Program Evaluation of a Critical Care Advanced Practice Provider Fellowship

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"On my honor as a student, I pledge that I have not received any unauthorized aid on this assignment."

Abstract

Multiple factors such as workforce issues, decreasing resident hours, and increasingly critically ill patients have led to a higher demand of advanced practice providers (APPs) in critical care areas. Given variability in educational programs, previous experience in healthcare, and traditional orientation and onboarding structures, role transition for APPs into specialized areas such as intensive care units remains a challenge. Structured fellowship programs with specialized training in skills and simulation allow for a more robust experience for the new graduate APP but remain underutilized and are rarely described in the literature.

The purpose of this scholarly project was to conduct a program evaluation of an existing APP fellowship program at the author's work site. The evaluation was completed after the graduation of the first cohort in August 2021 and utilized the Centers for Disease Control framework to guide the scholarly project. The results of the program evaluation were presented to the fellowship committee, key stakeholders and executives at the institution and will be used to support and improve the current critical care program, as well as expand into other areas at the institution.

Keywords: fellowship, advanced practice provider, critical care

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Program Evaluation of a Critical Care Advanced Practice Provider Fellowship at an Academic Medical Center

The number of critically ill patients in the United States has steadily increased in the last decade, reaching five to six million patients a year (Kleinpell et al., 2019). Combined with the increasingly complex nature of disease, presence of multiple comorbidities, and high acuity levels, hospitals face increasing numbers of shortages of health care workers to care for these patients. Additionally, reductions on physician resident hours and a worsening shortage of critical care trained physicians have led to unsafe provider staffing models, increasing risk for errors, iatrogenic illness, and substandard care (Kumar et al., 2013; Lois, 2014). Utilization of physician assistant (PA) and nurse practitioner (NP) roles in the intensive care unit (ICU) has been recognized as a cost-effective strategy to help provide appropriate patient care and help to safely address shortages in critical care (Trombley et al., 2018).

Despite an increasing presence and responsibilities in the ICU, role transition for NPs and PAs has commonly been reported as to be quite challenging by both the advanced practice providers (APPs) and the physicians working alongside them (Andrade, 2015). Both NP and PA education and experience can vary greatly from program to program and based on previous personal experience before attending graduate school (Luckianow et al., 2015). While NPs in the ICU typically have experience as a registered nurse (RN) in the ICU, this is not a requirement for entry into many NP programs, and not all acute care programs compel ICU rotations for graduation from acute care programs. Similarly, while PAs often have patient care hours or training before PA school as a nurse's aide, emergency medical technician, or other related health care roles, many have no exposure to the ICU and those that do are often only exposed to critical care in one four to six-week elective rotation (Luckianow et al., 2015). Current education

for APPs encompasses a large range of acute care disease processes that spans adult and gerontological populations, leading to small amounts of knowledge about many disease states but resulting in little confidence on the part of the APP and questionable concentrated comprehension of specialties and areas such as critical care (Sciacca & Reville, 2016). A three to six month orientation period is relatively standard for a new graduate APP in the ICU, but new APPs frequently express doubt in their capacity to perform essential job functions, as well as cope with the pressures and responsibilities of functioning as a provider in the ICU at the end of orientations of these lengths (Andrade, 2015). While current standards for NP and PA educational programs result in masters-prepared providers, much of the role has historically relied on post graduate, on-the-job experience (Schofield & McComiskey, 2015). APPs and ICU intensivists alike agree that this results in sub-optimal experiences for the new graduate APPs, with some physicians reporting that often at the beginning of their practice these APPs function at the level of a medical student (Schofield & McComiskey, 2015). However, work has been done in the past to optimize the education of APP providers in a variety of specialized settings (Kleinpell et al., 2019).

Given these challenges and the anticipation of an even larger presence of APPs in the ICU, attention has turned to improving the educational experience for new graduate APPs in critical care. These programs are frequently referred to as “residencies” or “fellowships,” with the American Nurses Credentialing Center (ANCC) recommending the term “fellowship” for advanced practice nurses. ANCC defines a fellowship as a “planned, comprehensive program through which currently licensed and certified advanced practice registered nurses (APRN) can demonstrate the knowledge, skills, and attitudes necessary to meet the standards of practice defined by a professional society or association or the applicant organization” (American Nurses

Credentialing Center, 2019, p. 10). ANCC offers accreditation of APP fellowship programs entitled, Practice Transition Accreditation Program (PTAP). Of note, ANCC does not mandate a required length of APRN fellowship programs unlike the requirement for RN residency programs accredited by ANCC.

A growing body of evidence supports development and implementation of these fellowship programs in a variety of specialized settings to improve training experiences, patient outcomes, and provider retention (Nolan et al., 2019; Taylor et al., 2017). However, few studies have described results of a formal programmatic evaluation of an APP fellowship program. Nolan and his colleagues described a six-step program evaluation of an oncology APP fellowship that showed graduates were more able to manage complex cancer patients. Additionally, learning points elucidated by the program evaluation allowed the program to continue to improve the training of the oncology APPs (Nolan et al., 2019). While ANCC does not report how many APRN fellowships have PTAP accreditation, Camal Sanchez performed a comprehensive review of 14 APRN fellowships in the United States, though they did not describe length or specialties of the programs (Camal Sanchez, 2018). Andrade reviewed current acute care NP fellowship programs in 2015 and found a total of 11 programs (Andrade, 2015). No published studies were found that provided large-scale data on the average cost to implementing fellowships including salary/stipend and cost of training though Dains and Summers described the cost for a oncology fellowship at $145,450 per fellow per year (2015).

Medical simulation has been shown to be an increasingly effective complementary tool in healthcare, ranging from nursing to medical education and beyond (Bowen et al., 2020; Park & Holtschneider, 2016). Historically, new providers and previous NP/PA fellows have reported experiencing significant learning benefit with simulation experiences and the rich learning

during the post simulation debriefing period. The simulation environment safely replicates high-stakes patient scenarios in a safe learning environment, while attempting to elicit a sympathetic response from the learner as they work through the clinical problem at hand. High-fidelity simulation presents an extremely safe, controlled learning environment to augment a new provider's hands on experience in clinical practice, especially when performed throughout the year long clinical experiences.

At the doctoral student's practice site, the decision was made in 2019 by executive and cardiothoracic leadership to develop a pilot fellowship program for new graduate APPs in the critical care setting with a special focus on cardiothoracic surgery. The fellowship was entitled, Critical Care Advanced Practice Provider Fellowship (CCAPPF). A search was conducted for evidence-based methods for training and education, as well as structured descriptions for existing fellowships. The PTAP program developed by ANCC was selected as the framework for the fellowship with the goal to apply for accreditation as an external marker of excellence. Currently, there are two organizations in the United States providing accreditation for nurse practitioner fellowships, ANCC's PTAP, and the National Nurse Practitioner Residency and Fellowship Training Consortium (NNPRFTC) funded by the Community Health Center, Inc. (CHCI). ANCC has long reviewed and accredited nurse residency programs for new graduate RNs in their PTAP and has worked for the last decade to expand its purview to include NP fellowship programs. For PAs, there are two additional organizations offering credentialing for PA fellowship programs: Accreditation Review Commission on Education for the Physician Assistant (ARC-PA), and Association of Postgraduate PA Programs (APPAP). There are no organizations currently offering joint accreditation for NP and PA programs, though there continue to be discussions by the respective credentialing bodies (Kidd et al., 2021). Given the

institution's familiarity with and current accreditation of their nurse residency program, as well as the extremely rigorous standards set forth by ANCC, PTAP was chosen by program leadership as the standard for developing and implementing the critical care fellowship, with the goal of applying for ARC-PA accreditation in the future.

A general lack of consensus exists regarding appropriate length of APP fellowships, though review of published programs reflects graduation at approximately one year (Andrade, 2015; Caldwell et al., 2019; Keefe Marcoux et al., 2019). Given the published data of year-long fellowships and the co-director's personal experience with a previous year-long fellowship, the decision was made to proceed with a year-long fellowship program.

As a result of careful planning, the fellowship was designed around the five PTAP domains: program leadership, quality outcomes, organizational enculturation, development and design, and practice-based learning. Given that the design and practice-based learning domains were the domains most lacking in current APP education at the student's practice site, the planning team determined that a concentrated review of these domains would be the best focus for a program evaluation. Therefore, the purpose of this doctoral project was to complete a systematic evaluation of the PTAP domains of design and development and practice-based learning in a critical care APP fellowship program at an academic medical center.

Review of Literature

A comprehensive review of the literature was conducted to answer the PICOT question: What are the outcomes of practice-based learning and design and development domains in a critical care APP fellowship? Articles that evaluated the use of skill labs, simulations labs, development of didactic with skill building in APP fellowships were included in the review of literature (ROL).

Literature Review Methodology

Searches were performed in the PubMed, EBSCO, Cochrane, and Web of Science databases, as well as Google Scholar, utilizing the search terms including “fellowship,” “advanced practice provider,” “nurse practitioner,” “physician assistant,” “simulation lab,” “sim lab,” “simulation based,” “critical care,” “intensive care units.” Appropriate optimization of Boolean operators “AND” and “OR” for each database was used to insure capture of all applicable studies. Additional filters were set to human subjects only, adults, and English language, as well as including only studies with the last 10 years.

