sufficient breadth and depth. The time faculty spend teaching and supervising residents should be documented and reported. Additionally, any off-campus rotation site should have a local director accountable for resident education and supervision. It is also recommended that faculty be involved in scholastic pursuits, including projects for the professional development of themselves and their residents [16]. Worthy academic pursuits should include organized rounds or teaching rounds, journal clubs, conferences, as well as traditional research projects. Ideally, faculty should therefore have peer-reviewed funding, publications in peer-reviewed journals, publications or presentations at meetings, and participation in national committees or other professional organizations.

Selection of residents is performed at the discretion of the individual program and should comply with their policies and procedures. Resident applicants must all meet the ACGME institutional requirements as well [17]. The number of residents allowed in a program is determined by the ACGME, and program directors are not allowed to increase the number of spots in a program without prior approval. As stated prior, all resident hires require a signed appointment letter.

## **Educational Program Components: The Core Competencies**

One of the goals of resident education is to obtain a mastery of domains outside of the direct clinical arena. While much of the litany of material we are expected to master has been standardized (i.e., physiology, pharmacology), the manner in which we are trained to practice as physicians is not (i.e., bedside manner, professionalism). It is for this reason that in 2002 the ACGME developed an initiative called the Outcome Project [7]. They identified the six core competencies which would henceforth be used by GME programs to evaluate their residents. Since that time many graduate educators enhanced their educational programs to meet the objectives of the Outcome Project [18]. These six core competencies are patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. While the ACGME discusses these competencies at length, let us investigate the competencies as they pertain to anesthesiology.

At the forefront of the core competencies is patient care. A resident must be able to provide care that is “compassionate, appropriate, and effective for the treatment

**Table 4.2** Resident minimum case requirements for graduation

Clinical case/procedure	Minimum required
Spinal	40
Epidural	40
Peripheral nerve blockade	40
Special situation complex: trauma/burns	20
Cardiac with or without CBP (majority must be with CBP)	20
Intrathoracic noncardiac	20
Major vascular (open or endovascular)	20
Vaginal delivery (normal or high risk)	40
Cesarean section (normal or high risk)	20
Pain consultation (acute pain, chronic pain, and/or cancer pain)	20
Intracerebral (endovascular or open, majority must be open)	20
Pediatric cases: each category inclusive of younger patients	
<3 Months	5
<3 Years	20
<12 Years	100

of health problems and the promotion of health” [19]. As the level of experience allows, residents must demonstrate their ability to care for patients. Early in training, residents should be expected to treat patients with common diagnoses and for uncomplicated procedures, for example, provide an anesthetic for a laparoscopic cholecystectomy in a healthy patient. As they progress in training they should demonstrate proficiency in performing complex procedures such as the placement of a pulmonary artery catheter. To ensure that the anesthesiologist can meet this competency upon graduation, minimum requirements of cases and subspecialty procedures were added to the core requirement. The minimum case required for graduation is found in Table 4.2.

Right behind patient care is medical knowledge. Residents are expected to obtain sufficient knowledge of “biomedical, clinical, epidemiological-behavioral sciences” and know how to apply this knowledge to patient care [20]. Acquisition of this knowledge should occur from multiple sources including direct clinical teaching rounds, a robust didactic schedule, participation in multidisciplinary conferences, specialty meetings, journal clubs, and independent learning. Specific for anesthesiology, resident education should encompass a variety of topics both in and outside of the clinical arena. Required didactic topics are included in Table 4.3. While there is no minimum number of lectures required, a regular schedule should exist such that by the time residents complete the program they have been exposed to all the necessary topics. Regular involvement of department faculty is required, and it is strongly encouraged that the program director be directly involved in providing lectures and the didactic schedule. Resident run lectures should also be encouraged, and have been shown to improve resident satisfaction [21]. In addition to traditional didactics, e-learning modules and teleconference type lectures have also been successfully utilized [22, 23]. A robust didactic schedule is not only required,

**Table 4.3** Required didactic topics for resident education

Required didactic topics	Potential inclusive topics
Basic science	Physiology Pharmacology Anatomy
Clinical anesthesiology	Subspecialty discussion Procedure-based topics Clinical dilemmas
Practice management	OR management Types of practice Financial planning Billing Regulatory issues
Management of the geriatric patient	Postoperative cognitive dysfunction Postoperative delirium Management of the patient with multiple medical problems Physiologic changes of aging
Management of the ambulatory surgical patient	Management of postoperative nausea and vomiting The ambulatory patient with morbid obesity Productivity at the ambulatory surgical center

**Table 4.4** The PDSA cycle

PDSA cycle	Summary of cycle steps
Plan	Plan a change aimed at improvement
Do	Carry out the change
Study	Study the results of the change and focus on what worked, what went wrong, and why
Act	Adopt, abandon, or run the change through the cycle again

but regular attendance to morning conferences has been correlated with increased written board scores [24].

