The 2011 Institute of Medicine report on the future of nursing recommended that nurses practice to the full extent of their education and training. Nurse anesthetists in certain regions of the country have been unable to maintain regional anesthesia skills because of anesthesia practice models. Factors including increased patient loads, economic motivators, and desire to maintain skill sets are driving evolution of the anesthesia practice model. In many practices, Certified Registered Nurse Anesthetists (CRNAs) now have the opportunity to expand their practice scope to include regional anesthesia. This has created the need for a pathway to rapidly develop or augment skills for CRNAs who have not been performing regional anesthesia. Well-designed and facilitated simulation methods can be effective for teaching and evaluating clinical skills with incorporation of rigorous assessment instruments to ensure consistency in training outcomes. The purpose of this quality improvement project was to determine the effectiveness of a blended-learning regional anesthesia training curriculum on improving CRNA knowledge, skill, and attitude in regional anesthesia administration as part of a clinical credentialing pathway. Forty-nine CRNAs completed all course components, including meeting all skill training thresholds through deliberate practice and use of validated checklists. Knowledge and confidence levels demonstrated significant gains.

Keywords: Checklists, deliberate practice, epidural anesthesia, simulation, spinal anesthesia.

The 2011 Institute of Medicine's Future of Nursing report and the Consensus Model for APRN (Advanced Practice Registered Nurse) Regulation, Licensure, Accreditation, Certification and Education have expressed the value of APRNs being able to practice to the full extent of their training. The American Association of Colleges of Nursing (AACN) also supports increasing the entry level of education for APRNs, including Certified Registered Nurse Anesthetists (CRNAs). The AACN indicates that these efforts will support the US nursing workforce and help to improve the utilization of valuable healthcare resources.

Many CRNAs in the US workforce have not been able to maintain their privileges for regional anesthesia practice, for a variety of reasons. Recent changes in practice environments present the opportunity for CRNAs to now be credentialed for regional anesthesia. Simulation education has proved effective in teaching other clinical skills to a threshold level of competence with translation to success in the clinical area. Examples include placement of a central venous line and lumbar puncture.

Development of similar simulation skills laboratories and workshops to help CRNAs improve knowledge, skill, and confidence relative to administration of spinal and epidural anesthesia could potentially help to bridge the gap between initial training and the reintroduction of regional anesthesia skills after an interruption in regional anesthesia practice.

This issue of an interruption in practice has created a need to provide CRNAs with an effective hospital-level recredentialing educational pathway. One possible solution, which has demonstrated effectiveness, is a blended-learning approach. A blended-learning curriculum incorporates both online and face-to-face (simulation) components. Such a curriculum for regional anesthesia training could potentially facilitate the CRNA credentialing pathway and address the gap that exists when CRNAs who are trained in regional anesthesia during their anesthesia education must refresh the skill for current practice needs.

This article describes the development of a blended-learning training course for nurse anesthetists at the Peter M. Winter Institute for Simulation, Education,
and Research (WISER), an internationally renowned multidisciplinary training and research facility located in Pittsburgh, Pennsylvania. An alpha practice course was implemented initially with development of checklists as a pilot study, followed by a beta evaluation by experienced obstetric anesthesia instructors. Finally, the course was deployed for CRNAs as part of the credentialing process. Full project implementation incorporated online learning activities, realistic simulation on-task trainers, deliberate practice, structured feedback, and focused debriefing. Best practices for simulation educational methods were used whenever possible.

- **Historical Background.** Historically, the scope of practice of nurse anesthetists has sometimes been limited depending on the state of the license, facility of practice, hospital bylaws, local culture, and other healthcare providers involved in the patient’s care. Nurse anesthetists, although educated and trained to perform spinal and epidural blocks, may be out of practice in these techniques because of these prohibitive practice restrictions. One effect of the passage of the Patient Protection and Affordable Care Act of 2010 was an expansion of the number of patients entering the healthcare system. Additionally, there has been an emphasis on the importance of multidisciplinary teamwork in the pursuit of safe, high-quality, cost-effective anesthesia care. The stimulus for removal of practice restrictions for nurse anesthetists is multifactorial and includes the economic benefit of keeping the costs of healthcare affordable and the need for these skilled practitioners to practice to their full capability within the context of maintaining patient safety. Thus, CRNAs in many practices across the US are being offered an opportunity to practice to the full level of their education and training. However, because of the changing practice landscape, there now exists a gap for some CRNAs between the initial training program and the current opportunity for clinical use of skills that are within the scope of practice of CRNAs. Furthermore, epidural and spinal anesthesia are technically challenging anesthesia techniques that require practice to achieve competence and maintain proficiency. Several studies have demonstrated that experience in anesthesia training in a simulated environment before patient encounters can improve procedural efficiency, decrease error rates, and positively affect quality of care and patient safety.