Any applicable results from these searches were collated in a reference management software program. This resulted in 86 total articles, 16 duplicate articles were removed, resulting in 70 articles. Each of the 70 articles were reviewed for applicability and were excluded if they focused on registered nurse residencies, APP students versus post-graduate program, or were opinion responses to previous articles. Articles were included if interdisciplinary training of NPs or PAs were addressed. This resulted in 23 studies for complete review. The PRISMA table is found in Appendix A with a complete ROL table in Appendix B.

The studies gathered by the search were evaluated for evidence level and quality utilizing the Johns Hopkins Evidence-Based Practice Model criteria (Dang et al., 2022). There were 20 total articles that were research-focused. Three of the studies were randomized controlled trials and level I evidence (Bowen et al., 2020; C. E. Brown et al., 2018; Curtis et al., 2013) and were high quality data. 17 of the studies were level II studies (Ahmed et al., 2019; Allan et al., 2010; Bradley et al., 2021; Brown et al., 2020; K. M. Brown et al., 2018; Cashen & Petersen, 2016; Chan et al., 2013; Dillon et al., 2016; Fehr et al., 2017; Gilfoyle et al., 2017; Jarding et al., 2018; Leibenguth et al., 2019; Murray et al., 2018; Nolan et al., 2019; Reinarz, 2013; Ryan et al., 2019;

Shaw-Battista et al., 2015) and all were high quality data. Three of the studies were level V descriptive-only studies focusing on quality improvement (Dains & Summers, 2015; Kramer & Valente, 2020; Luckianow et al., 2015) of high quality.

Studies Describing APP Fellowships

The rise of APP fellowship programs across a variety of subspecialties over the last 10-15 years (Camal Sanchez, 2018) is reflected in the increasing publications describing APP fellowships. Despite this growth, however, no reports of a comprehensive program evaluation of a full year-long APP fellowship were found. Nolan and colleagues described development and implementation of an APP fellowship in oncology focused on cancer survivorship in a large academic medical center (2019). Taking an existing oncology APP fellowship, leaders implemented a two-week course on survivorship based on feedback from alumni of the oncology fellowship program. A program evaluation of the survivorship course was completed with feedback from 10 APP stakeholders but no such review is noted for the program as a whole. Kramer and Valente described the development of a year-long hematology/oncology APP fellowship including development of the curriculum but did not report any outcomes or systematic program evaluation (2020). No reports of outcomes of full-length fellowships were found in this literature review and there remains little consensus on training criteria or a central database of APP fellowship programs (Klimpl et al., 2019).

Studies Describing Simulation Lab Training for APPs

Since no reports were found of program evaluations of a full-length APP fellowship, reports of the use of simulation to augment APP knowledge or skills were used as a proxy for the state of PBL. A total of 14 articles reported on the utilization of simulation training in post-graduate APP training, with three level I RCTs. Curtis et al. described an RCT with a mixture of

391 internal medicine physicians and 81 NPs, randomizing participants to either usual education or 8 simulation-based modules on communication skills for patients and family with serious illness (2013). Outcomes included patient-reported quality of communication (QOC) as primary, and patient-reported quality of end-of-life care (QEOLC), depressive symptoms, and family-reported QOC and QEOLC as secondary outcomes. Depressive symptoms were improved in the intervention arm, but there was no significant difference in QOC and QEOLC. A similar RCT was performed with 13 neonatal NPs (NNPs) in a level IV neonatal ICU (NICU), randomizing the NNPs either to the control group of test simulation followed by a difficult conversations workshop, or the intervention arm of workshop followed by test simulation (Bowen et al., 2020). This study showed improved empathy, and objective communication skills as perceived by expert observers in the intervention group after a multi-session simulation-based workshop. The sample size of this RCT was small but adequately powered for the purpose of the study, and attempted recruitment of all available NNPs at a single site. Brown and colleagues published a third RCT evaluating self-assessment scores before and after simulation-based palliative care communication skill workshops (2018). Studying a mixed group of residents, fellows, and NPs from two major academic centers, 472 total participants were broken down into the control group of standard education or the intervention group that participated in the communication workshop. The primary outcome evaluated in this study was self-assessment of competency and communication skills, with the intervention showing overall improvement ($p < .001$). Secondary outcomes showed improvement in three of the four metrics evaluated including expressing empathy, discussing spiritual issues, and eliciting goals of care.

Nine other studies utilized simulation for training that included APPs. Allan and colleagues published on simulation-based training for providers in a pediatric cardiac intensive

ICU at a tertiary-care center, with 182 multidisciplinary providers including three NPs (2010). In this quasi-experimental study, data was collected from the participants before and after simulation training and reflected improvement in self-perceived ability to function as code team members, as well as confidence in raising concerns to code leaders; no other objective data was collected. Brown and colleagues studied 30 acute care pediatric NPs at 13 academic medical centers while implementing a multi-institutional simulation boot camp for pediatric NPs (2018). Boot camp curriculum included didactic sessions, case studies, and high-fidelity simulation of a variety of topics encountered by critical care NPs and a pre- and posttest were conducted before and after the boot camp. There was a statistically significant increase in posttest scores (p <.001) and confidence and satisfaction both improved after the simulation. Cashen and Petersen created a simulation scenario-based study for fellows, residents, medical students, and APPs for pediatric pulseless ventricular tachycardia (2016). Utilizing module-based simulation education, they reported an *N* of 110 but only 94 responses from the participants. The only data measured and reported were the written evaluations from participants utilizing a Likert scale of 1-4 (1= not at all, 4=to a great extent) to describe how well the 18 sessions met the objectives with an average score of 3.8. Utilizing 10 simulated decompensated pediatric patient scenarios, Fehr and colleagues evaluated head-to-head performance of team leaders in rapid responses by nurse practitioners versus intensivists-in-training at a children's hospital (2017). Performance was evaluated by two raters utilizing a standardized assessment, though the role and training of the rates are not noted in the study results. Six teams led by NPs and 11 teams led by MDs were evaluated and the only metric reported is that the MD teams outperformed the NP teams.

Somewhat paradoxically to the finding of physician superiority in leading critical scenarios, Murray et al. compared the performance of ICU fellows and NPs after completion of a

simulation program consisting of 16 scenarios. Seventeen total providers managed eight scenarios at the beginning of their training and completed the other eight at the end of their training period with final scores compared head to head. This validated, with a large effect size, that simulation-based programs and methodology is appropriate to use in assessing progress in decision-making skills, as well as equivocal performance of the physicians versus NPs. Completing a multicenter prospective intervention study at four tertiary-care children's hospitals, Gilfoyle et al. studied clinical performance and teamwork of interprofessional resuscitation teams after a simulation-based intervention (2017). Studying a total of 300 subjects including residents, NPs, RNs, and RTs in 51 teams, the primary outcome evaluated was adherence to pediatric advanced life support (PALS) and the secondary outcomes were time to chest compression initiation and teamwork performance, measured after a one-day team training course in PALS, team efficiency, and teamwork in a simulated environment. In a pre- and posttest model, all outcomes showed significant improvement after the intervention (p <.0001 for all). Ryan and colleagues studied seven NPs in four different scenarios utilizing and pre- and posttest design pilot (2019). Implementing a four-hour simulation course for NPs in pediatric emergencies at a training hospital, the authors reported statistically significant improvement in before and after self-assessed comfort levels in team leading (p =.03), sharing a mental model (p =.008), and differential diagnosis for the scenarios (p =.008).

Two simulation-based studies involved training providers to care for patients on extracorporeal membrane oxygen (ECMO) therapies. Based on the results of the initial one-day pilot boot camp focused on 30 acute care pediatric NPs, Brown et al. developed a simulation curriculum for 23 pediatric ICU NPs via a two-day course (2020). Using a prospective pre-post design, 25 NPs from 14 academic centers participated in this study that had three total aims: 1) to

improve knowledge of the NPs for early recognition and treatment of patients in scenarios such as shock, surgical emergencies, and ECMO, 2) improve the knowledge of the NPs regarding resuscitation metrics and 3) to reduce time-to-task performance by the leader of resuscitations. There was a 27% improvement in post-scores after the boot camp educational intervention as well as an improvement in time to task for resuscitation; additionally, at a three month follow up, 100% of participants responded that the course prepared them for critical emergencies. Chan et al. created a simulation-based education module for novice learners for ECMO education at a children's hospital for 26 fellows, RNs, NPs, and RTs (2013). The curriculum included lectures, hands-on experience with ECMO, and participation in emergency scenarios utilizing a mannequin and all participants were administered both written and practical tests with one participant failing the written and one participant failing the practical test. Twenty-two of the 26 participants scored the training at 4 or higher (on a Likert scale where 5=very useful) for improving their knowledge, ability to perform in emergency ECMO scenarios, and overall confidence.