At the core of the practice-based learning and improvement competency is a commitment to lifelong learning and quality improvement [25]. It involves utilizing skills in self-assessment and reflection with the goal of improving practice. One such tool developed by Dr. Edwards Deming, called the P-D-S-A cycle or Plan, Do, Study, Act cycle [26], has been utilized by several industries and medicine subspecialties with great success [27–29]. A summary of the PDSA cycle can be found in Table 4.4. These cycles can be applied to clinically based improvement projects (improving cardiac case set-up times), personally oriented projects (stress or time management projects), or even practice-based projects (introduction of new ASA guidelines into practice). Inherent in this competency is the use of Evidence-Based Medicine (EBM), as many of the EBM-related skills, such as appraising and assimilating evidence into practice, are directly in line with this competency. Additionally, residents are required to participate in quality improvement (QI) initiatives, which can include participation in M&M conferences, membership to a QI committee,

or analysis of a specific practice outcome [30–32]. Lastly, resident teaching skills are included in this domain. Residents are expected to obtain proficiency in educating patients, students, residents, families, and other members of the healthcare team. The role of the resident educator is discussed later below.

Good interpersonal and communication skills are critical for the practicing anesthesiologist, and as such, this core competency is one of the most important. According to the ACGME, residents in anesthesiology programs must “demonstrate interpersonal and communication skills that result in the effective exchange of information” [33]. This includes communication with patients and their families of different socioeconomic and cultural backgrounds aimed at general patient care as well as specific tasks such as the taking of a history, obtaining consent, and informing patients of the anesthetic and postoperative care plans. Residents should also be trained in communicating effectively with other members of the healthcare team, which is critical in the operating room environment where as much as 30 % of procedure-specific information can be lost due to miscommunication [34]. These types of errors can have dire consequences [35]. It is advised by the ACGME that this training not just be “On-the-job,” but that residents should have a structured curriculum around this topic. Two such validated curricula include both Relationship Express [36] and Team STEPPS [37]. Lastly, residents are expected to maintain a comprehensive, timely, and legible medical record.

Proficiency in professionalism can be broken down into three major components: commitment, adherence, and sensitivity [38]. Residents are expected to be committed to their patients, treating them with respect, compassion, and empathy. Residents should adhere to ethical guidelines and show respect for patient autonomy and privacy. Additionally residents are expected to show sensitivity to a patient’s culture, gender, age, and/or disability. Since this competency is behavioral in nature, it is often demonstrated through other competency domains. Evaluation tools on professionalism exist and are usually in the form of 360 evaluations [39]. While it may seem difficult to teach professionalism, it may be integrated into other didactics and case discussions. It may also be taught using role play, simulation, or small case vignettes [38]. It is most likely best learned through example, which is why promoting professionalism within the teaching faculty is important, as it can effect outcomes [40].

Proficiency in systems-based practice is based on the realization that the anesthesiologist is but one part in not only a clinical care team but also within a layer of the healthcare system [41]. Residents are therefore expected to work within various healthcare delivery locations and systems as well as be able to coordinate patient care within anesthesiology. Residents should be mindful of the costs of their interventions and should conduct risk–benefit analysis based on each patient. Within this core competency lies the expectation that the resident will work as part of an inter-professional and multidisciplinary team. For example, the anesthesiology resident is expected to work with not just his surgical and nursing colleagues, but must be proficient in coordinating care with patient floors, intensive care units, and other remote locations such as radiology and the labor and delivery floor. Our unique omnipresence in the hospital also makes us ideal candidates to identify system

errors, and residents are expected to participate in the identification of these system errors as well as the implementation of solutions.

Anesthesiology residents are also required to participate in a yearly simulation activity as per this competency.