The theoretical basis is well established for use of simulation to aid in acquisition of psychomotor skills and development of expertise. Simulation training can refine technical skills and expand the teaching paradigm to include critical thinking or management of rare complications, such as those seen with spinal and epidural block placement. Traditional healthcare simulation courses involve a simulation exercise followed by a facilitated postevent debriefing in which learners discuss what was done correctly and what could be improved the next time, usually without additional opportunities to apply the specific new knowledge. Research in development of expert performance suggests that deliberate practice is a hallmark in the development of high-level performance. Successful training in deliberate practice involves the following factors: (1) motivated learners, (2) well-defined learning objectives, (3) precise measurements of performance, (4) focused and repetitive practice, and (5) informative real-time feedback concerning performance.

- **Rationale and Specific Aims.** To close the gap between initial training for practice and a current need to utilize skills that are within the CRNA scope but have not been used in practice for a time, the authors developed an evidence-based regional anesthesia training course as a blended curriculum designed to facilitate regional anesthesia credentialing. The course development included an online educational component and a hands-on simulation component focused on deliberate practice. Following successful course completion, the credentialing pathway could be accomplished by completing a supervised clinical component. This article describes the development and evaluation of a blended curriculum (Nurse Anesthetist Regional Anesthesia Training [NARAT] course) that qualified CRNAs for the final step of the credentialing pathway.

The main purpose of this project was to develop a blended simulation curriculum incorporating online knowledge components, hands-on deliberate practice, and checklists to increase the knowledge, confidence (attitude), and skills of CRNAs in regional anesthesia practice. A secondary purpose was to determine the success of this preparation in facilitating participants’ credentialing trajectory toward independent regional anesthesia practice.

**Review of the Literature**

Decay of skill and knowledge is a major issue, especially when trained or acquired skills are needed after long periods of nonuse. There are proven ways to address these knowledge deficits and challenges. One such educational method is expertly developed simulation, which incorporates best procedures such as deliberate practice, feedback, debriefing, and rigorous assessment using checklists. The traditional “apprentice” model in healthcare education has undergone a pedagogical shift to a simulation-based learning model. Experiential learning, deliberate practice, and the ability to provide immediate feedback are the primary advantages.

- **Deliberate Practice.** The term deliberate practice was first used by Ericsson in instructional science research and has been adopted in medical education. Deliberate practice involves repetitive performance of intended cognitive or psychomotor skills in a focused domain, coupled with rigorous skills assessment. Deliberate practice has been studied most often in the domains of music, sports,
Deliberate practice requires working at the edge of competency, is effortful, requires feedback and focuses on remediation of weaknesses. Building comfort level and confidence levels in students is very important and enables the learners to attain fluency with their current level of performance. They are then equipped to reapply deliberate practice to attain the next level of performance. Deliberate practice can be applied to any aspect of performance. It is effective for both cognitive skills and motor skills. It is fair to say that expertise will not be attained without the regular use of deliberate practice to one's domain of performance.

- Simulation. The literature for simulation training has expanded exponentially in recent years. Healthcare, like aviation, is driven by safety, more specifically patient safety. As the link between simulation and patient safety becomes increasingly apparent, simulation training is being adopted as the education method of choice for acquisition of a number of critical behaviors, including technical skills and teamwork.

Several studies have demonstrated that experience in anesthesia training in a simulated environment before patient encounters can improve procedural efficiency, decrease error rates, and positively affect quality of care and patient safety. Laurent et al. used a global rating scale in a study as an assessment tool for the simulation training. Friedman and associates researched the clinical impact of epidural anesthesia simulation on short- and long-term learning curves of providers. Even though simulation training has been considered an important anesthesia training tool, Fehr and colleagues suggested that further study of the transferability of anesthesia simulation training to clinical care and demonstration of improved patient outcomes was necessary. Feedback and debriefing are critical to effective learning in simulation and should be guided by individual learning needs.