Studies Describing Skills Lab Training for APPs

Six studies explicitly described the utilization of skills labs for APP training. Ahmed and colleagues described a critical care "boot camp" for new, post-graduate APPs at a tertiary-care university affiliated center in the form of a 10-hour day plus prework that consisted of procedural skills training as well as simulation scenarios, followed by high-quality debriefing (Ahmed et al., 2019). Though not a full-length fellowship, outcomes were measured for the nine APPs through pre-boot-camp medical knowledge assessment, simulation-based assessment, self-efficacy scores, and boot-camp evaluation, as well as open-ended feedback solicited by participants. All participants passed the simulation-based assessment and self-efficacy scores were higher in

every metric measured. Leibenguth et al. (2019) implemented a pulmonary ultrasound (US) training skills lab for 11 novice APPs in three different ICUs. This program resulted in a significant increase in pulmonary ultrasound knowledge post-course, with pretest median of 13 and posttest median of 22 ($p < .001$; maximum score 23), as well as an increase in skill and clinical use of pulmonary ultrasound based on pre and post-score comparisons. A descriptive study of the utilization of obstetric ultrasound educational modules and skills lab was performed by Shaw-Battista et al. (2015) in a team of interprofessional obstetric providers including APPs. In the original ultrasound educational offering, 72 professional providers participated; given the success of their initial offerings, the program was adapted to include asynchronous modular education, which had 162 participants. This training consisted of 10 modules with a pre and post-test before and after the modules, as well as a two-hour skills lab. No outcomes other than positive participant evaluations were described by the authors. Reinarz developed a practice improvement project for needle thoracostomy procedures with 18 total NNPs at a large multifacility neonatal practice with NNPs covering NICUs from level II to level IV units (2013). 10 of the NNPs were provided with procedural review education before being asked to perform the competency, while the remaining eight were not given any education before performing the skill. Participants were evaluated using a 21-point rubric and also completed self-evaluations for efficacy and confidence. The group that received additional education had a small positive impact on their performance (mean performance score of 91.2% versus 81.5%); self-assessed confidence was reportedly higher post-skill performance in both groups, though exact figures on each group are not provided.

In 2021, Bradley et al. described the development and evaluation of a two-day skills and simulation course for 16 total providers including 11 APPs in a post-acute acre setting. Four total

skills were evaluated included knee aspiration/injection, gastrostomy tube removal/replacement, tracheostomy tube exchange, and basic suturing, with participants completing a pre- and posttest before a didactic and proctored, dedicated practice time in a simulation lab. Self-confidence and improvement between the pre- and posttests both showed statistically significant improvements (p <.001, p <.001). Jarding and colleagues utilized both skills and simulation in a descriptive study with 17 NNPs at a single center level III NICU (2018). Their goal was to create and validate a procedural checklist measuring the competency of NNPs performing nine NICU high-risk procedures: intubation, laryngeal mask placement, umbilical artery cannulation, lumbar puncture, abdominal paracentesis, chest tube placement, umbilical line suturing, intraosseous access, and defibrillation. Education was provided to all participants for each of the procedures and each skill was evaluated by three individual evaluators, once in real time and two additional times utilizing video recording analysis. Scores from the three evaluations were compared and utilized to validate the checklists, showing high interrater reliability for evaluations NNP procedural skills in a simulation setting.

Summary of Review of Literature

In a review of the literature, no studies were found that described a comprehensive program evaluation on a full, year-long APP fellowship in any specialty, including critical care. While there has been a marked increase in literature in the last five to ten years describing the development of APP training or APP fellowships, none of these describe any measured outcomes of a full year-long program. Additionally, no studies were found that specifically evaluated any of the PTAP domains including PBL or design and development. However, multiple studies evaluated components of both of these domains including high-fidelity simulation and skills lab. These articles focused on the development and effect of interactive or high-fidelity strategies

such as boot camps, communication modules, simulation-based on specific learner outcomes but essentially no programmatic outcomes. Many of the outcomes described relied exclusively or largely on self-reported scores submitted by the participants, with 12 of the 23 studies utilizing improvement of confidence or self-efficacy scores as reported by the learners; all of these studies described improvement of these scores after the interventions. Other studies measured objective data such as faculty feedback, performance on graded skills or simulations, improvement on pre- and post-tests, or some combination of these metrics. Out of 12 studies that described these metrics, 11 showed positive outcomes after the interventions, though some were only slightly improved or with questionable clinical significance. Overall, there were 18 total studies found that support components of an APP fellowship designed around PTAP criteria such as skills labs, simulation, and clustered education in a boot camp format but no formal evaluations of a complete fellowship program exist.

Methods

Program Evaluation Framework

The purpose of this doctoral project was to complete a systematic evaluation of the PTAP domains of design and development and practice-based learning in a critical care APP fellowship program at an academic medical center. The Centers for Disease Control's (CDC) Framework for Program Evaluation in Public Health was utilized as the implementation framework for this project. The intent of this Framework is to identify the impact of a particular program, as well as improving outcomes by systematic evaluation of the components of the program through six key steps (Centers for Disease Control, 1999).

Step 1. Engage Stakeholders

The CDC defines stakeholders as those involved with programmatic operations, those who serve or are affected by the program, or those who have authority or power to change the program (Centers for Disease Control, 1999). Identification and involvement of the key stakeholders is crucial to the success and evaluation of any program.

Three groups of stakeholders at the practice site were engaged in this program evaluation: the APP fellowship committee including director of advanced practice, physician champion/medical director, and fellows from the first fellowship cohort. The APP fellowship committee, consisting of APP leaders from across the institution, serve either as preceptors, lecturers, mentors or teachers for the fellowship, and agreed to participate in the initial interview and selection of the fellows. The physician champion was identified early in the development process as "medical director", a required role for the ARC-PA program. The medical director is a cardiothoracic surgeon and current co-medical director of the cardiothoracic ICU (CTICU), and works closely with APPs in the ICU both as a surgeon and an intensivist. A comprehensive review of the proposed curriculum and experiences was undertaken by the medical director before finalization of the program, with any feedback or suggestions considered and incorporated appropriately. The third group of stakeholders comprised of the two fellows who completed the first cohort of the fellowship. Engagement of the key stakeholders for the program evaluation occurred via questionnaires that were dispersed and returned utilizing the secure Qualtrics program. Each stakeholder was asked the same six questions. The results of the stakeholder assessment follows.

Question 1.

Do you know what components of the fellowship program are currently evaluated? What components/outcomes should be evaluated?

Results. Four of the six respondents (67%) stated that they knew which components are currently evaluated, with two stating they were unsure of what is currently evaluated. No components or outcomes were suggested that are not already evaluated in the current structure of the program.

Question 2.

Do you know what activities are being provided for practice-based learning? What do you think are the three most important activities? Least important?

Results. Five out of six (83%) stakeholders confirmed knowledge of PBL activities provided in the fellowship. Least important PBL activities were case study review and organizational enculturation by one respondent each with no other stakeholders stating an opinion. 100% of respondents listed clinical rotations as one of the most important activities for PBL; 83% of the stakeholders listed simulation and skills lab as one of the most important activities. Two stakeholders (33%) discussed leadership training/education as most important. One respondent each suggested teach backs, mentorship, and promoting quality as priorities.

Question 3.

How does the overall quality of training and education of the critical care fellows differ from training and education of other new graduate APPs?

Results. All respondents believed that the quality of the Fellowship program is superior to training and education of that of non-fellowship trained APPs and all discussed structure as a driving factor behind the success of the program.

Question 4.

Current simulations include: Diabetic Ketoacidosis (DKA), unstable tachycardia, massive gastrointestinal bleed, ruptured abdominal aortic aneurysm, massive pulmonary embolism, COVID-19/tension pneumothorax, intracranial hemorrhage, altered mental status/status epilepticus, hypoxia/congestive heart failure, chronic obstructive pulmonary disease (COPD) exacerbation, cerebral vascular accident, acute respiratory distress syndrome (ARDS), trauma, acute renal failure, post op cardiac surgery patient/hypotension, cardiomyopathy/venoarterial ECMO, pancreatitis/difficult patient, ethyl alcohol (ETOH)/myocardial infarction (MI), toxidrome, acetaminophen overdose (OD)/acute liver failure (ALF), mega-code, breaking bad news. What other critical care situations should the fellow be trained in via simulation?

Results. One respondent (17%) stated that the current list of simulations was adequate. One stakeholder each suggested "leadership, team building, and respect scenarios that involved softer communication skill as a supplementary to clinical focus," "emergency airway acquisition," "septic shock," endocrine derangements including "thyrotoxicosis, myxedema, CIRCI, etc.," and "VV ECMO," respectively, with a total of 83% of respondents suggesting a concept to review in simulation that was not covered by previous offerings.

Question 5.

Evaluation of simulation skills was performed quarterly throughout the fellowship utilizing a standardized form (Appendix D). Is there anything that should be included in evaluation that is not and is four times a year an adequate number of evaluations?

Results. 100% of the respondents stated that the evaluation form was appropriately comprehensive. Four out of the six respondents stated that they felt that quarterly evaluations were the appropriate frequency for simulation skills evaluation. One stakeholder stated that they

thought evaluations could be increased to every other month to allow earlier identification of practice gaps and one stakeholder stated that quarterly assessments would be insufficient if a fellow was not performing well.

