

Trauma advanced practice provider education: the current state of trauma advanced practice provider postgraduate education in the United States

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ABSTRACT

Background Postgraduate education for advanced practice providers (APPs) is a rapidly evolving field and includes residencies and fellowships designed to help narrow the gap between physicians and APPs. The current state of trauma APP postgraduate programs in the U.S. is unknown. The aim of this study is to identify the APP postgraduate programs in the U.S. dedicated to trauma training and to understand the baseline characteristics of these programs and their curriculums, including which technical skills and bedside procedures a trauma APP should be expected to perform.

Methods This is a cross-sectional study of all identifiable APP postgraduate programs in trauma surgery in the U.S. through June 2022. A survey tool designed to better understand training programs and curriculums was created. A web-based survey using Qualtrics was sent to the program directors of the identifiable trauma programs. Descriptive statistics were calculated as appropriate.

Results Eight programs were identified as primarily trauma training programs. Six programs completed the entire survey, and one program completed 50% of the survey. Programs vary in the number of graduates, clinical rotations, and educational curriculums, though all programs offer didactics and simulation curriculums for procedure skill development. Most programs are not accredited.

Conclusion This is the first study developed to understand the content and curriculums of postgraduate trauma programs for APPs. There are only a handful of programs dedicated to trauma training, and their educational offerings are diverse, with similarities across programs in expected procedural competency. There is a need for trauma programs to invest in and further standardize APP training.

Level of evidence IV.

BACKGROUND

Postgraduate training for physician assistants (PAs) and nurse practitioners (NPs) is a rapidly evolving and expanding field. The number of advanced practice providers (APPs) nationwide has doubled from 2000 to 2016 and is expected to double again by 2030.¹ APPs have become an increasingly large part of the healthcare provider workforce and practice across many medical specialties, both in the outpatient and inpatient arena as well as surgical and medical fields. Onboarding models were developed to help APPs transition to clinical practice and augment the education they completed in school

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Postgraduate education programs for advanced practice providers (APPs), including residencies and fellowships, have increased exponentially in number in the last decade, but the number of postgraduate trauma APP programs and information about their educational offerings is not known.

WHAT THIS STUDY ADDS

⇒ This is the first study that identifies existing postgraduate trauma APP programs in the U.S. and describes program characteristics including clinical rotations, didactic curriculums, and simulation curriculums. Program curriculums in addition to expectations for graduation for the APP fellow are highly variable.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Considering the ongoing interest in and need for postgraduate APP education and the expanding role of APPs in trauma, there is a benefit for trauma programs to invest in APP training. Given the diversity of the educational offerings and variability in requirements for accreditation, it may be beneficial for a leading national organization to champion the effort in setting educational standards for postgraduate APP training programs in trauma.

with hands-on, patient centered learning opportunities that allow them to observe and be observed in practice. The first of these models is the traditional transition to practice program. These programs are typically unique to each healthcare institution and vary in content, duration, and competency evaluations and prepare APPs for general clinical practice.² The second onboarding model is the postgraduate training program, also referred to as residency or fellowship. PA fellowships emerged in 1971^{3,4} whereas NP fellowships were initiated in 2007.⁵ Residencies and fellowships are designed to provide formal, advanced didactic clinical training in a particular specialty with formal instructional methods; most programs' duration are 6–18 months. For the remainder of the article, postgraduate training program will refer to a fellowship or residency program but not transition-to-practice programs.

Aside from additional clinical training, a survey of graduates of postgraduate PA programs showed

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other benefits of postgraduate training. All graduates were employed post completion of the program and said the program added value to their career. Over 90% of graduates felt the program made them more competitive in the job market, would recommend a postgraduate training program to others, and that training prepared them for leadership.⁶ As the role of APPs has expanded throughout the clinical sphere, there has been heightened interest from many healthcare organizations to understand how to best help new graduate APPs transition to practicing clinicians. There has also been a rapid increase in the number of APP postgraduate programs. In 2012, a total of 49 postgraduate PA programs were identified.⁷ By 2021, using a query of the membership rosters of the Association of Postgraduate PA Programs (APPAP) and Association of Postgraduate APRN Programs (APGAP), the same author identified 106 programs at 42 sponsoring institutions that enrolled both PAs and NPs together in an integrated program.⁸ However, most strikingly, at the annual joint conference of APPAP and APGAP in 2022, 444 unique postgraduate program tracks were identified. Notably, the large majority of these programs were not affiliated with APPAP or APGAP and identified themselves as contemplative or fully running.⁹