## **Program Design: Basic Requirements for the Clinical Base Year**

According to the ACGME a minimum of 4 years of GME is required [42]. Of those 4 years, three must be dedicated to clinical anesthesiology (CA-1, CA-2, CA-3) with 1 clinical base year (CBY). The ACGME offers three options for anesthesiology-accredited programs. A program can offer a 3-year advanced track, a 4-year comprehensive track (including CBY), or a combination of the two options. Should the program opt for a 3-year advanced track prospective residents are required to match their CBY independent of their advanced program. Those residents have a choice of participating in a transitional, preliminary medicine, or preliminary surgical CBY. It is highly suggested that the CBY be completed before the resident begins CA-2 year, and it must be completed prior to beginning the CA-3 year. There are some advantages from the resident prospective in matching in a 1+3-year program. First, they will get clinical experience at another institution, which broadens their clinical experience. Second, it gives the resident flexibility of being in different locations for their training. Finally, the resident has more flexibility in the type of CBY, as he/she may choose from medicine, surgery, or a transitional curriculum. There are also advantages to the 4-year combined program. Residents of a 4-year program will only have to move once and may have a housing advantage over their 1+3 colleagues. Combined residents will also work within multiple departments of their home institution, which will make them familiar with the medical record and order entry systems, as well as the basic logistic layout of the institution. Additionally, interns of 4-year programs will be working side by side with their colleagues from other specialties, allowing them to form bonds with residents that they will be working with for the rest of their residency. Likewise, residents who pursue elective rotations in anesthesiology such as pain management are more likely to get credit toward their overall requirements since they will rotate through their respective parent department.

Regardless of the program chosen the requirements for the CBY are the same. In general, the resident should expect 12 months of broad education in various medical disciplines. They should be expected to be directly involved in decision making and should be responsible for patient care with adequate supervision. By the end of the year the resident should have basic fundamental competencies such as obtaining a complete medical history, performing a physical exam, basic patient assessment, and order appropriate diagnostic studies, and enact a treatment plan for a patient [42]. Specifically, residents must spend at least 6 months taking care of inpatients in internal medicine, pediatrics, surgery or surgical subspecialties,



obstetrics and gynecology, neurology, and/or family medicine. It is recommended but not required that the residents have a rotation in critical care and emergency medicine of one, but not more than 2 months duration. Residents may take up to a 1-month rotation in anesthesiology during the CBY. Each month in the year can count for only one requirement, even if it crosses disciplines (i.e., a rotation in the surgical ICU can count as either surgery or critical care).

### Program Design: Clinical Anesthesia Years (CA-1, CA-2, CA-3)

The goal of the clinical anesthesia years is to provide residents with a comprehensive background and proficiency in all areas of anesthesiology including preoperative, intraoperative, and postoperative care. Residents should also be versatile in the treatment and management of critically ill patients as well as those with chronic and acute pain. Training should be progressive in its complexity, allowing the resident to manage more difficult patients and procedures with proper supervision. By the end of training the resident should be “sufficiently independent” in clinical decision making and patient care and can lead a perioperative care team [42]. Required rotations and their respective lengths are found in Table 4.5.

In addition to the basic rotations residents are also encouraged by the ACGME to rotate through additional subspecialties (no more than 6 months) as well as other focused educational experiences [42]. For example, a resident interested in pediatric anesthesiology may choose to take rotations in the neonatal ICU, or rotate with a genetics expert, a pediatric infectious disease specialist, or a pediatric surgeon. Likewise, those interested in pain may pursue elective rotations in other related fields such as psychiatry, physical medicine and rehabilitation, and/or neurology. It is up to the discretion of the program director to allow residents to pursue these opportunities and weigh their educational and clinical merit. Residents may also request rotations at off-site locations, so long as there is adequate supervision, resources, a responsible local site director, and safe transport to the location.

**Table 4.5** Required rotations for graduation

Rotation	Length
Obstetric anesthesia	Two 1-month rotations
Pediatric anesthesia	Two 1-month rotations
Neuroanesthesia	Two 1-month rotations
Cardiothoracic anesthesia	Two 1-month rotations
Critical care	Four distinct and progressive clinical months
Pain management	Three 1-month rotations
Preoperative evaluation	One-month rotation
PACU	0.5-month rotation

Note 2 months of critical care and 1 month of pain management can occur during the CBY

## Resident Milestones and Examinations

Although residents are expected to progress linearly through their training, this is often not the case as not all residents are created equal. It is therefore prudent for the program director to set clinical and educational milestones that residents are expected to achieve. This is not done in a make or break manner, but serves as a tool to alert the program director that a resident may need remediation in a certain area. A basic milestone scheme is shown in Table 4.6.