Question 6.

What other feedback do you have for the fellowship program design and evaluation?

Results. 83% of respondents responded with positive feedback only. One respondent added recommendations to continue with current structure with specific requests to "continue to incorporate an interprofessional panel to help guide the fellowship" and "solicit feedback from fellows during the year- as you are." One respondent responded asking for "more procedural opportunities; more medical ICU (MICU) experiences".

The stakeholder assessment affirmed the original evaluation design (Step 3) and the questions to be addressed with evidence or data. The majority of respondents were confident in their knowledge of PBL activities offered; additionally, the majority felt that clinical rotations and simulation and skills lab activities are the most important PBL components in the fellowship. There was no clear consensus on the importance of other activities. Minor learnings for improvement of the fellowship included multiple suggestions for additional simulation scenarios, and formalizing plans for when a fellow demonstrates concerning levels of competency on simulation evaluations or shows a lack of progression over a period of time. Sixty-seven percent of those surveyed felt that quarterly assessment of each fellow was appropriate, while 33% felt that increasing the frequency of simulation evaluation may be valuable for early identification and intervention for fellows who may struggle with required skills.

Step 2. Describe the Program

Program Description.

The practice site is a 631-bed, academic level one trauma center with four separate adult intensive care units (ICU), all staffed with APPs in various roles and coverage. The first critical care APPs were hired in the early 2010s, largely to supplement the role of the rotating residents and provide continuity for specific patient populations within that critical care specialty. Since then, the number of APPs in adult and pediatric ICUs has increased exponentially, with an estimated 100 APPs in critical care areas throughout the institution. A critical care fellowship program for APPs, Critical Care Advanced Practice Provider Fellowship (CCAPPF) was developed between 2019-2020 to address transition to practice (TTP) needs within the institution. The first cohort consisted of one PA and one NP who completed the fellowship between August 2020 to August 2021.

The structure of the CCAPPF, subsequently referred to as the fellowship, is a 12-month cycle from cohort to cohort. Because most masters and doctoral degrees for APPs are awarded in the May and December time periods, capturing new graduate NPs and PAs a few months after graduation allowed for a predictable and feasible time period to onboard a new hire into the institution, with new provider credentialing taking approximately two to three months to complete. Utilizing this timeframe for new graduate hires, a start-date in the fellowship of late August/early September was established.

An organized, guided onboarding process for the NP/PA fellows was designed, including guidance during credentialing, obtaining necessary licenses, and all other onboarding requirements. Additionally, the fellowship co-directors provided guidance on procedural credentialing as competency was achieved throughout their rotations and simulation experiences.

APP fellows rotated through a range of acute care services and intensive care units, with a focus on cardiac and vascular care. Fellows worked alongside experienced preceptors three to four clinical days each week (depending on length of workday on service or in the ICU) in addition to one dedicated didactic day per week. Fellows rotated on a service or team during the onboarding period while any unanticipated logistical and technical issues were resolved (i.e. electronic health record access, badge access, etc.). The remaining rotations were balanced between services and ICU's to provide comprehensive exposure to each population. For example, prior to a trauma ICU rotation, the fellows spent approximately two weeks with the trauma service, including operating room time (if applicable). In a 12-month fellowship, the rotation timeline was constructed of approximately nine to ten months of dedicated rotations with two to three months of elective time.

With the expansion of transition to practice programs nationally, more comprehensive accreditation processes have been established (Church et al., 2019). Accreditation provides high-quality program standards, increases the opportunity for program funding as well as the achievement of national recognition for the organization (Church et al, 2019). The co-directors of the critical care APP fellowship began by investigating accreditation options for NP and PA fellowships. Both attended a PTAP conference in late 2019 and early 2020, respectively, to learn about the process and criteria for national accreditation through the American Nurses' Credentialing Center (ANCC). The ANCCs *Practice Transition Accreditation Program* (PTAP) sets the national standard for residency programs for new RNs and fellowship programs for APRNs. The CCAPPF was developed at the student's practice site in alignment with the five domains of the 2020 PTAP Manual's conceptual model: program leadership, quality outcomes, organizational enculturation, development and design, and PBL.

Medical simulation research has shown that the more informed a learner is in a new environment, the greater capacity the learner has to be more focused on the learning activity (Stephenson & Poore, 2016). A basic outline of the didactic structure and clinical rotations set the tone for the fellowship and augment the pre-learning environment (Stephenson & Poore, 2016), so this was developed and provided for the fellows at the beginning of the program. To optimize the learning and educational experience, provide clear expectations, limit anxiety and distractions for the fellows, each candidate received a fellowship manual on their first "Onboarding Day," which included program guidelines and expectations, institutional resources, a general rotation timeline as well as their first few clinical rotation schedules, work hour expectations, and schedule request guidelines. The manual also included a "Day in the Life" daily work flow description for each rotation, including rotation objectives, start times for each unit/service, expectations, attire, where to report each morning, and key contact numbers for the service/unit.

Individual sections within the manual also included key articles and resources pertaining to each rotation to establish baseline knowledge. The resource manual served to consolidate fellowship guidelines and expectations, but also functioned as a way to facilitate organization of resources and learned materials acquired throughout the program. By the end of the CCAPPF, each fellow had an extensive repertoire of key and landmark articles, resources, and clinical protocols relating to a range of trauma, surgical, and critical care topics.

Design and Development.

The goal of the design and development domain of the PTAP accreditation process is that the program design will ensure the success of both the fellows and the future of the program. This domain is the process of building infrastructure and competency requirements so the

program meets its objectives and goals (ANCC, 2019). The infrastructure of the fellowship was built by the co-directors utilizing existing resources including current orientation and onboarding techniques for APPs and available orientation materials provided by the academic center. New structural elements were designed per PTAP criterial for PBL including simulation and skills lab experiences, fellow competency assessment tools, and tools utilized to evaluate fellows.

Selection criteria for clinical preceptors included years of experience, interest in precepting, and engagement in the fellowship program. Preceptors were required to complete basic preceptor education such as teaching styles and feedback delivery, as well as complete a preceptor training module. Clear expectations of preceptors were communicated and provided by the program director and coordinators, including mentorship skills and expectations, APP fellow learning objectives, and clinical benchmarks (such as an increase in patient load responsibilities through progression of fellowship). The goal of these expectations and communications were to achieve a relatively uniform, stable teaching platform for the fellows. Training was provided through various modalities such as computer-based learning modules and resources available on the PTAP website. Preceptors provided in-depth feedback via evaluations at the end of each clinical rotation.

The fellowship curriculum consisted of clinical and didactic instruction. The program included one protected, guaranteed eight to ten hour didactic education day each week, in addition to a full clinical schedule of 36-44 hours per week paired with an experienced APP in the assigned rotation. In additional to the didactic day, APP fellows attended Grand Rounds, critical care lectures throughout the institution, and attendance at weekly morbidity and mortality (M&M) conferences. In collaboration with other expert and senior APP's throughout the institution as well as physician leadership, a monthly critical care-based lecture series was

developed and built into the didactic fellowship curriculum; attendance at these lectures was opened to all APPs throughout the institution, as well as nurses, physicians, and other specialists based on the topic presented. Continuing medical education units were available to all participants. This lecture series promoted education for all APP's throughout the institution, while being guided towards content relevant to APPs in critical care. For example, during the fellows' neuro critical care rotation, an APP expert provided a 60-minute lecture on a neuro-based topic.

As a method of enhancing the knowledge base, research and oral presentation skills, each APP fellow created and presented one case study per month referred to as "teach backs." The purpose of these "teach backs" were to facilitate critical thinking and evidence-based practice about a patient or topic of interest, while fostering multidisciplinary learning across specialties, as well as serve as educational sessions for the fellows. Additionally, the fellows participated in Fundamentals of Critical Care Support (FCCS), a course offered by the Society of Critical Care Medicine, designed to teach the basics of critical care to new nurses, physicians, respiratory therapists, and APPs.

As part of the design and development domain, each fellow also completed either quality improvement or evidence-based practice projects in collaboration with the co-fellow. These collaborative projects encouraged communication, delegation, and accountability while facilitating analysis of a systems-based problem or deficit at the practice site. In addition, the fellows completed an abstract during the program, with the opportunity to expand this work to a formal presentation at a national conference and/or publishable manuscript.

Practice-Based Learning.

Defined as "learning that takes place in the workplace setting under the guidance of preceptors, mentors, or other experienced healthcare professionals, or a combination thereof, and promotes the process of investigating and evaluating professional practices in the context of best-available evidence to continuously improve outcomes" (ANCC, 2019, p. 9), practice-based learning (PBL) focuses on how fellows are taught. Included in this domain are evaluations of development and application of critical thinking and communication skills, as well as the utilization of skills and simulation lab time in achieving those goals. Program specific definitions of PBL for this program evaluation included three subsets: procedural, high fidelity simulation, and performance during clinical rotations.

