Anesthesia Care Team Risk: Considerations to Standardize Anesthesia Technician Training

Lisa Haas, CRNA, DNP, NE-BC

The anesthesia profession has produced voluminous research data on equipment and techniques leading to safer practices, but the lack of attention given to the inconspicuous role of anesthesia support personnel on the anesthesia care team may pose a risk to patient safety. It is questionable whether the skills of anesthesia support personnel who are trained on the job have kept up with an increasingly complex healthcare environment. Medical technology and demand for high-quality care will continue to escalate; patient safety will remain a top priority. Therefore, a definitive strategy to mitigate risk and ensure patient safety begins with strengthening the infrastructure of the anesthesia team. Formal education and certification may ensure that skill sets of anesthesia support personnel will uniformly advance with technology and standards of patient care.

Keywords: Anesthesia support personnel, certified anesthesia technician, patient safety, standardization.

The anesthesia care team has been defined as a physician anesthesiologist and a nurse anesthetist engaged in interactive professional practice. However, there is another largely unstudied, and perhaps unrecognized, member of the team utilized in the highly specialized environment of anesthesia care. Tasked with the responsibility to manage supplies, care for anesthesia-related equipment, and assist anesthesia providers, this ubiquitous workforce executes job duties with ill-defined scope of work, training, and nomenclature. Historic discussion in the limited body of literature available referred to this demographic as “anesthesia support personnel.” The descriptor anesthesia support personnel (ASP) is used here to promote continuity of a meaningful analysis of research findings on the role as described from a range of working labels.

The 2008 National Healthcare Quality Report, produced by the Agency for Healthcare Research and Quality, asserted that patient safety has been getting worse instead of better since the release of To Err is Human: Building a Safer Health System by the Institute of Medicine in 2000 (Figure 1). In the anesthesia specialty, however, exemplary progress in improving safety and outcomes was cited by the latter document. Today’s successes are attributed to the adoption of provider standards of care, nearly universal introduction of technologically advanced hemodynamic monitoring systems, highly specialized airway instrumentation equipment, and physiologically appropriate ventilators with specific and sensitive alarm functionality. The sophisticated level of machinery and the advanced techniques providers employ has outpaced what on-the-job training can offer to ASP.

Recent findings by Ford confirmed pervasive unawareness by anesthesia providers regarding the lack of formal training for ASP and underscored the tremendous gap in knowledge and understanding about the working relationship, expectations, and job scope divisions between anesthesia providers and support staff. Haller et al suggested most anesthesia quality indicators were related to patient safety that linked providers, processes, and techniques to outcome measures, but team interactions were not considered despite the identified need to “make changes, behavioral or structural, in our practice for the sake of our patients”. Because the important role of ASP in anesthesia team dynamics remains a largely unexplored source of quality related outcomes, it may be an overlooked opportunity for the anesthesia community to secure future successes in improved safety and quality in anesthesia care.

The seminal work of McMahon and Thompson found that ASP comprise a healthcare workforce that functions within an idiosyncratic educational framework, where training may be obtained through enlistment in the uniformed services, equipment manufacturer’s service schools, or on the job. The authors further noted that varied training sources for ASP suggested, but did not ensure, that skills have been learned to meet the demands of the anesthesia care environment. Informal, on-the-job training relies on the learner’s ability to process, retain, and generalize concepts to use in different work settings, technically referred to as “transfer of training.”

A central question is whether these independent and unstandardized sources of training support a climate that allows a learner to successfully and consistently execute “transfer of training” to different environments.

Without a comprehensive definition of duties and the underlying knowledge base for those duties in ASP job description, variance in performance and skill may be perpetuated through on-the-job transfer of unauthenticated knowledge. As a result, a blurring of professional

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duty boundaries between anesthesia providers and ASP may result in a subculture with far greater risk tolerance than that of the parent organization. The degree to which ASP assist providers, including unwittingly performing functions restricted to the scope of licensed professionals, such as admixing anesthesia-related medications, creates an opportunity for patient injury and the associated potential for tort due to provider malfeasance, regardless of intention. The Table proposes a sample list of appropriate work scope for uncertified ASP.

On-the-job training is relatively inexpensive, yet it is not easily standardized and quality assurance relies on frequent competency assessment. Formal training, on the other hand, is based on codified knowledge that makes deficiencies more easily discovered and rectified. Although acquisition of formal knowledge requires time and more resources than on-the-job training, structured training may ultimately reduce patient safety risk for the organization and the anesthesia team. For example, required knowledge set forth by the Association for the Advancement of Medical Instrumentation for decontamination, inspection, preparation, packaging, sterilization, storage, and distribution of supplies for surgical instrument-processing technicians is remarkably similar to the knowledge expected of ASP. The Association for the Advancement of Medical Instrumentation, a nonprofit organization providing multidisciplinary leadership to technical specialists that includes surgical instrument-processing technicians, recommends specialty certification as proof of proficiency within 2 years of hire as a condition of employment. Recent work by Chobin argued for formal professional development that included theory and return demonstration by surgical instrument-processing technicians because the degree of an employee’s knowledge and skills can directly affect patient safety. Thus, other technical specialties with similar peripheral patient care exposure to that of ASP are proactively seeking quality improvement in patient safety through formal training that culminates in certification.