Epidural and spinal anesthesia are technically challenging regional anesthetic techniques that can be improved with continued skill execution. Simulation education for technical skill acquisition of regional anesthesia traditionally is focused on haptics from the Greek word haptikos meaning "to sense or touch." Deliberate practice eases haptic finesse and skill acquisition of placing a spinal or epidural block.

- Checklists. Anesthesia care has become more complex with an increased number of "routine" tasks and responsibilities that cannot realistically be remembered even by experts. Nanji and Cooper stated that checklists in anesthesia have resulted in a reduction in process variability and have led to improved outcomes and reduced incidences of complications. Wong et al. evaluated task-specific checklists while using a global rating scale for ultrasound-guided regional anesthesia. The American Society of Regional Anesthesia and Pain Medicine has developed checklists to effectively improve performance during the treatment of local anesthetic systemic toxicity, a life-threatening event. Checklists appear to be effective tools for improving patient safety in various clinical settings by strengthening compliance with guidelines, eliminating human variables, reducing the incidence of adverse events, and decreasing morbidity and mortality. Well-constructed checklists codify interventions, remove ambiguity, and increase reliability of care processes. In educational settings, checklists can serve not only as evaluation tools but also as an efficient means of communicating a set of expectations regarding effective performance. The goals of checklists for the NARAT course included the following: (1) acting as cognitive guides for the participants, (2) ensuring that all critical actions were taken, (3) reducing variability between providers, and (4) enhancing coordination during high workload and stressful situations. Checklists for basic procedural skills require an approach to standard setting in which patient safety concerns are paramount. Only by requiring a high level of performance in the simulation laboratory can we promote patient safety in the more unpredictable clinical environment.

- Merging Deliberate Practice, Simulation, and Checklists. Simulation experiences involving checklists have been an accepted part of training, assessment, and research in the aviation industry, nuclear power industry, and the military. These industries have widely accepted standards that have been emulated in healthcare training, including in regional anesthesia training courses. The Agency for Healthcare Research and Quality has likewise encouraged the use of critical event crisis checklists for operating room emergencies involving anesthesia. These checklists have been developed and tested in experiential simulation learning environments.

One key characteristic related to use of checklists is in development and validation. The literature is consistent in emphasizing the importance of careful checklist development, with the Delphi method (which uses expert consensus building) recognized as a valuable tool in developing checklists that are able to assess skill performance. The overall consensus in the literature is that checklists are a valuable and accepted adjunct in simulation training designed to improve clinical performance. Incorporating checklists into simulation training, which
includes important processes such as anesthesia care, can help to ensure that the essential steps are manageable, standardized, and consistently performed. Udani et al focused on simulation-based mastery learning with deliberate practice to improve clinical performance in spinal anesthesia for anesthesiology residents. Simulation was combined with the use of checklists and deliberate practice to train anesthesiology residents, with primary outcomes reported as the percentage of checklist tasks performed correctly. Their study demonstrated the effectiveness of a simulation-based curriculum in significantly improving anesthesiology residents’ performance of subarachnoid block. Furthermore, the deliberate-practice training component added a significant, independent, incremental benefit to performance improvement.

- **Debriefing.** Debriefing is a form of structured feedback that follows a simulation event and is a conversation-al period for reflection aimed at sustaining or improving future performance. Extensive learning can be achieved during debriefing and often depends on the debriefing skills of the facilitator as well as the learner’s perceptions of a safe and supportive learning environment as created by the facilitator. In contrast, poorly facilitated debriefings may create adverse learning, generate bad feelings, and may lead to a degradation of clinical performance, self-reflection, or harm to the educator-learner relationship.

Debriefing provides an opportunity to clarify the learner’s knowledge and rationale for actions during the simulation experience. A systematic review of high-fidelity simulation literature reported that 51 studies listed educational feedback during debriefing as the single most important feature of simulation-based education.