The PBL procedural activities in this fellowship included: point of care ultrasound, skills labs in arterial and central line insertion, bronchoscopy, para- and thoracentesis, pigtail and large bore chest tube placement, and basic suturing, though not all components included and performed were formally evaluated. Point of care ultrasound (POCUS) is becoming an increasingly valuable bedside tool for diagnosis and management of problems in the critically ill patient. Thus, APP fellows logged point of-care ultrasound encounters, for central or arterial line access, lung imaging, Focus Assessment with Sonography for Trauma (FAST) exams, and bedside echocardiogram. As part of the didactic learning program, fellows spent monthly one-on-one time with the lead sonographer to gain a baseline knowledge of the ultrasound machine and basic critical care ultrasound skills. Additionally, fellows observed online lecture content and evidence-based articles to facilitate their learning in this emerging bedside skill.

CCAPPF fellows participated in monthly skills labs as well to practice arterial and central line placement, bronchoscopy, thoracentesis, paracentesis, and basic suturing techniques

in a safe, controlled environment with highly experienced APPs moderating and teaching. Hands on experience with the equipment in a casual learning environment allowed new providers to familiarize themselves with the equipment and discuss nuances and pearls with experienced operators for each type of procedure. These skills labs were also open to experienced and new providers alike throughout the institution to bolster the APP's general procedural knowledge, allowing multiple APPs throughout the institution to benefit from the resources offered for the fellowship program.

As part of their didactic curriculum and to satisfy the high-fidelity component of PBL, fellows participated in twice monthly simulation experiences ranging from medical, surgical, traumatic and neurologic patient situations, as well as mega-codes requiring ACLS and post-arrest management. The goal of the simulation experiences was for the fellow to assume the role of team leader and "run the room" as a provider, practice clear and closed-loop communication, and master the assessment, diagnosis, and management of common critical care problems. Simulations were developed in conjunction with fellowship committee members and simulation experts within the institution, lasting approximately 15-20 minutes in length with equal time with 20-30 minutes for reviewing the scenario and learning points led by experienced providers trained in running simulations and debriefing techniques. These simulations were originally designed to be performed with both APPs participating in the scenario together in tandem. However, after completing multiple scenarios with the fellows together, it was clear to leadership and the simulation specialists that one of the fellows tended to "take over" running the scenario, leaving the other fellow showing less management and leadership qualities. The simulation was modified so that each fellow ran the same scenario and observed their colleague do the same. Additionally, simulations served as an opportunity for

outcome testing with "testing" simulations performed quarterly throughout the program to formally evaluate the learners' progress, and scored by the co-directors. In summation, unique simulations were performed at least 12 times throughout the fellowship year, with four of these simulations having formal evaluations completed by experienced proctors.

Outcomes

A total of six evaluation tools were used in the fellowship that aligned with the accreditation standards of ANCC's PTAP. These tools included quarterly simulation evaluation (Appendix C), POCUS evaluation (Appendix D), skills evaluation for central line placement (Appendix E), quarterly skills self-evaluation (Appendix F), clinical self-evaluation (Appendix G), and preceptor clinical evaluation (Appendix H). Though the doctoral student did not find evidence of standards for APP competency assessment beyond ANCC's PTAP, a comprehensive evaluation process can provide a strong foundation for the educational curriculum (Sciacca & Reville, 2016).

Evaluations of PBL were completed at various intervals depending on the skill or performance area being evaluated. For simulation experiences, a standardized evaluation was completed by a preceptor and/or skills lab instructor. Pre and post scores were collected and shared with the fellows. These evaluations and feedback provided in a calm, quiet environment served as a critical component to tracking the growth and development of the APP fellow, as well as the overall success of the CCAPPF program. Self-evaluations were performed by the fellows at the beginning, midpoint, and upon completion of the fellowship. Secondly, fellows completed an evaluation of each rotation, and each preceptor completed an evaluation of the fellow rotating with his or her service or unit. The feedback was utilized to address any issues or concerns that emerged, as well as gauge the quality and overall experience of each rotation. The

evaluations were created utilizing a dedicated fellowship account with Google, which can be utilized to track and extract any data for potential analysis or future publication.

APP fellows met monthly with the program director to address any issues and provide higher-level leadership and mentorship. In addition, fellows and coordinators engaged in an informal "check in" on a monthly basis to track any issues, concerns, or challenges with the curriculum, assignments, or clinical environment. Coordinators also facilitated collegial events such as dinners and opportunities to collaborate, commiserate and build co-fellow camaraderie.

Lastly, a final in-person exit interview was performed collaboratively with both fellows, complete with a wide range of questions and open-ended dialogue. An informal exit interview can foster creative discussion on barriers and areas of improvement, and highlight areas of strength within the program.

Step 3. Focus Evaluation Design and Step 4. Gather Credible Evidence

The evaluation design was affirmed through the stakeholder assessment so no significant changes to the design were needed. Five questions were used to structure the systematic evaluation of the design and development domain and the PBL domain of the fellowship. Results are provided below.

Question 1.

What components of the fellowship program are currently evaluated? What components/outcomes should be evaluated?

Development and Design.

Clinical evaluations were completed eliciting feedback from preceptors for each rotation utilizing the same standardized form throughout the year. The program director was responsible

for communicating expectations regarding these surveys as well as assuring their completion, tracking scores, compiling totals, and assuring progression throughout the year. Fellows were also asked to provide feedback for their preceptors to assure continued quality training experiences for the fellows and that information was reviewed after each rotation and again at the end of the year by the fellowship director.

Multiple self-evaluations were also deployed to help measure progression throughout the year. A self-evaluation tool to measure perceived clinical abilities of the fellows was utilized to track confidence levels and abilities to care for patients in the clinical arena. Fellows completed these evaluations quarterly which were reviewed by leadership with special focus on any noted areas of weakness. A separate self-evaluation tool was utilized quarterly by the fellowship to track progression in the fellows' confidence in their procedural abilities. Similarly to the self-evaluations for clinical skills, the results of these evaluations were reviewed by leadership and help guide ongoing feedback and experiences based on concerns expressed by the fellows.

"Fellow teach backs" occurred monthly and consisted of a formal 20-30 minute presentation by each fellow on a topic that they had learned about during that month's rotation. Each of these presentations were evaluated by the director or co-director and feedback was provided to the fellows after each session. Additionally, each fellow chose one teach back to expand upon for an extended end-of-year lecture which was included as the monthly lecture series offered to APPs hospital-wide.

Practice-Based Learning.

Multiple components of the fellowship were evaluated on a regular basis. For PBL, quarterly fellowship simulation evaluations were completed by fellowship leadership with feedback provided to the fellows after each evaluation. Progression of abilities regarding central

line placement were evaluated at three separate points throughout the year after multiple lectures and skill lab sessions on the topic, in addition to any procedural experience gained during actual clinical rotations. Abilities of the fellows to perform appropriate and diagnostic bedside ultrasound including FAST and echocardiography were also measured every three months utilizing a standardized form.

Question 2.

Which activities are being provided for practice-based learning?

Simulation scenarios were completed by the fellows every two weeks with skills being formally evaluated on a quarterly basis. The fellowship director and co-director, as well as an additional NP affiliated with the fellowship program attended a formal training program offered by simulation faculty to aid in developing, implementing, running, and debriefing the simulation scenarios. A total of 22 formal simulations were developed and performed throughout the year in a state-of-the-art medical simulation facility with fellowship leadership and simulation lab staff observing. Topics for the simulations covered a wide range of critical care topics as well as interpersonal skills such as “breaking bad news.” Initially, the fellows worked together to respond to each simulation, acting in tandem to care for the “patient.” However, after completion of the first three scenarios, the decision was made by leadership to split the fellows into two separate groups, running the same scenario twice back to back. This allowed for each fellow to serve as the true “leader” of the scenario versus one fellow dominating the scenario based on comfort level with the topic. Additionally, it allowed one fellow per scenario to observe their co-fellow completing the same simulation after they had, thus adding to their learning throughout the experience. Debriefing sessions were led by fellowship leaders after each simulation with both fellows together employing evidenced-base techniques.

Procedural skills such as arterial and central line placement, bronchoscopy, paracentesis, lumbar puncture, suturing, and chest tube placement (procedures frequently performed in the ICUs by APPs) were also practiced multiple times throughout the year with "skills days" proctored by experienced and credentialed providers. In addition to the two fellows, newer graduate APPs throughout the institution were invited to attend skills days with priority given first to CTICU APPs and then to any critical care APPs. A comprehensive lecture was provided by an experienced provider to the group, which was followed by one-on-one hands-on time with a preceptor and training mannequin specific to the skill being taught. Each attendee and fellow were given the opportunity to complete at least one full completion of each skill as well as ask clarifying and troubleshooting questions.

The increasing utilization of POCUS in the ICU setting is crucial for comprehensive and timely patient care in the critically ill patient. Given the lack of formal POCUS training during most NP and PA programs, POCUS training and evaluation was also chosen for the CCAPPF program. An initial comprehensive lecture on POCUS including FAST, echocardiogram, vessel imaging, and lung evaluation, followed by a separate hands-on session with experienced proctors and specialty POCUS trainers. These sessions were repeated every three months and augmented with real-time patient scenarios both with experienced preceptors as well as the head sonographer.

Question 3.

How does the overall quality of training and education of the critical care fellows differ from training and education of other new graduate APPs?