In addition to clinical-based milestones, residents are expected to excel academically on standardized exams. The first series of examinations is referred to as the Anesthesia Knowledge Test or AKT. It is designed and distributed through a collaborative effort between Metrics and the Inter-Hospital Study Group for Anesthesia Education (IHSGAE) [43]. Residents in anesthesiology programs take three versions of the AKT at predetermined intervals. The first version of the test called the AKT-1 is taken twice. It is taken on the first day of anesthesiology residency (CA-1 year) and then taken again at day 30. This first test is not a metric for the residents, but is in fact a measure of a program's ability to teach their residents a basic knowledge of anesthesia [44]. It focuses on the basics of cardiopulmonary resuscitation and the knowledge needed to administer an anesthetic to a healthy, uncomplicated patient presenting for simple surgery. The second AKT is the AKT-6, taken 6 months into CA-1 year, and is made up of eight major areas including anesthesia, cardiovascular, equipment, neuromuscular, pharmacology, regional anesthesia and pain therapy, respiration, and miscellaneous. Like the AKT-1 it is used to evaluate both resident progression and program adequacy. The last AKT, the AKT-24, is taken at the end of CA-2 year. It is designed specifically to test the subspecialty knowledge of the CA-2 resident in seven areas including perioperative medicine, critical care, cardiovascular, neuroanesthesia, pain management, pediatrics, and obstetrics. Examinees are asked to mark on their score sheet which subspecialties they have rotated through for comparative purposes [44].

Every year on the first Saturday in March residents will also take the in-training examination administered by the American Board of Anesthesiology (ABA). It is a 4 h long voluntary computer-based test. The contents of the exam are the same regardless of the clinical year (each resident has a test made from the same pool

**Table 4.6** Example resident milestones

Time period	Resident milestone
0–1 Months	The resident is able to be left alone for very brief periods (less than 5 min) in uncomplicated cases with stable patients
1–3 Months	The resident is able to be double covered for simple cases
6 Months	The resident is capable to be a first responder to simple floor intubations with immediate back-up available
10–13 Months	The resident has demonstrated the ability to begin subspecialty rotations
24 Months	The resident has demonstrated the ability to lead a perioperative care team
36 Months	The resident has demonstrated the ability to practice independently

of questions), in contrast to the AKT. Residents in 4-year categorical program are often expected to take the in-training examination during their CBY, while residents who are in preliminary years may not have this opportunity. The examination covers every area relevant to anesthesiology including basic science, clinical science, organ-based basic and clinical sciences, clinical subspecialties, as well as special problems or issues in anesthesiology [45].

Besides the AKT and in-training exam, residents who will complete training after June 30, 2016, will also take a staged version of the written boards (Part 1 Examination) at the beginning of their CA-2 year (July 2014) [46]. This examination, now called the BASIC examination, will focus on basic content areas such as pharmacology, physiology, anatomy, anesthesia equipment, and monitoring. The ADVANCED exam will still be administered after graduation from an ACGME-accredited program and will focus on subspecialty areas, but will also cover all topics present in the BASIC exam.

## **Resident Requirements: ACGME Duty Hours, Logs, and Evaluations**

The death of Libby Zion at the hands of a resident in a New York Hospital in 1984 sparked great interest in limiting duty hours for house staff [47]. In New York State, the Libby Zion law, also known as the Bell Commission, was passed in 1989 limiting residents to work no more than 80 h/week and for no more than 24 h in a row [48]. At that time these restrictions were met with much resistance, as programs claimed that restricting hours was detrimental to training competent physicians and that programs would have to increase residency times to compensate. In fact, it was believed that several institutions ignored these rules outright, especially those outside of New York [47].

However, in 2003 the ACGME released their own mandatory work hour restrictions, which looked very similar to the standards set by the Bell Commission [49]. Now programs would have to comply with the work hour restrictions or risk losing accreditation. Since that time there have been many revisions and expansions to work hour rules, aimed at preventing resident fatigue and improving patient care. Additionally, programs are now required to have didactic sessions on resident fatigue, stress management, and sleep deprivation [42]. Concerns about increased errors by increasing the amount of patient handoffs exist, and multiple specialties have expressed concerns that these new duty hour restrictions either negatively affect their programs or are ineffective in decreasing errors and resident fatigue [50–52]. A summary of the ACGME duty hour rules is found in Table 4.7.