Due to the lack of a single administrative body providing oversight for these postgraduate programs, there is limited understanding of the APP postgraduate educational environment.¹⁰ Several national organizations including the American Nurses Credentialing Center (ANCC), the National Nurse Practitioner Residency and Fellowship Training Consortium and the Commission on Collegiate Nursing Education provide accreditation for NP residency/fellowship programs. The PA profession offers separate accreditation programs, including the Accreditation Review Commission on Education for the Physician Assistant and APPAP. Each of these organizations recommends different competency frameworks for the evaluation of APPs participating in postgraduate training programs.^{11 12} Further, the postgraduate NP training programs, both accredited and non-accredited, use different competencies in the evaluation of NPs in their programs.¹¹ Neither PA nor NP postgraduate training programs require formal accreditation to exist. Currently, there is no standardized curriculum or competency assessment across NP or PA postgraduate programs, nor a unified credentialing body. Further, a single, comprehensive resource that identifies all postgraduate APP training programs does not exist.

In 2021, APPAP surveyed their members to understand the characteristics of PA postgraduate training programs across multiple specialties and described the general qualities of these programs, concluding that training occurs across a broad spectrum of medical and surgical specialties. Further, there is great diversity in the institutions overseeing the programs, but most postgraduate PA programs are situated in teaching hospitals. The study identified the need for more granular research on postgraduate training programs.¹³

Due to the limited understanding of postgraduate APP training programs, especially specific to trauma, we sought to gain a better understanding. The aim of this study was to identify the postgraduate APP programs in the United States dedicated to trauma training and understand the baseline characteristics of these programs and their curriculums, including which technical skills and bedside procedures a trauma APP should be expected to perform. This is the first study of this kind specific to trauma programs. This information was presented in part at an educational session at the 36th Eastern Association for the Surgery of Trauma Annual Scientific Assembly. We have broken the session into two separate articles, with this being about APP

postgraduate education and the other article discussing APP utilization on trauma teams.¹⁴

METHODS

This is a cross-sectional study of all identifiable APP postgraduate programs in trauma surgery in the USA as of June 2022. Multiple methods were used to identify all active postgraduate programs. First, the websites for APPAP¹⁵ and APGAP¹⁶ were queried for trauma, acute care surgery, emergency general surgery (EGS), and surgical critical care programs. Additionally, online searches using Google were completed to identify other postgraduate APP programs that may not have been listed on these sites using the terms “advanced practice provider,” “APP,” “postgraduate program,” “fellowship,” “residency,” “postgraduate program,” “trauma,” “acute care surgery,” “emergency general surgery,” and “surgical critical care” either combined or individually. If the programs were not clearly designated as trauma programs, program directors (PDs) were contacted to analyze if trauma was considered a major component of the training program.

A survey tool designed to better understand training programs and curriculums was created. Questions were designed by the APP fellowship leadership at a single institution (MetroHealth) and revised by the team after meetings and pilot testing with PDs and leadership at that program. The final version of the survey was approved by consensus of the fellowship leadership. It consisted of 30 multiple choice and free response questions whose aim was to gather information about key program characteristics, curriculums, development of procedural skills, and graduation requirements.

A web-based survey using Qualtrics was sent to PDs of the identifiable trauma programs. The survey was available for about 1 month in June 2022 to complete. To encourage full participation, follow-up email reminders were sent to non-responders. Survey completion was voluntary. The programs were given the right to withhold their names and for their responses to remain confidential to the public. Descriptive statistics were calculated as appropriate. As this is not human subjects research, no IRB approval was required.