**Early History**

The earliest evidence of a dedicated assistant to the anesthesia provider is referenced during the late 1930s in Oxford, England. Sir Robert Macintosh, the first professor of anesthesia in the United Kingdom and chairman of the Nuffield Department of Anesthesia in Oxford, is arguably one of the most prominent and readily recognized historical figures in the anesthesia specialty. A fitting memorial biography published in his honor eloquently stated, “It is doubtful anyone has contributed so much to the basic principles underlying the safe practice of anesthesia”. With his proclivity toward safety practices and intuition that teamwork somehow equated to better outcomes, Dr Macintosh believed that the anesthesia provider “would benefit from the introduction of someone to look after apparatus, and lend a hand generally in the operating theatres.” In 1937 Richard Salt of Oxford became the first officially titled “anaesthetic technician”, whose me-
• Organize and maintain the anesthesia care environment, equipment, and supplies to facilitate efficient department workflow.
• Inventory, order, and maintain sterile and unsterile anesthesia supplies and noncontrolled pharmacy drugs; rotate stock and monitor for expiration dates; maintain quality control documentation.
• Maintain an inventory of anesthesia equipment; track items out for repair, on loan, or contracted from vendors; demonstrate ability to perform and maintain records of routine preventive maintenance.
• Demonstrate technical knowledge and troubleshooting ability for anesthesia delivery systems, invasive and noninvasive hemodynamic monitoring systems, and related equipment.
• Prepare anesthesia workspace with routine intubation and suction equipment; anticipate supplies needed for procedures such as invasive monitoring, regional anesthesia, and management of difficult airway access, according to daily OR schedule.
• Aid in preparation of patients for procedures, including placement of blood pressure cuff, ECG leads, and pulse oximeter.
• Remove and dispose of all relevant supplies and equipment after anesthetic use; exchange soiled for clean parts of appropriate equipment between cases; restock anesthesia workstation with supplies and drugs according to department policy.
• Clean and decontaminate anesthesia equipment between cases; prepare appropriate equipment for sterile processing per department policy and CDC guidelines and protocols.
• Maintain Material Safety Data Sheet records as required by the OSHA.
• Demonstrate practice of The Joint Commission’s Environment of Care, National Patient Safety Goals, and Infection Control and Prevention as related to the anesthesia department.
• Maintain current BCLS certification and demonstrate understanding of the ASA Difficult Airway Algorithm.
• Demonstrate effective interpersonal skills; maintain professionalism toward customers, hospital employees, and patients at all times.
• Participate in anesthesia department’s quality improvement and risk management programs.

Table. Suggested Job Description for Uncertified Anesthesia Support Personnel
Abbreviations: ASA, American Society of Anesthesiologists; BCLS, basic cardiac life support; CDC, Centers for Disease Control and Prevention; ECG, electrocardiogram; OR, operating room; OSHA, Occupational Safety and Health Administration.

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Mechanical talents helped catalyze several of Dr Macintosh’s advancements in anesthesia science, including development of the Macintosh laryngoscope blade and vaporizer delivery refinement of ether concentrations in the Epstein-Macintosh-Oxford anesthesia machine.

Clearly the art and science of anesthesia have progressed immensely since the introduction of the Epstein-Macintosh-Oxford anesthesia machine, and in the past 2 decades information and technology have advanced at an accelerated pace. In Mr Salt’s era the role of the anesthetic technician bore close relationship to today’s biomedical technician, whose primary focus is maintenance, service, repair, and overhaul of medical equipment and systems. The function of the anesthesia technician has since hybridized to include more active participation in assistance with direct patient care. Intravenous therapy, operation of autotransfusion equipment, electrocardiogram monitoring, and administrative functions influencing department budgetary and policy issues are now within the scope and standards of a formally trained and certified anesthesia technician or technologist.

According to the American Society of Anesthesia Technologists and Technicians (ASATT), the official organization of both certified and uncertified ASP in the United States, a survey of its members in 2011 revealed that only 189 certified anesthesia technicians and technologists identified themselves as such nationally, although these results represented only 7% of total membership. Since the inception of ASATT in 1989, formal education has not been compulsory, nor has certification, which would otherwise validate that certain principles of anesthesia assistance have been mastered. Therefore, training for ASP is assumed primarily on the job at the local level and remains the predominant learning pathway for the ASP role.