To ensure compliance with duty hour regulations residents are required to maintain accurate logs of their duty hours. It is recommended the hours be entered daily to increase accuracy, but it is not required. These logs are regularly reviewed by both the program director and the GMCC of the institution. Multiple logging systems exist; however, many institutions have adopted systems such as New Innovations

**Table 4.7** ACGME duty hours summary [42]

ACGME rule	Interpretation	Exceptions/caveats
80 h rule	Duty hours must be limited to 80 h/week averaged over a 1-month period	Final year residents can extend their week to provide continuity of care of critical importance and unique educational value to the resident
Mandatory time free of duty	One duty free day every week (averaged over 4 weeks) is required	None, home call may not be assigned on free days
Maximum duty period length	PGY-1 residents: 16 h PGY-2 residents: 24 h	For PGY-2 residents, napping between 10 p.m. and 8 a.m. after 16 h of duty is suggested Residents are allowed 4 h of nonclinical duty time for transition of care after a 24 h shift
Minimum time off between duty periods	PGY-1 and intermediate residents should have 10 h, must have 8 h off between shifts PGY-2 residents must have 14 h off after a 24 h shift	Final year residents may have less than 8 h off between shifts at the discretion of the program director so long as the extra duty time is of high educational value
Maximum in-house night float	No more than six consecutive nights	
Maximum in-house on-call frequency	PGY-2 and above may be scheduled for no more than every third night (over a 4-week period)	
At-home call	Time spent in hospital counts toward 80 h maximum	May be more frequent than every third night but must not preclude reasonable amounts of rest and personal time for residents
Moonlighting	All moonlighting shifts count toward duty hours and must remain compliant PGY-1 residents may not moonlight	

which allow residents to view and edit their duty hour logs. These systems allow residents to input the type of duty hours worked (Home Call vs. In House Call vs. OR Shifts, etc.) and will automatically alert them to work hour violations. Residents may also enter their vacations into the system.

Anesthesiology residents are also required to keep a log of their cases and procedures. This data may be entered into the ACGME's Resident Case Log System [53]. The data entered into this system is encrypted and is used by the ACGME for accreditation purposes only [54]. Residents can track their case logs in real time, and compare the cases entered against a template with required minimum cases to alert residents who may be deficient in certain clinical areas. Additional fields are provided as descriptors for procedures that are encouraged but not required (i.e., using ultrasound for a peripheral nerve block). No patient identifiable information should be entered into this log.

In addition to case and duty hour logs, residents and faculty are also required to complete evaluations. Formal evaluations must be completed in a timely manner

during each rotation. As per the ACGME, for each rotation the program must provide objective assessments of the resident in relation to the core competencies, use multiple evaluators (faculty, peers, patients, etc.), document progressive resident performance, and provide each resident with documented evaluations on a semiannual basis. These evaluations must be accessible by the resident for review [42]. Additionally, upon completion of residency the program director must also provide a summative evaluation of the resident to be placed into the permanent record. This evaluation must also be accessible to the resident and must document resident performance and verify competence sufficient to enter practice [55]. Likewise, the program must also evaluate faculty on an annual basis, which should include reviews of the faculty member's teaching ability, commitment to education, clinical knowledge, professionalism, and scholarly activities. Faculty evaluations must include written confidential evaluations by residents [42]. To complete the circle, the program must also evaluate itself. It must monitor and track progress at least annually in the following areas: resident performance, graduate performance (performance on certification examinations), faculty development, and program quality. Both residents and faculty must participate confidentially and in writing to this evaluation at least annually [42]. If the program is found to be inadequate in any area the program must create a formal written action plan. Specifically for anesthesiology, the ACGME also obtains data from the ABA on the most recent board examination scores. At least 70 % of residents should be certified in the latest 5-year period [42]. Several modes of evaluation exist from web surveys, to paper forms; however, many programs utilize standardized surveys from companies such as New Innovations [56] or MyEvaluations [57] to ensure quality and anonymity. If any resident believes their evaluations are not anonymous, they can report their concerns to their local GMEC, their departmental ombudsperson, or to the ACGME directly.

## **The New Anesthesiology Resident: Clinician, Researcher, Clinical Educator**

As one can see, the role of the resident is dynamic and growing. Whereas in the past residents in anesthesiology were focused on clinical competence, resident responsibilities have expanded. Residents are now given specific goals and objectives which must be met on their clinical rotations as well as demonstrate proficiency in the core competencies, increasing in complexity as training progresses. Standardized exams are increasing in number as well, ensuring that residents are up to date on their education. Clinical duties have also expanded, requiring anesthesiology residents to not only be proficient in the OR but also be able to practice as leaders of perioperative teams and perioperative consulting physicians, able to practice in a variety of clinical environments.