RESULTS

Forty-three postgraduate programs were initially identified from the query from the APPAP and APGAP websites and online search. After further investigation into program websites or communication with PDs, most programs were deemed not primarily trauma training programs. Twenty-two programs were critical care programs, 11 programs were general surgery programs, and two programs were duplicate. A total of eight programs were identified as primarily trauma training programs. Of these programs, six programs completed the entire survey, and one completed about 50% of the survey. Of the program respondents, six were PAs, and one was an NP. The program respondents are listed in [table 1](#), which contains basic information about each program and demographics. Program inception ranged from 2010 to 2021, and programs have between 1 and 10 graduates per year. All but one program has had both PA and NP graduates; one program has only had PA graduates. Only two programs received accreditation; one program was accredited by the ANCC and another program by the APPAP. Five centers were not accredited. Of these five, only one program was planning on pursuing accreditation in the future, one program was not planning on pursuing accreditation in the future, and three programs were unsure. The top reasons cited for not pursuing accreditation or being unsure were that there is no unifying accrediting body

Table 1 Postgraduate trauma APP programs and demographics

Program	Location	Program inception year	Fellows graduating yearly, n	Types of APP graduates from program	Accreditation	Other postgraduate APP programs offered at institution
Ohio Health	Columbus, OH	2016	10	PA and NP	ANCC	Behavioral Medicine
Intermountain Medical Center	Murray, UT	2010	1	PA and NP	None	Primary Care
Carilion Clinic	Roanoke, VA	2017	2	PA and NP	None	8 other specialties
MetroHealth Medical Center	Cleveland, OH	2021	1–2	PA and NP	None	Neuro Critical Care and Addiction Medicine
Atrium Health	Charlotte, NC	2013	4	PA and NP	None	17 other specialties
George Washington University	Washington, DC	2015	2	PA and NP	None	None
Capital Health	Pennington, NJ	2018	1	PA	APPAP	None

ANCC, American Nurses Credentialing Center; APP, advanced practice provider; APPAP, Association of Postgraduate PA Programs; NP, nurse practitioner; PA, physician assistant.

and the process being too costly. Not having enough time and not being of great interest to administrators were other reasons cited for not pursuing accreditation. The top reasons for starting an APP postgraduate program were as a pipeline for recruitment into difficult to train specialties, interest in providing further education for providers, and an opportunity to train APPs in institution-specific protocols. Other less common reasons were business development, financial/economic benefit for the division, to honor their mission of encouraging APPs to practice at the top of their scope, and to advance the PA/NP profession.

We also attempted to understand the educational offerings of postgraduate trauma APP programs as there is no standardized curriculum. The most common core rotations for APP fellows were trauma floor, trauma intensive care unit (TICU), nights, and trauma/surgical stepdown unit with five of the seven programs mandating these rotations. Four programs included EGS and surgical ICU (SICU) in core rotations. Three programs included outpatient clinic as a core rotation. Other less common core rotations included surgical floor, cardiology, renal, infectious disease, neurology, neurocritical care, medical ICU, cardiac ICU, palliative medicine, acute pain service, orthopedics, neurosurgery, pharmacy, anesthesia, otolaryngology, plastic surgery, nutrition, and wound care. Elective rotation offerings by each program were equally varied. The most offered elective rotations were cardiothoracic surgery, neurocritical care and orthopedics (three of seven programs) and EGS, SICU, and physical medicine and rehabilitation (two of seven programs). At least one center offered the following additional rotations as electives: trauma floor, surgical floor, TICU, Trauma/EGS nights, trauma/surgical stepdown, burn, prehospital/air transport, nutrition, community/level III trauma center, rapid response, neurology, neurosurgery, nephrology, radiology, advanced heart failure, palliative care, and pediatrics.