In comparison to the two fellows in the inaugural class, three advanced practice providers were onboarded in the doctoral student's practice site (CTICU) during the same year. All were

new graduate APPs with two NPs and one PA. Typical orientation time varies for new graduate providers in the CTICU with past experiences ranging from three months to just over five months. In comparison to the CCAPPF fellows, these new graduate hires did not complete any formal POCUS training, participate in additional case studies or teach backs, participate in any skills or simulation time (completing procedures only with a preceptor in real time when an opportunity arose), and received only informal feedback from preceptors throughout their orientation period. Attendance at monthly educational lectures on rotating topics was open to all APPs throughout the institution but not mandated as it was for the fellows. A focused professional practice evaluation was completed on all APPs at the end of 90 days; for APPs trained in the typical manner, this may serve as their only formal evaluation with completed metrics. For APPs completing the fellowship, they were evaluated formally throughout the year complete with detailed documentation of strengths, weakness, and recommendations for continued areas of focus.

At the completion of the fellowship, both fellows applied and interviewed for positions at the fellowship institution. One fellow applied just to the CTICU and one fellow applied to both the MICU and CTICU. One fellow withdrew their application and relocated for family reasons and the remaining fellow accepted a position in the CTICU and began that role shortly after fellowship graduation, leading to a 50% retention rate for the program. In comparison, the retention rate of the same three APPs hired in the CTICU was 66% with one provider leaving after less than a year for a job outside of critical care and the other two remaining in the CTICU. Figure 1 shows the differences between traditional onboarding and the CCAPPF onboarding at the practice site:

Figure 1

Comparison of Traditional Training Versus Fellowship Training for Critical Care APPs

Onboarding Elements	Traditional Critical Care	Fellowship Critical Care
Training period	*3-5 months*	*12 months*
Structured simulation experiences	0	14 sessions
Structured skills experiences	0	14 sessions
Adult ICU rotations	1 ICU	8-9 ICU
Formal POCUS training	None	4 sessions
Critical care lectures with CEUs	None	12 lectures
Teach back presentations	None	12 presentations
Self-evaluations	None	Quarterly
Mentoring program	None	Ongoing through year
Case study completion	None	12 sessions
Weekly hours	~40 (3 12's)	Full clinical schedule + didactic days
Quality improvement project completion	0	1
Committee membership	0	1-2

Question 4.

The fellowship included the following simulations: Diabetic Ketoacidosis (DKA), unstable tachycardia, massive gastrointestinal bleed, ruptured abdominal aortic aneurysm, massive pulmonary embolism, COVID-19/tension pneumothorax, intracranial hemorrhage, altered mental status/status epilepticus, hypoxia/congestive heart failure, COPD exacerbation, cerebral vascular accident, ARDS, trauma, acute renal failure, post op cardiac surgery patient/hypotension,

cardiomyopathy/VA ECMO, pancreatitis/difficult patient, ETOH/MI, toxidrome, acetaminophen OD/ALF, mega-code, breaking bad news. What other critical care situations should the fellow be trained in via simulation?

The current simulations utilized were all validated by the stakeholder evaluations. Multiple suggestions were made by stakeholders for new scenarios in addition to the current offerings. Some were niche and likely only to be encountered in certain patient populations and specialties such as thyrotoxicosis and myxedema. Others such as septic shock and emergency airway acquisition would be broadly applicable irrespective of setting and add to the overall rigor of the fellowship program.

Question 5.

For evaluation of PBL, what was the average rating of each POCUS, skills, and simulation performance in the first fellow cohort using the standardized form? What is an adequate number of evaluations? Are any key elements missing from the standardized evaluation forms?

POCUS.

Given the frequent utilization of POCUS within the critical care setting, POCUS was chosen for formal evaluation at five different points throughout the fellowship year. The rating scale for the POCUS evaluation was:

1- needs additional training/teaching

2- requires frequent guidance/developing

3- requires occasional guidance

4- independent, competent

5- skilled, highly proficient

The POCUS evaluation form focused on utilization of POCUS for FAST/abdominal exams, vessel imaging, components of echocardiography, and lung evaluation. Scores for each fellow for their first POCUS evaluations were 22/110 and 51/110, respectively. For their final evaluation, their scores were 110/110 and 110/110, reflecting an improvement of 400% and 115%, respectively. The POCUS evaluation format reflected the critical components of ultrasound utilization and contained all necessary components of evaluating POCUS performance abilities in the critically ill patient. Given the exponential growth reflected in the scoring tools by both fellows and positive feedback of stakeholders, formal evaluation performed five times a year appears to be adequate.

Central Line Placement.

Central lines were chosen for formal evaluation and progression and performance was measured during three different points during the year; beginning, middle, and end of the fellowship. The rating scale for the central line placement evaluation was:

1- needs additional training/teaching

2- requires frequent guidance/developing

3- requires occasional guidance,

4- independent, competent

5- skilled, highly proficient

Areas evaluated include patient care and procedural skills, medical knowledge, independent practice, direct clinical practice, set up, catheter placement, and completion. Scores for each fellow on their first placement were 16/50 and 22/50, respectively. For the last placement, scores for each fellow were 50/50 and 40/50, respectively, demonstrating an increase of 212% and 82%.

Content of the standardized form and frequency of evaluations of central line placement skills were validated by the stakeholder group as both being adequate with no additions necessary.

Simulation.

Quarterly simulation evaluations were completed by fellowship leadership. The rating scale was

1- needs significant level of additional training/teaching

2- needs moderate amount of additional training/teaching

3- needs limited amount of additional training/teaching

4- independent, competent

5- skilled, highly proficient

6- NA- "not applicable"

The fellows were measured on 27 different aspects including recognition of signs of clinical deterioration, teamwork/collaboration with other team members, thorough exam and request of testing, clear communication and professionalism, delegation and overall performance. Scores for each fellow on their first simulation were 56/135 and 56/135, respectively. For the last simulation, scores for each fellow were 104/35 and 79/135, respectively, demonstrating an increase of 86% and 41%. Figures 2 and 3 depict the outcomes of Fellow A and Fellow B in the PBL domain:

Figure 2

Practice-Based Learning Outcomes for Fellow A

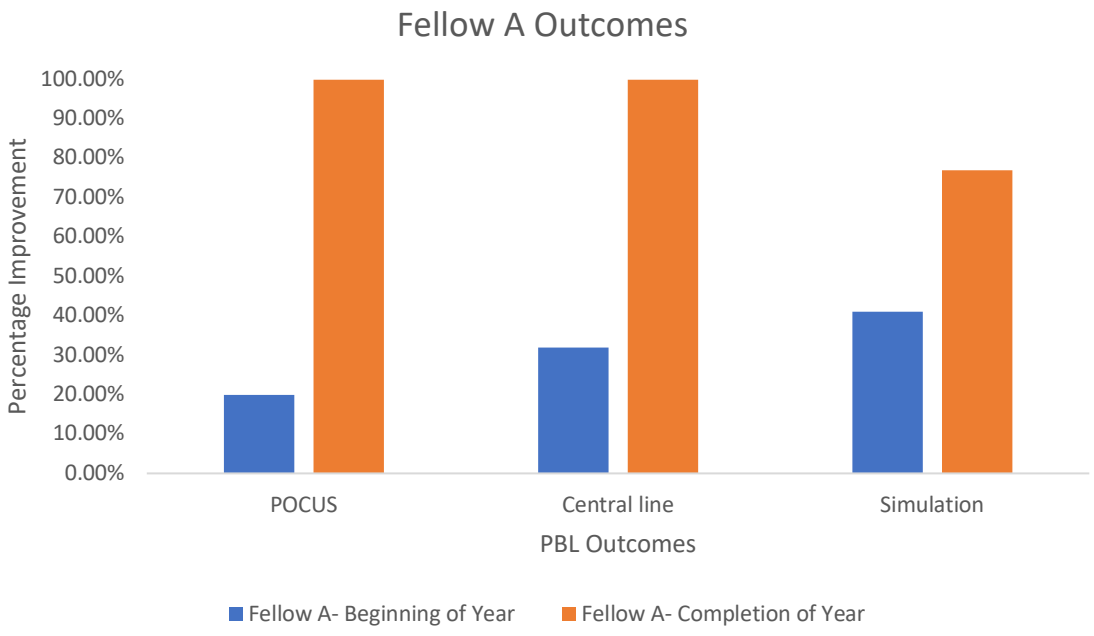
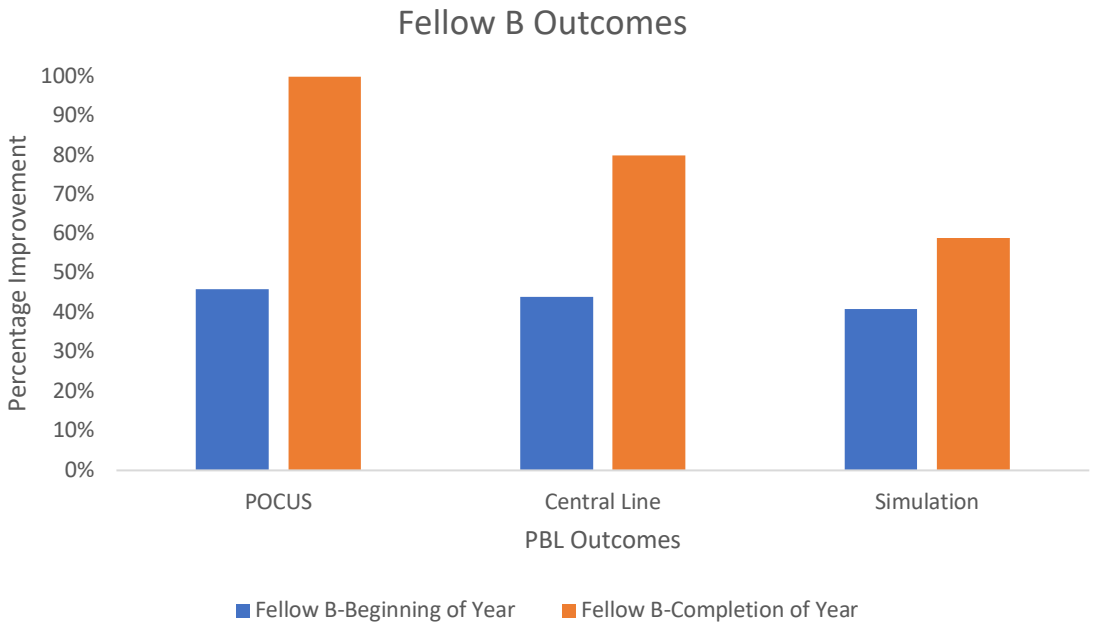