**Methods**

Exempt approval for the project was granted by the University of Pittsburgh Office of Human Subjects Protection. The first phase of the project involved alpha and beta course development to ensure that content was valid and that all instructors were knowledgeable about the course content and specific aims of this study and were prepared to instruct the course. All CRNA instructors for NARAT completed at least 50 epidural or spinal block placements in the last year and had an extensive knowledge base on regional anesthesia. Checklists for sterile technique, spinal block placement, and epidural block placement were adapted from previously published regional anesthesia checklists, with modifications designed to meet NARAT-specific course objectives. The modified Delphi approach was used to refine and ensure content validity of the developed checklists. Three expert CRNA instructors evaluated each checklist and offered feedback on each item. Each checklist action was listed in order (where appropriate) and assigned equal weight using a dichotomous scoring system (satisfactorily performed or unsatisfactorily performed). The iterative process allowed for systematic improvement and correction of any omissions or areas for improvement on each checklist item. The checklist review process continued until full consensus from the experts on all items was achieved.

The second phase of the project involved administering a precourse demographic and experience survey that focused on prior experience with spinal and epidural anesthetics, prior experience on the simulator trainer, prior practice on a spinal or epidural anesthesia trainer, preexisting skills, and comfort level before completing the course. A 15-minute video was produced that provided step-by-step instructions corresponding to the procedural and performance assessment checklists, to promote standardization. Minimum passing thresholds for the knowledge examination and skill checklists were established using a modified Angoff method. Precourse and postcourse evaluation surveys were developed. An 18-item postcourse survey was administered 6 months after successful course completion to evaluate perceived value and credentialing trajectory. Checklists for each participant as well as precourse and postcourse surveys were analyzed.

- **Interventions.** Development of the blended curriculum for spinal and epidural anesthesia training included online precourse didactic content, checklists, deliberate practice with mastery learning elements, and experiential learning with expert instructors. Baseline knowledge assessments were administered at the beginning of the course. Participants were required to achieve a threshold of 80% on the baseline assessment in order to progress to the hands-on component. A precourse/postcourse survey on attitudes was administered. The sample consisted of 49 CRNAs from a single large academic healthcare system who enrolled in the NARAT course, agreed to participate in this project, and completed all course elements including the precourse and postcourse surveys.

The course was administered by staff at WISER. The online course consisted of 7 modules, all of which were referenced to standard textbooks. Completion of online materials took approximately 4 hours, as reported by the expert instructors. Completion of all course elements was tracked via the Simulation Information Management System at WISER. Each page that a student opened in the course allowed tracking of completion of material review.

The hands-on practice included use of 2 specific task trainers. A spinal injection trainer (Life/form Spinal Injection Simulator, Nasco Inc) was used for spinal anesthetic insertion training. It has the advantage of realistic tactile feedback combined with a spinal column that can be filled with fluid to mimic cerebrospinal fluid when the spinal needle is successfully placed. The Obese Adult Lumbar Puncture/Epidural trainer (Simulab) was used for all epidural insertion training. The obese simulator was used because it has the advantage of loss of resistance
at 4.5 to 5 cm during epidural insertion training. Actual sterile kits (spinal and epidural) and sterile gloves used in the clinical setting were used for sterile technique evaluation as well as for practicing techniques.

- **Development of Course Materials.** Course materials were developed through a literature review of best practices for checklist development, deliberate practice, simulation, and structured feedback/debriefing. Course materials, evaluation instruments, checklists for skill evaluation, and surveys were developed through modification of existing instruments, including iterative modification incorporating clinical expert consensus. As noted, the modified Delphi method was used for checklist refinement. Minimum passing thresholds were established using a modified Angoff method. The Angoff method is a commonly used and legally defensible method for setting passing or cut scores for high-stakes examinations or assessments. It can also be used for setting passing scores on clinical checklists. The use of the Angoff method to evaluate a skills checklist allows expert evaluators collectively or individually to determine if a hypothetical minimally competent student would perform each item on the checklist correctly. The purpose in developing such a checklist is to ensure that performance of critical steps has little variability during the educational process and also as a performance guide for students (when given access to the checklists).

Five expert clinical instructors were enlisted to determine the passing threshold for the checklists. Each expert used a score of yes (1) or no (0) in the modified Angoff method for determining the minimum passing thresholds for participants. The scores were averaged on each item and then for the entire checklists to determine cut scores. For the NARAT course, the checklists were used to score performance and to regulate flow of the deliberate-practice process. The checklists thus were used both as a training process guide and in evaluation of the processes being trained.