Participation in scholarly activity is also required, including proficiency in the basic principles of research. Each resident must complete an academic assignment, usually during CA-2 or CA-3 years which may include presentations at grand rounds, publications in journals, authorship of book chapters, or clinical instruction

manuals [42]. In fact, programs that have structured educational curricula have benefitted from this requirement, seeing increased amounts of research productivity from their residents [58].

Finally, now more than ever, anesthesiology residents are expected to be clinical educators to their peers, medical students, patients and their families, as well as other healthcare professionals [42]. After all, the term “doctor” is taken from the Latin word “docere,” which means “to teach” [59]. While formal education-based curricula existed as early as the 1970s [60], by 2001, about half of all residency programs in the United States offered formal training in educational and teaching skills [61]. Programs around the country are now offering clinical education fellowship position or integrated clinical educator tracks [62], allowing residents to be not only first rate clinicians but first rate educators as well.

## References

1. Fenster JM. Ether day: the strange tale of America's greatest medical discovery and the haunted men who made it. New York: Harper Collins; 2001.
2. Betcher AM, Ciliberti BJ, Wood PM, Wright LH. The jubilee year of organized anesthesia. *Anesthesiology*. 1956;17:266.
3. Larson MD. History of anesthetic practice [Internet]. Miller's anesthesia. 7th ed. Amsterdam: Elsevier; 1846. p. 1–41. Available from: <http://dx.doi.org/10.1016/B978-0-443-06959-8.00001-7>
4. Meeting A 9th. Collected papers and minutes of the Long Island, New York and American Society of Anesthetists (1905–1936); 1936. p. Volume I.
5. Albert M. Betcher M. The Genesis of Contemporary American Anesthesiology. Volpitto, Vandam LD; 1982. p. 185–121.
6. Handbook for Delegates. The American Society of Anesthesiologists. Annual Meeting; 1965.
7. Taradejna C. ACGME history [Internet]. 2007. Available from: <http://www.acgme.org/acgmeweb/About/ACGMEHistory.aspx>
8. About ACGME [Internet]. 2013. Available from: <http://www.acgme.org/acgmeweb/tabid/116/About.aspx>
9. ACGME at a Glance [Internet]. 2013. Available from: <http://www.acgme.org/acgmeweb/About/ACGMEataGlance.aspx>
10. ACGME Fact Sheet [Internet]. 2013. Available from: <http://www.acgme.org/acgmeweb/About/Newsroom/FactSheet.aspx>
11. ACGME How to Apply for Accreditation in Eight Steps. 2013;(c):2–9 Available from: <http://dconnect.acgme.org/acgmeweb/Portals/0/application-process-eight-easy-steps.pdf>
12. Directors FP. ACGME Institutional Requirements. p. 1–4.
13. Program, Personnel, and Resources: Program Director. 2008;(1):5–7. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IIA\\_ProgramDirector\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IIA_ProgramDirector_Explanation.pdf)
14. Analysis D of O and D. Average length in years between program director appointment dates; 2007.
15. Program Director's “Virtual Handbook” [Internet]. 2013. Available from: <http://www.acgme.org/acgmeweb/tabid/279/GraduateMedicalEducation/InstitutionalReview/ProgramDirectorsVirtualHandbook.aspx>
16. II. Program Personnel and Resources B. Faculty and C. Other program personnel common program requirement. 2008. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IIBC\\_FacultyandOtherProgramPersonnel\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IIBC_FacultyandOtherProgramPersonnel_Explanation.pdf)
17. Resident Appointments; 2008.