Given the relative proportion of on-the-job–trained ASP working in the increasingly complex anesthesia environment, anesthesia providers place inordinate reliance on ASP who are preparing provider workspaces for anesthesia delivery. A provider is commonly dependent on the ASP to ensure that the anesthesia machine is decontaminated from prior use and a patent oxygen delivery system is verified for the next surgery. However, underlying principles and theories for ensuring a safe patient care environment in the context of epidemiology may not be included in his or her knowledge base. Recent findings support the perception that providers may not be aware of their anesthesia teammate’s limitations in scope or practical knowledge about infection control measures or potential hidden hazards among the hundreds of components in anesthesia equipment. Consequently, without validation of predetermined, standardized ASP competencies, patients may be at increased risk of iatrogenic injury.

Review of Literature

On-the-job training is defined as “of, relating to, or being something (as training or experience) learned, gained, or done while working at a job.” According to ASATT association specialist Alex Yannis (oral communication,
December 2011), only 45% of 2,500 ASATT members were actively certified in 2011. Because formal education of anesthesia-related principles culminating in certification is not required for ASP, most ASP learn through on-the-job training. The learner uses experiences to develop a knowledge base about anesthesia equipment, technology, interventional procedures, and work scope in their assistance to the anesthesia provider. Philosopher of science Michael Polanyi\(^{21}\) introduced the idea of “tacit knowing” as a functional relationship that “we know the first term only by relying on our awareness of it for attending to the second”. In other words, this type of learning is built on prior experiences. However, wisdom accumulated through life experiences and a common-sense approach to work and learning may be insufficient for ASP to negotiate through sophisticated demands of the anesthesia milieu. This idea is supported by the results of the 2011 ASATT membership survey,\(^{19}\) which point to a youth labor constituency based on reported highest level of education: 174 of 230, or 76% of responses, indicated the level of education required for employment was a high school diploma or general education development (GED) equivalent. Of those, 86 of 231 respondents indicated their highest level of education was intermediate or high school (Figure 2).

The Swedish Institute of Public Health and Caring\(^{22}\) characterized tacit knowledge as the “ability to act correctly and at times uncannily fast in difficult and uncertain situations”. The author qualified that the ability is based on formal knowledge, which has first been internalized and reflected on. The argument can be made that patient safety is at risk when the uncertified ASP encounters unfamiliar emergent situations, and tacit knowledge cannot be called on because an internalized, formal knowledge base is nonexistent. Studies have not yet been conducted to compare quality outcomes between on-the-job versus formally trained anesthesia technicians, but there is great opportunity for future research to bridge the gap in literature surrounding safety metrics in this workforce.

Weller and colleagues\(^{23}\) reported that anesthesia providers’ perceptions of support team capabilities had either a positive or negative emotional impact on the team depending on perceived level of specialized anesthesia training. Patient simulation scenarios in anesthesia crises involving providers, formally trained anesthesia technicians, and experienced operating room nurses produced qualitative results revealing that optimal team function was achieved more consistently with trained technicians. A companion simulation-based randomized controlled trial by the same group of authors reported objective evidence that the presence of a trained assistant reduced errors in anesthesia.\(^{24}\) The actual number of uncertified practicing ASP is unknown since there are neither requirements for national certification nor registration with the ASATT and no database is available to accurately identify the reach and scope of this workforce. However, the companion research studies from Australia\(^{23,24}\) support the assertion of the ASATT that formally trained, anesthesia-specific support staff adds value and safety to patient care.

According to Pronovost et al.\(^{25}\) a sustainable strategy to mitigate risk of anesthesia mishaps leading to patient injury begins with ensuring a cohesive team, thereby increasing safety. The authors assessed what improvements were necessary to achieve patient safety at multiple levels of the organization. They discovered a dearth of investment in human capital, concluding that the healthcare industry will stall patient safety efforts if interventions and solutions are predicated on the “mistaken belief” of short-term return on human capital investments. Focus on, and development of, teamwork and communication are cornerstone changes to bring about improved patient outcomes.\(^{26}\) Interventions to improve care must be inextricably linked with efforts to improve teamwork, and networks of teams to centralize the common goal of patient safety.