The curriculums for each program were as different as their clinical rotations (table 2). All programs offered didactics and additional certification. Six programs offer simulations for technical skills and procedures and conferences during which the fellow is expected to present. Five programs offer their fellows research opportunities. Five programs have a remediation plan should the fellow be underperforming. Expected procedural competence is variable; however, the most common skills that APP fellows are expected to perform are central lines, arterial lines, chest tubes, and intubation. Only one program offers dedicated surgical first assist training, whereas five programs offer first assist training based on patient availability. For most programs, graduation requirements include passing both clinical and professionalism evaluations and advanced trauma life support in addition to successful completion of procedural

simulations and presentations. In only one program were the fellows expected to complete a research project.

Salary for APP fellows was provided by four of the programs who responded and ranged from 50% to 79% of non-fellow APP salary. Regarding hiring practices of APPs after completion of postgraduate training, programs offered a position to between <25% and 100% of their graduate fellows, with four of six programs offering positions to >50% of their fellows. On graduation, 0%–100% of the APP graduates were hired by the center where they completed their postgraduate training.

Most programs were willing to collaborate with other APP postgraduate training programs on joint initiatives in the future including virtual didactics, research projects, standardizing curriculums and developing an accreditation or verification process. One program suggested partnering with other programs for advocacy purposes and support for training programs.

DISCUSSION

This is the first study to describe broad characteristics of postgraduate APP training programs in trauma in the United States. The findings help elucidate demographic, educational, and administrative aspects of these training programs. The information is pertinent to APPs, given the rising number that are pursuing postgraduate education; to trauma programs, who are looking to hire an increasing number of skilled providers in an ever-changing healthcare landscape; and to national surgical and trauma organization that may influence the education of the APPs. The findings can be used to support APP postgraduate education program development and expansion in addition to curriculum standardization and accreditation processes in the future.

Our study had a rate of return of 75% respondents fully completing the survey. This is like other similar survey studies of APP postgraduate programs, whose return rate was 47%–91%.^{9,14} In this study, only two of seven (29%) of the trauma programs were accredited. Further, only one of the five (20%) non-accredited program respondents were planning on pursuing accreditation. This is consistent with the findings in a national survey of postgraduate PA programs by Kidd *et al* which found that 67% of programs would decline pursuing accreditation.¹³ The reasons cited for not pursuing accreditation in Kidd *et al*'s study were cost (48%) and lack of support (18%), which were similar to our study, that reported cost and lack of unified accrediting body as the top reasons. Regarding main drivers for postgraduate training program creation, the programs in our study reported being a pipeline for recruitment and education as the primary reason with business/economic reasons being secondary.

Table 2 Educational offerings from postgraduate trauma APP programs

Program	Curriculum	Other certifications	Operative first assist training	Graduation requirements	Expected procedural competence	Remediation plan
Ohio Health	Didactics, simulation, fellow presentations	ATLS, FCCS, ultrasound	None	Passing clinical and professionalism evaluations and final exam, completion of procedural simulations and presentations	Art line, CVC, intubation, chest tubes, thoracentesis, paracentesis	Yes
Intermountain Medical Center	Didactics, simulation, research, fellow presentations, institution conferences	ATLS, FCCS, Intermountain Critical Care Conference and Excellence in Trauma Care Conference	Varies	Passing clinical and professionalism evaluations, ATLS, and final exam; completion of procedural simulations, presentations, and research project	CVC, chest tube, intubation, joint reduction, suturing	Yes
Carilion Clinic	Didactics, simulation, research, fellow presentations	ATLS, FCCS, ultrasound	Varies	Completion of the program	Not specified	No
MetroHealth Medical Center	Didactics, simulation, fellow presentations	ATLS, Stop the Bleed	Varies	Passing clinical and professionalism evaluations and ATLS, completion of procedural simulations and presentations	Suturing, laceration repair, CVC, ABG/art line, chest tubes, intubation, I&D	Yes
Atrium Health	Didactics, simulation, research, fellow presentations	ATLS, FCCS, ultrasound	Dedicated	Passing clinical and professionalism evaluations and ATLS, completion of procedural simulations and presentations	CVC, art line, intubation, paracentesis, thoracentesis, chest tubes	Yes
George Washington University	Didactics, simulation, research, fellow presentations	ATLS, FCCS, ultrasound, ENLS, ECMO	Varies	Passing clinical and professionalism evaluations, ATLS, and final exam; completion of procedural simulations and presentations	Independently: CVC, art lines, dialysis catheters, midlines, bedside U/S; with supervision: intubation, percutaneous tracheostomy, PEG, chest tubes	Yes
Capital Health	Didactics, research	Not specified	Varies	Not specified	Not specified	Not specified