18. Swing SR. The ACGME outcome project: retrospective and prospective. *Med Teach*. 2007; 29(7):648–54. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18236251>
19. Patient Care [Internet]. 2008. p. 2008. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5a\\_EducationalProgram\\_ACGMECompetencies\\_PatientCare\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5a_EducationalProgram_ACGMECompetencies_PatientCare_Explanation.pdf)
20. Medical Knowledge [Internet]. 2008. p. 2008. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5b\\_EducationalProgram\\_ACGMECompetencies\\_MedicalKnowledge\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5b_EducationalProgram_ACGMECompetencies_MedicalKnowledge_Explanation.pdf)
21. Farrohi ET, Jensen AR, Brock DM, Cole JK, Mann GN, Pellegrini CA, et al. Expanding resident conferences while tailoring them to level of training: a longitudinal study. *J Surg Educ*. 2008;65(2):84–90. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18439525>
22. Markova, T., Roth L. E-conferencing for Delivery of Residency Didactics. *Acad Med* 2002;77(7):748-9
23. Sajeva M. E-learning: Web-based education. *Curr Opin Anaesthesiol*. 2006;19(6):645–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17093369>
24. Landers DF, Becker GL, Newland MC, Peters KR. Lecture practices in United States anesthesiology residencies. *Anesth Analg*. 1992;74(1):112–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/1734770>
25. Practice-based Learning and Improvement [Internet]. 2009. p. 8–9. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5c\\_EducationalProgram\\_ACGMECompetencies\\_PBLI\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5c_EducationalProgram_ACGMECompetencies_PBLI_Explanation.pdf)
26. Moen R, Norman C. Evolution of the PDCA Cycle. 1–11. Available from: <http://pkpinc.com/files/NA01MoenNormanFullpaper.pdf>
27. Anderson C. How are PDCA cycles used. *Bizmanualz* [Internet]. June 2011. Available from: <http://www.bizmanualz.com/blog/how-are-pdca-cycles-used-inside-iso-9001.html>
28. Curran ET, Bunyan D. Using a PDSA cycle of improvement to increase preparedness for, and management of, norovirus in NHS Scotland. *J Hosp Infect*. 2012;82(2):108–13. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22944362>
29. Michael M, Schaffer SD, Egan PL, Little BB, Pritchard PS. Improving wait times and patient satisfaction in primary care. *J Healthc Qual*. 2013;35(2):50–9; quiz 59–60. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23480405>
30. Falcone JL, Lee KKW, Billiar TR, Hamad GG. Practice-based learning and improvement: a two-year experience with the reporting of morbidity and mortality cases by general surgery residents. *J Surg Educ*. 2012;69(3):385–92. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22483142>
31. Thomas MK, McDonald RJ, Foley EF, Weber SM. Educational value of morbidity and mortality (M&M) conferences: are minor complications important? *J Surg Educ*. 2012;69(3):326–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22483132>
32. Bevis KS, Straughn JM, Kendrick JE, Walsh-Covarrubias J, Kilgore LC. Morbidity and mortality conference in obstetrics and gynecology: a tool for addressing the 6 core competencies. *J Grad Med Educ*. 2011;3(1):100–3. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3186274&tool=pmcentrez&rendertype=abstract>
33. Interpersonal and Communication Skills [Internet]. 2008. p. 2008. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5d\\_EducationalProgram\\_ACGMECompetencies\\_IPCS\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5d_EducationalProgram_ACGMECompetencies_IPCS_Explanation.pdf)
34. Gillespie BM, Chaboyer W, Fairweather N. Interruptions and miscommunications in surgery: an observational study. *AORN J*. 2012;95(5):576–90. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22541769>
35. Neily J, Mills PD, Eldridge N, Dunn EJ, Samples C, Turner JR, et al. Incorrect surgical procedures within and outside of the operating room. *Arch Surg*. 2009;144(11):1028–34. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19917939>
36. Berger JS, Blatt B, McGrath B, Greenberg L, Berrigan MJ. Relationship express: a pilot program to teach anesthesiology residents communication skills. *J Grad Med Educ*. 2010;2(4):600–3. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3010947&tool=pmcentrez&rendertype=abstract>