### Table 1. Participants’ Experience as a Certified Registered Nurse Anesthetist (CRNA)

<table>
<thead>
<tr>
<th>Precourse survey</th>
<th>No. (%)</th>
</tr>
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<tbody>
<tr>
<td>Average length of time as a CRNA, years</td>
<td>15.5</td>
</tr>
<tr>
<td>No preexisting regional skills</td>
<td>42 (86)</td>
</tr>
<tr>
<td>Experience with placement of epidural or spinal block</td>
<td>28 (57)</td>
</tr>
<tr>
<td>Had placed 1-5 “spinals” as a CRNA</td>
<td>31 (63)</td>
</tr>
<tr>
<td>Had placed 1-5 “epidurals” as a CRNA</td>
<td>40 (83)</td>
</tr>
<tr>
<td>Performed 1-5 sterile procedures a month</td>
<td>30 (61)</td>
</tr>
<tr>
<td>Performed 6-10 sterile procedures a month</td>
<td>19 (39)</td>
</tr>
<tr>
<td>Right-hand dominant</td>
<td>46 (93)</td>
</tr>
<tr>
<td>Last time any participant had placed a spinal or epidural block, months</td>
<td>≥ 24</td>
</tr>
</tbody>
</table>

Results

- **Demographics (Precourse).** All the participants had prior anesthesia training on a simulator (SimMan, Laerdal Medical), spinal/epidural model, or other mannequin. Additional information regarding the participants’ experience as a CRNA and hand dominance was collected (Table 1).

- **Knowledge and Skills.** The independent online pre-course didactic work had an 80% threshold examination for the participants to be able to continue with the hands-on didactic portion. Fifty-two participants were originally enrolled. Three were not successful in meeting the threshold knowledge of 80% for the online didactic portion of the course and were dismissed from the hands-on didactic portion.

Forty-nine CRNAs successfully completed each item on the skills component. Deliberate practice was encouraged throughout the skill training until CRNAs indicated they were comfortable. A skills assessment was then conducted using the checklists. All CRNAs were required to achieve a 100% score on the checklist or were redirected to practice until competent and were then retested to the 100% threshold.

- **Attitudes (Precourse vs Postcourse).** Postcourse scores for comfort and confidence level for both spinal and epidural blocks were improved compared with precourse results. Means of both the comfort and confidence levels of placing spinal blocks after course completion; comfort/confidence level of placing epidural blocks after course completion; trajectory to credentialing; the role the NARAT course played in the credentialing process; attitude regarding skill improvement and development that included sterile gloving, preparation of the kit, and technique; evaluation of checklists; and attitude regarding safety. On the post-course survey, participants were also asked to rate the value of the course in facilitating their credentialing for regional anesthesia privileges at a single major healthcare organization in Western Pennsylvania.

- **Credentialing.** Forty-nine CRNAs successfully completed all aspects of the course and were thus eligible to be credentialed in the clinical setting. The goal was for
all 49 participants to be credentialed to perform spinal and epidural blocks in the clinical setting. However, only 5 (10%) of the participants were eventually credentialed at their home institution. All 5 CRNAs who were credentialed were from the same clinical facility in the healthcare organization. Their facility incorporated a supportive postcourse immersion rotation that enabled these CRNAs to practice their refreshed skills in the clinical environment soon after completion of the course. This factor was reportedly instrumental in the successful credentialing of 5 CRNAs who participated in the NARAT course.

Discussion
In this quality improvement project, best practices and guidelines for simulation course deployment, development, and improvement were used. These included use of the Delphi method/Angoff method for checklists, deliberate practice, realistic simulation, and debriefing and structured feedback. Initially, there was a plan to evaluate reported success and complication rates among CRNAs that were already credentialed in regional anesthesia with the CRNAs who participated in the NARAT course, as an attempt to bridge the gap in the literature of simulation training in the laboratory with transfer of skills to actual clinical practice. Unfortunately, only 5 CRNAs were successfully credentialed after their participation in the NARAT course. All 5 CRNAs were employed at the same facility, which had established a structured postcourse clinical training program. Although outside the sphere of control, this result emphasizes the critical nature of the training facility-clinical practice connection and the need to ensure that the training program trajectory includes agreement by each clinical facility that the staff will engage in completion of the credentialing pathway.