Figure 3

Practice-Based Learning Outcomes for Fellow B



The comprehensive nature of the evaluation forms were validated by the stakeholders; however further evaluation and discussion suggested that increasing the frequency of formal simulation evaluation, using either the same or an abbreviated tool, may help better and sooner identify fellows who need additional training and experiences.

Question 6.

For evaluation of design and development, what was the average rating of clinical evaluations and self-evaluations for skills and clinical performance in the first fellow cohort using the standardized form? What is an adequate number of evaluations? Are any key elements missing from the standardized evaluation forms?

Clinical Evaluations.

The fellow was rated by their primary preceptor for the rotation utilizing a scale of 1-5 with 1- "needs additional training/teaching", 2- "requires frequent guidance/developing", 3- "requires occasional guidance", 4- "independent, competent", 5- "skilled, highly proficient", and NA- "not applicable". Areas evaluated include: professionalism, teamwork and collaboration, working in interdisciplinary teams, consultation, interpersonal and communication skills, systems-based practice, healthcare delivery systems, quality improvement, safety, patient-centered care, independent practice, direct clinical practice, medical/clinical knowledge, clinical and professional leadership, ethics, policy, and informatics and information literacy. Descriptions or examples of each competency were provided for each question and sub-heading. Average scores for each fellow their first rotation were 4.3 and 3.49, respectively. For the last rotation, average scores for each fellow were 4.6 and 3.83, respectively, demonstrating an increase of 7% and 9.7% throughout the year. One potential drawback to measuring progress in this particular way is that evaluations were given by different providers on different units so it is challenging to

directly compare the data when compared to other evaluations that are completed by the same set of individuals. Review of stakeholder responses confirm that both the comprehensiveness and frequency of these evaluations are appropriate and in fact much more complex than what is performed for most other orienting APPs.

Self-evaluation Clinical.

The fellows completed quarterly self-evaluations regarding their confidence in their clinical skills utilizing a scale of 1-5 with 1- "not confident at all" to 5- "extremely confident." They were asked to complete assessments of their perceptions regarding completing consults, collaborating with interdisciplinary teams, developing relationship, accepting guidance and feedback, rounds presentation, and recognizing clinical signs of decompensation. Self-reported scores for Fellow A and Fellow B on perceived clinical abilities were 64/115 and 74/115, respectively, at the beginning and 93/115 and 110/115, respectively at the completion of the fellowship, reflecting a 45% and 35% increase in self-confidence.

Self-evaluation Skills.

The fellows completed quarterly self-evaluations regarding their confidence in their clinical skills utilizing a scale of 1-5 with 1- "not confident at all to 5- "extremely confident." For skills self-evaluation, the fellows were asked to rank their confidence in multiple areas including central/arterial line insertion, pulmonary artery catheter insertion chest tube insertion, bronchoscopy, paracentesis, lumbar puncture, suturing techniques, and POCUS abilities. Self-confidence in these abilities were self-reported by the Fellow A and Fellow B at 94/305 and 97/305, respectively, and 247/305 and 275/305, reflecting a 167% and 184% increase in the fellows' confidence in their ability to perform specific procedures and skills, shown below in Figures 4, and 5. Figure 6 outlines and compares all evaluations completed throughout the year-

long fellowship. The comparison shows the domain evaluated, a brief description, the frequency that the subject was completed, the frequency that the subject was evaluated, the evaluation tool utilized, and any applicable results from the evaluations, allowing for a comprehensive review of all components utilized in the development and execution of the fellowship program.