37. Team Stepps [Internet]. 2013. Available from: <http://teamstepps.ahrq.gov/>
38. Professionalism [Internet]. 2008. p. 5–6. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5e\\_EducationalProgram\\_ACGMECompetencies\\_Professionalism\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5e_EducationalProgram_ACGMECompetencies_Professionalism_Explanation.pdf)
39. Meng L, Metro D. Evaluating professionalism and interpersonal and communication skills: implementing a 360-degree evaluation instrument in an Anesthesiology Residency Program. *J Grad Med Educ.* 2009;1(2):216–20.
40. Bahaziq W, Crosby E. Physician professional behaviour affects outcomes: a framework for teaching professionalism during anesthesia residency. *Can J Anaesth.* 2011;58(11):1039–50. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21866428>
41. Systems Based Practice [Internet]. 2008. Available from: [http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5f\\_EducationalProgram\\_ACGMECompetencies\\_SBP\\_Explanation.pdf](http://acgme.org/acgmeweb/Portals/0/PDFs/commonguide/IVA5f_EducationalProgram_ACGMECompetencies_SBP_Explanation.pdf)
42. ACGME Program Requirements [Internet]. 2008. p. 1–31. Available from: [http://www.acgme.org/acgmeweb/Portals/0/PFASSETS/ProgramRequirements/040\\_anesthesiology\\_f07012011.pdf](http://www.acgme.org/acgmeweb/Portals/0/PFASSETS/ProgramRequirements/040_anesthesiology_f07012011.pdf)
43. Metrics [Internet]. Available from: <http://www.metricsinc.org/>
44. The Interhospital Group for Anesthesia Education [Internet]. Available from: <http://www.metricsinc.org/ihsgae.htm>
45. ABA. In-training content outline [Internet]. Available from: <http://www.theaba.org/pdf/ITEContentOutline.pdf>
46. ABA. Staged examinations [Internet]. Available from: <http://www.theaba.org/Home/TrainingPrograms>
47. Lerner B. A life-changing case for doctors in training. *New York Times* [Internet]. New York; 3 March 2009. Available from: [http://www.nytimes.com/2009/03/03/health/03zion.html?\\_r=0](http://www.nytimes.com/2009/03/03/health/03zion.html?_r=0)
48. Lerner B. A case that shook medicine. *The Washington Post* [Internet]. Washington, DC; 28 Nov 2006. Available from: <http://www.washingtonpost.com/wp-dyn/content/article/2006/11/24/AR2006112400985.html>
49. Philibert I, Friedmann P, Williams WT. New requirements for resident duty hours. *JAMA.* 2002;288(9):1112–4. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12204081>
50. Roehr B. Reducing interns' duty hours is problematic, studies show. *BMJ.* 2013;346:f1998. Available from: <http://www.bmj.com/cgi/doi/10.1136/bmj.f1998>
51. Desai S V, Feldman L, Brown L, Dezube R, Yeh H-C, Punjabi N, et al. Effect of the 2011 vs 2003 duty hour regulation-compliant models on sleep duration, trainee education, and continuity of patient care among internal medicine house staff: a randomized trial. *JAMA.* 2013;173(8):649–55. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23529771>
52. Drolet BC, Sangisetty S, Tracy TF, Cioffi WG. Surgical residents' perceptions of 2011 accreditation council for graduate medical education duty hour regulations. *JAMA.* 2013;148(5):427–33. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23677406>
53. ACGME Case Log System [Internet]. 2013. Available from: <https://www.acgme.org/connect/login?ReturnUrl=%2fconnect%2fissue%2fwfsfd%3fwa%3dwsignin1.0%26wtrealm%3dhttps%253a%252f%252fwww.acgme.org%252fResidentDataCollectionNet%252fACGME%252fResidentCaselogs%252fCaselogsHome.aspx%26wctx%3drm%253d0%2526id%253dpasive%2526ru%253d%25252fResidentDataCollectionNet%25252fACGME%25252fResidentCaseLogs%25252fLogin.aspx%26wct%3d2013-05-27T21%253a58%253a30Z%26whr%3d3dacme-us>
54. ACGME. Resident case log system [Internet]. Available from: <http://www.acgme.org/acgmeweb/DataCollectionSystems/ResidentCaseLogSystem.aspx>
55. Common Program Requirements; 2011. p. 1–19.
56. New Innovations, INC. [Internet]. 2013. Available from: <http://www.new-innov.com/pub/rms/main.aspx>
57. Evaluations M. MyEvaluations.com [Internet]. 2013. Available from: <https://www.myevaluations.com/>
58. Ahmad S, De Oliveira GS, McCarthy RJ. Status of anesthesiology resident research education in the United States: structured education programs increase resident research productivity. *Anesth Analg.* 2013;116(1):205–10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23223116>



59. The Latin Dictionary [Internet]. 2013. Available from: <http://latindictionary.wikidot.com/verb:docere>
60. Meleca C. A house staff training program to improve clinical teaching. *Conf Res Med Educ.* 1977;16:332–3.
61. Morrison EH, Friedland JA, Boker J, Rucker L, Hollingshead JMP. Residents as teachers training in U.S. residency programs and offices of graduate medical education. *Acad Med.* 2001;76:S1–4.
62. A L. Program Overview [Internet]. 2013. Available from: <http://icahn.mssm.edu/departments-and-institutes/anesthesiology/programs-and-services/anesthesiology-residency>