• Interpretation. A blended curriculum including online components and best practices in simulation training techniques was effective in establishing a high level of knowledge and skill for all participants that established their eligibility to become credentialed in spinal and epidural block skills in a clinical setting. Incidental observations demonstrated that age may influence confidence and comfort levels regarding actual performance of spinal and epidural blocks. The older the practitioner, the less confident and comfortable he or she is performing certain tasks. This finding could be because the CRNAs are further away from their initial training or are less motivated at the end of their careers. Simulation-based deliberate-practice training can help to facilitate the comfort and confidence levels of CRNAs and other anesthesia providers in skill maintenance and can upgrade readiness for return to hands-on practice. Checklists were effectively developed and deployed for evaluation as well as to guide processes in the simulation training. Further study is warranted for evaluation of anesthesia practices and task performance milestones of confidence and comfort levels during performance of spinal and epidural anesthesia.

• Barriers to Credentialing and Practice. Barriers to CRNA and APRN practice are complicated and multifactorial, and can vary substantially based on the practice setting. Reported barriers to credentialing specific to this project included the following:
  • Lack of clinical support from leadership and anesthesiologists
  • Fewer opportunities for CRNAs attempting to get credentialed at teaching institutions that have training responsibilities to residents and fellows
  • Lack of interest of other hospital staff to assist CRNAs in patient positioning for spinal/epidural anesthesia
  • Lack of opportunities based on clinical assignments for CRNAs
  • No consistent opportunity to perform spinal/epidural anesthesia
  • Discomfort performing regional anesthesia techniques with the production pressures that are common in the clinical arena and/or with the criticism that is voiced by supervising physicians in the presence of an awake patient.

• Limitations. Limitations of this project included the small sample size of 49 CRNAs that were all from a single academic healthcare organization. It is possible that the organization’s culture influenced the results. It was difficult to demonstrate that the course intervention influenced clinical performance (including success and complication rate reduction) because only 5 CRNAs were ultimately credentialled as a result of the program. The

<table>
<thead>
<tr>
<th>Measure</th>
<th>Precourse</th>
<th></th>
<th></th>
<th>Postcourse</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
</tr>
<tr>
<td>Comfort</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Epidural</td>
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<td>1.0</td>
<td>2.0</td>
<td>4.0</td>
<td>0.58</td>
<td>4.0</td>
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<td>2.43</td>
<td>0.77</td>
<td>3.0</td>
<td>4.14</td>
<td>0.69</td>
<td>4.0</td>
</tr>
<tr>
<td>Confidence</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Epidural</td>
<td>2.14</td>
<td>0.9</td>
<td>2.0</td>
<td>4.0</td>
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<td>4.0</td>
</tr>
<tr>
<td>Spinal</td>
<td>3.0</td>
<td>1.1</td>
<td>3.0</td>
<td>4.14</td>
<td>0.69</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Table 2. Precourse/Postcourse Comparison of Comfort and Confidence Levels for Spinal and Epidural Technique for NARAT Course Participants
Abbreviation: NARAT, Nurse Anesthetist Regional Anesthesia Training.
lack of a precourse agreement connecting the training program to each clinical facility for finishing the credentialing path was a substantial limitation.

**Conclusion**

The development and maintenance of ongoing competency is critical for CRNAs who wish to perform spinal and epidural anesthesia but who have had a lapse in opportunity since graduation from their anesthesia programs. How these individuals navigate credentialing pathways toward resuming regional anesthesia practice is of concern across the industry. The integration of blended curricula, including high-quality simulation experiences with rigorous verification of knowledge and skill, is an important supplement to the traditional supervised apprenticeship model. These efforts are essential to bridging the existing CRNA practice gap (those whose initial training included regional anesthesia experience but who have not had the opportunity to maintain their regional skills in their recent practice). Simulation provides a safe environment in which to develop and hone skills with procedures, and to maintain or reestablish competency. Further development of checklists, deliberate practice, simulation, and structured feedback experiences has the potential to change laboratory performance, care practices, and patient outcomes if adequate clinical support is available in completing the credentialing pathway and then assessing clinical performance and patient care outcomes.

An important incidental observation was that age seems to be a factor in the anesthesia provider’s comfort level of performing a spinal or epidural. This is an important factor given the demographics of the CRNA workforce and may warrant future evaluation.

Some elements were essential during development of the blended course that was designed to help CRNAs improve the knowledge, attitude, and skills needed for competent regional anesthesia practice. These essential elements included recruitment and development of expert clinical instructors, quality control in curriculum development, preestablishing a supportive postcourse clinical process, and rigorous checklist development processes.

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DISCLOSURES
The authors have declared no financial relationships with any commercial entity related to the content of this article. The authors did not discuss off-label use within the article.