There are indications that a correlation exists between cohesive teamwork and better patient outcomes. For-profit and more decentralized healthcare systems have been identified as those having appreciably lower patient quality of care levels, whereas system centralization and job ownership\(^{27}\) increased quality indicators by 30%. Based on these investigations, the currently decentralized ASP national workforce is likely to develop great variation in skill sets between healthcare systems and regions depending on the specialized needs of each operating room environment. Subsequently, decentralized on-the-job training perpetuates a “silo syndrome” where over time individual workgroups manifest their own culture to meet their particular needs rather than interacting on common agendas across the organization, industry, or profession, resulting in fragmented practice standards.\(^{28}\)

**Current Issues and Status of Anesthesia Technician Practice**

Drawing from studies confirming effective teamwork as a contributing factor to safety, Braithwaite et al.\(^{29}\) imparted the concept of a “natural network” where those with mutual interests form and subsequently produce a sum greater than its parts. The Australasian Society of Anaesthesia Paramedical Officers closely approximates the ASATT in professional scope and objectives in that the society aspires to organize and formalize the role of nonnursing anesthesia technicians.\(^{30}\) This workforce, conceptualized in 1994, uses the descriptors *anaesthesia technicians* and *paramedical officers/assistants*, and the society’s united membership combines Australia, New Zealand, and Asia. A review of the society’s constitution\(^{31}\) reveals the scope and duties of like-minded professionals providing research, advancing ideas, and reducing...
patient risk within their scope of the anesthesia care team. Braithwaite et al.\(^2\) argued for letting these “natural network” groups focus on the individual problems that compromise patient safety and that are specific to their expertise. As such, greatly expanding the pool of certified anesthesia technicians could bring novel approaches to safety in patient care as a result of their viewing anesthesia practice from a different focal point.

Progress toward the goal to formally train ASP in the United States is encouraging, albeit on a protracted timeline. Since 1996 the ASATT has continued its grassroots efforts to formalize the role of ASP through certification. In 2001 the first anesthesia technologist certification (CerATT) was awarded,\(^3\) giving this nascent profession’s career ladder a second, higher rung. Internet engine searches readily uncover certification-eligible anesthesia technician programs in Washington, California, Florida, Wisconsin, Pennsylvania, New York, and Texas, with college associate of science (AS) or arts (AA) degrees concomitantly awarded. Community college programs with relevant in-class didactic and hospital-based clinical instruction are becoming more available nationwide as a point of entry for prospective anesthesia technicians. However, certification eligibility can also be achieved through online self-study coursework and a prerequisite 2 years’ on-the-job training.\(^4\) According to organizational leadership (V. Reyes, CerATT, oral communication, June 2011) ASATT is actively pursuing college-partnered anesthesia technician certification and degree program accreditation through the Commission on Accreditation of Allied Health Education Programs. Formal education coupled with specialty certification will act to galvanize the anesthesia technician community as a profession.

Furthermore, the ASATT has a developed and comprehensive Standards of Practice document along with official liaison support from the American Society of Anesthesiologists and American Association of Nurse Anesthetists. As declared in the ASATT mission statement,\(^5\) this workforce is committed to “raising the standards of patient care and providing a safe anesthetic environment”, evidence that this workforce has consciously positioned itself for organization into an officially recognized professional entity.

Summary and Conclusions

Patient safety has been a paramount concern of the public, government agencies, and healthcare industries for more than a decade but a solution to this multifaceted problem remains elusive. Current scientific thinking alludes to a culture of patient safety dependent on infrastructure and investment in human capital within teams of an organization. The propensity for risk to safety is perpetuated and potentially escalated by a silo culture, that is, skill sets that are tailored to workplace microcosms and cannot be reliably transferred to other anesthesia care environments. Unfortunately, the quality and scope of on-the-job training may vary widely across healthcare facilities depending on infrastructure and availability of assistive personnel capital, local leadership risk tolerance, and resultant ability to align with parent corporate directives.

Although not widely identified as such in the literature, ASP are an integral part of the anesthesia care team, and recognition of their contributions to patient care is overdue. In light of immense advancement and increased complexity of anesthesia-related technology, equipment, and techniques since the days of Richard Salt, the rationale supporting on-the-job training as sufficient for the ASP role is archaic and deserves a comprehensive review. It is evident that as a healthcare discipline, the anesthesia community should weigh the high value placed on the ASP in the clinical environment against a seemingly contradictory

**Figure 2.** American Society of Anesthesia Technologists and Technicians 2011 Membership Survey of Education Level

![Bar chart showing education level distribution](chart.png)
entry-level education and training requirement. Healthcare industry acknowledgment of and action on this education-expectation dichotomy may ensure continued successes in subsequent anesthesia safety reports by the Institute of Medicine. Given the high degree of presumptive trust in ASP, the anesthesia community would serve this special workforce, the anesthesia team, and patients by supporting validation of that knowledge through standardized formal education and certification processes.

REFERENCES

AUTHOR
Lisa Haas, CRNA, DNP, NE-BC, is chief CRNA/anaesthesia department manager at Kaiser South San Francisco, South San Francisco, California. Email: Lisa.E.Haas@kp.org.