ABG, arterial blood gas; APP, advanced practice provider; art, arterial; ATLS, advanced trauma life support; CVC, central venous catheter; ECMO, extracorporeal membrane oxygenation; ENLS, emergency neurological life support; FCCS, fundamental critical care support; I&D, incision and drainage; PEG, percutaneous endoscopic gastrostomy; U/S, ultrasound.

This is similar to what Klimpl *et al* found in a survey of postgraduate APP hospital medicine programs, where training and retaining applicants was cited by all programs as being the main reason for creating a postgraduate training program and building interprofessional teams, managing patient volume, and reducing overhead were secondary reasons.¹⁷ This is reasonable as it is supported by the literature. In a study examining the effect of an APP postgraduate training program on a hospitalist program, Lackner *et al* found that the training program was beneficial to the hospitalist division by reducing costs associated with having unfilled vacancies, improving capacity on the hospitalist service, and providing a pipeline for filling NP and PA vacancies on the hospitalist service.¹⁸

Although no other studies examining characteristics of postgraduate trauma APP programs exist, a similar study to ours was performed by Klimpl *et al*. This study was a survey of postgraduate hospital medicine APP programs that elucidated patterns regarding curriculums across postgraduate programs.¹⁷ He found that, just as in trauma postgraduate training programs, there is no universally mandated clinical rotation. Further, he described a large variety between postgraduate training programs, reporting 20 different clinical rotations offered. Regarding other educational opportunities, all hospital medicine postgraduate training programs offer didactics and additional certification, which was similar to trauma APP postgraduate training programs. Only 70% of hospital medicine postgraduate programs mandated fellow presentations, as compared with 86% of trauma postgraduate programs. Formal procedural skills training is mandated in only 50% of hospital medicine postgraduate programs as compared

with 86% of trauma postgraduate programs. This difference may be explained by the increased number of procedures inherent to the surgical subspecialty as compared with the medical specialty. Finally, although 71% of trauma postgraduate programs expect their fellows to participate in a research project, only 20% of hospital medicine programs mandate participation in a scholarly project whereas another 70% offer the opportunity.¹⁷

In our study, we found that the motivation for developing and maintaining an APP postgraduate program in trauma is similar across programs, and they share some similarities in curriculums; however, the clinical rotations, certifications, and technical skills training offered by the trauma programs are varied. This is likely secondary to the differences in APP utilization across each program. The national trauma community has not yet established standards regarding medical knowledge or procedural competency for the APP in trauma surgery. Refreshingly, all programs demonstrated motivation to continue collaborating with future educational and research efforts aimed at defining a standardized curriculum and optimizing APP utilization. One example of such collaborative efforts between institutions was to define ideal utilization of the trauma APP.¹⁴

There are a few notable limitations to our study. First, although we used multiple methods to identify as many postgraduate trauma programs as possible, it is likely that we did not capture all existing programs. Further, the accuracy of our data is reliant on self-reported data from the PDs. Finally, although our survey underwent several iterations after revisions were made to increase understanding and yield of the questions, our answers were ultimately subject to the PDs' interpretation.

CONCLUSION

This study is the first of its kind developed to understand the content and curriculum of postgraduate trauma training programs for APPs. APPs have proven to serve critical roles in the trauma team, and there is an apparent ongoing interest in postgraduate training. With interest piqued, there is a mutual benefit for administrators and providers alike to invest in APP training given the important impact APPs have on patient outcomes. Ongoing discussion of a standardized educational curriculum and accreditation process at the national level will benefit postgraduate APP programs, trainees, and patient care.

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