Figure 4

Development and Design Outcomes for Fellow A

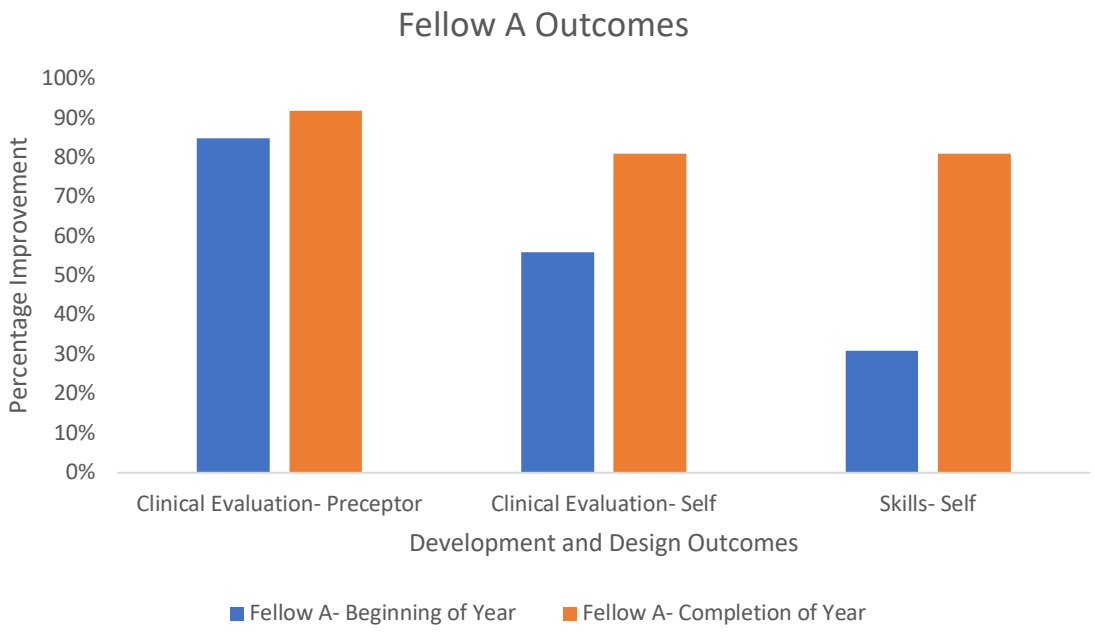


Figure 5

Development and Design Outcomes for Fellow B

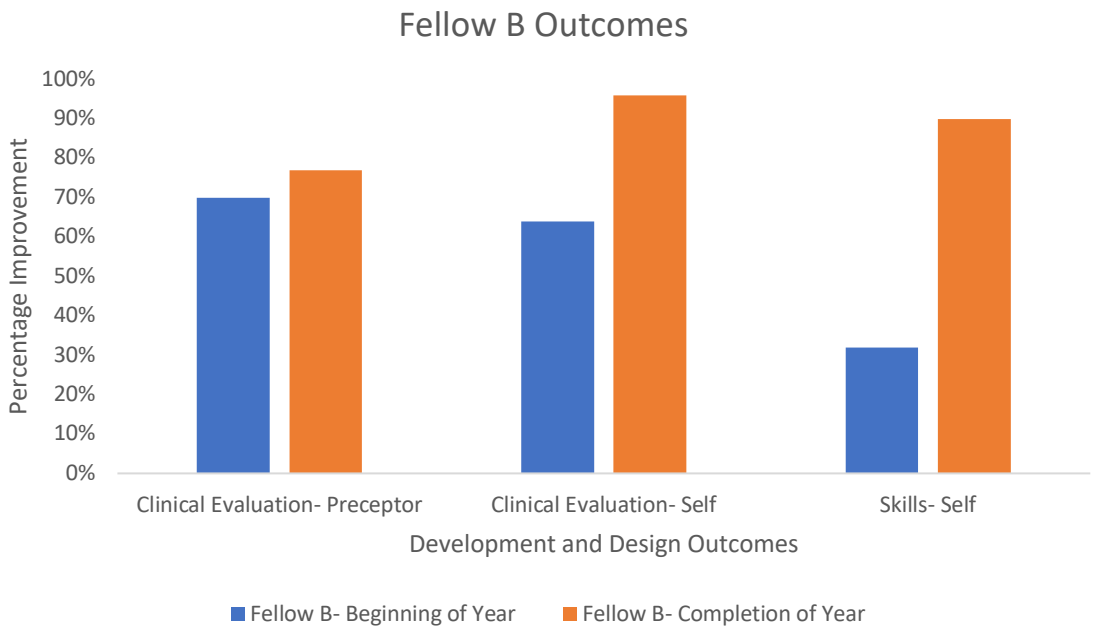


Figure 6

Comparison of All Evaluations in APP Fellowship

	PBL or DD	Brief Description	Frequency performed	Frequency evaluated	Evaluation method/tool	Results
POCUS	Both	Skills lab	Q 3 months	Q 3 months	PBL tool w/ Likert Scale (LS)	257% average improvement
Central line	PBL	Skills lab	3x/year	3x/year	PBL tool w/ LS	147% average improvement
Arterial line	PBL	Skills lab	3x/year	None	-	Completion
Paracentesis	PBL	Skills lab	2x/year	None	-	Completion
Thoracentesis	PBL	Skills lab	2x/year	None	-	Completion
Chest tube placement	PBL	Skills lab	2x/year	None		Completion
Bronchcoscopy	PBL	Skills lab	3x/year	None	-	Completion
Suturing	PBL	Skills lab	Once	None	-	Completion
Simulation	Both	Sim lab	Monthly	Quarterly	PBL tool w/ LS	64% average improvement
Clinical evaluations	Both	Preceptor evaluation of clinical abilities	Ongoing	Monthly	DD tool w/ LS	8.4% average improvement
Self-evaluations clinical	DD	Self-evaluation of clinical abilities	Ongoing	Quarterly	DD tool w/ LS	40% average improvement
Self-evaluations skills	DD	Self-evaluation of skills abilities	Ongoing	Quarterly	DD tool w/ LS	175% average improvement

Step 5. Justify Conclusions

To support and justify conclusions, the evidence collected and reviewed must align with the agreed-upon metrics determined by the stakeholders. Based on the findings of this program evaluation, recommendations were formulated about the fellowship.

Recommendations.

Given the small number of fellows who completed the program in the first cohort and the limited data based on that small cohort, additional graduates from the program with continued assessment of feedback is necessary to make any larger conclusions or broad changes to the program. Additionally, the impact of COVID-19 on the first cohort and therefore the outcomes of the program cannot be overstated. The beginning of the pandemic occurred as initial in-person interviews for the first CCAPPF class began; after quickly pivoting to a virtual-only format for the remaining interviews, offers were quickly extended and accepted. However, much of the planning that had already gone into the fellowship including format and content had to be adjusted to accommodate restrictions such as social distancing, restrictions on new learners in certain environments, and units that house COVID-19 patients that were over-capacity with limited resources to precept and train. Some changes made will likely remain permanent; for example, the addition of a virtual component to interviews and lectures offer a level of flexibility that increased participants and applicants and will be evaluated for the future. Other changes will likely revert to pre-COVID-19 plans and further assessment will be needed.

Five recommendations were presented for changes to the CCAPPF program which included:

- development and implementation of additional simulations
- increasing the frequency of simulation evaluations

- implementation of beginning and end of year evaluations for all skills
- formalization of a performance improvement plan
- completion of a financial analysis.

Simulations.

Data collected from the first cohort shows significant improvement in simulation performance as the fellowship year progressed; additionally, both fellows reported an increase in self-confidence in performance and ability to handle simulation and real-life scenarios. Feedback from the stakeholder interviews validated the current model and simulations being used with suggestions for additional simulations. Considering the breadth of potential clinical experiences across the adult ICU spectrum, it would be challenging to address all possible scenarios through simulation time. While some suggestions from the stakeholders reflected very specialized situations like myxedema or thyrotoxicosis, some suggestions reflected scenarios that would prove to be valuable across all ICU rotations. The addition of emergency airway acquisition and septic shock simulations would add value and strength to the overall experience of PBL in the fellowship and prepare the fellows to manage these situations in the future. Venovenous (VV) ECMO was not included in the first cohort as this was considered a highly specialized procedure. However, utilization of VV ECMO greatly increased during the COVID-19 pandemic and expanded into ICU units that had not provided this highly specialized procedure previously. Thus, it is recommended to add a VV ECMO scenario to the fellowship. In summary, addition of emergency airway acquisition, septic shock, and VV ECMO simulations to the current curriculum is recommended. Based on the improvement of fellow performance in other simulations, the addition of these simulations would serve to strengthen the knowledge and skill of the providers.

While simulations are completed at least monthly, formal evaluations of the components and skill required to be successful in those scenarios are only completed quarterly. Some concern was expressed that quarterly evaluations were too infrequent to track progression or address weaknesses in a timely manner especially if a fellow was not performing at expected levels. While the data showed overall improvement in fellow performance, not all simulation scores improved from month to month and performance was not objectively captured for each simulation. Two recommendations are based on this insight gained: increasing the frequency of simulation evaluations and formalization of a standardized performance improvement plan should the need for one arise in any successive cohorts. While the formal and lengthy evaluation completed four times a year may not be required for every assessment, a shorter tool may serve as a measure of progression for all non-quarterly simulations. Additionally, while some work was done in the first cohort to address perceived deficiencies in a fellow's progression, a formal improvement plan would help to provide structure and documentation of progress, allowing for clear expectations for both the fellow and CCAPPF leaders. Therefore, it is recommended that formal evaluations of simulation occur with each scenario, and that a formal improvement plan be developed for times when scenarios reveal deficits in knowledge or action by the fellow.

Skills Evaluations.

At the time of the programmatic evaluation, POCUS and central line placement were the only skills measured at multiple points throughout the year. Improvement both of these skills was captured in both subjective and objective data from the first cohort. Fellows reported an increase in self-confidence in these skills and observers noted improvement in the technical skills required for central line placement and POCUS performance. While central line placement was chosen for evaluation because of the frequency of this procedure, as ease of utilizing a trainer

mannequin and evaluation of placement components by proctors, there would likely also be value in assessing progression of skills and ability in other procedures such as arterial line, chest tube, and bronchcoscopy. While time and space is limited for repeating all of these skills labs three total times, leaders should consider completing evaluations before the first and after the second lecture and skill completion for the remaining procedural skills. Evaluation of growth of the abilities of the fellows in these specific scenarios would allow a final repeat of a skill that the fellows showed the least improvement in or expressed interest/need in repeating a final time

Financial Analysis.

A financial analysis was not completed as part of this program evaluation. However, the cost of fellowships and return on investment should be calculated to sustain growth and quality and outcomes. Fellows' salaries, supplies for skills labs such as central line kits, time charged for simulation lab, administration time by coordinators, directors, and other fellowship leaders, retention, decreased orientation time and increased skill abilities for previous graduates, and overall return on investment will all factor into an in-depth analysis to present to executive leadership. Therefore, it is recommended that a complete financial analysis of the cost of the fellowship program be completed before graduation of the next cohort.

Step 6. Ensure Use and Share Lessons Learned

After completion of the evaluation of the practice-based learning and development and design domains of the CCAPPF, the key stakeholders were updated on the findings and the plan to address any deficiencies or areas for improvement. The doctoral student submitted the full evaluation findings to the stakeholders via visual presentation with sufficient time for a question and answer period. An abridged executive summary was provided via presentation to fellowship

committee members, current and previous fellows, co-directors, medical directors, as well as chief nursing and medical officers (Appendix I).

Conclusion

A variety of factors including workforce issues, staffing, and high complexity patient needs have led to an increasing need for APPs in the critical care setting. The acknowledgement that current traditional educational programs and on-the-job training may not be adequate for some providers and/or clinical settings is crucial to improving the current orientation and onboarding process for NPs and PAs alike. The makeup of a formal, year-long fellowship program provides the necessary additional training for APPs to care for critically ill patients at the top of their scope of practice. Utilization of ANCC's PTAP framework and its six domains allows for structured, evidence-based programs to be built around the needs of these providers, ultimately improving patient care, job satisfaction, and retention. While there has been a large increase in the number of these fellowship programs across the US, there remains a lack of formal studies reviewing the outcomes of these programs and no studies or reports were found in the literature describing a systematic evaluation of any of the PTAP domains in a critical care fellowship for APPs. This program evaluation was aimed at addressing this area of need and completed after the graduation of the first successful cohort using the CDC 6-step program evaluation framework for the practice-based learning and design and development domains of the PTAP structure This evaluation showed improved outcomes in the PBL and development and design domains as measured by competencies and evaluations in the curriculum, clinical, skills, and simulation arenas. There is evidence from this program evaluation that there is a strong presence of the development and design criteria but stronger evidence of the PBL domain specifically in the simulation and skills results. Five recommendations were based on these

conclusions and presented to stakeholders and leadership. Given the accelerated growth of APRN and PA programs, the increasing utilization of critical care, and shifts in resident and attending workforce issues, fellowships that are evaluated systematically for optimal outcomes at the program and learner level can fill a significant post-graduate learning need to enhance confidence, performance, and patient care.

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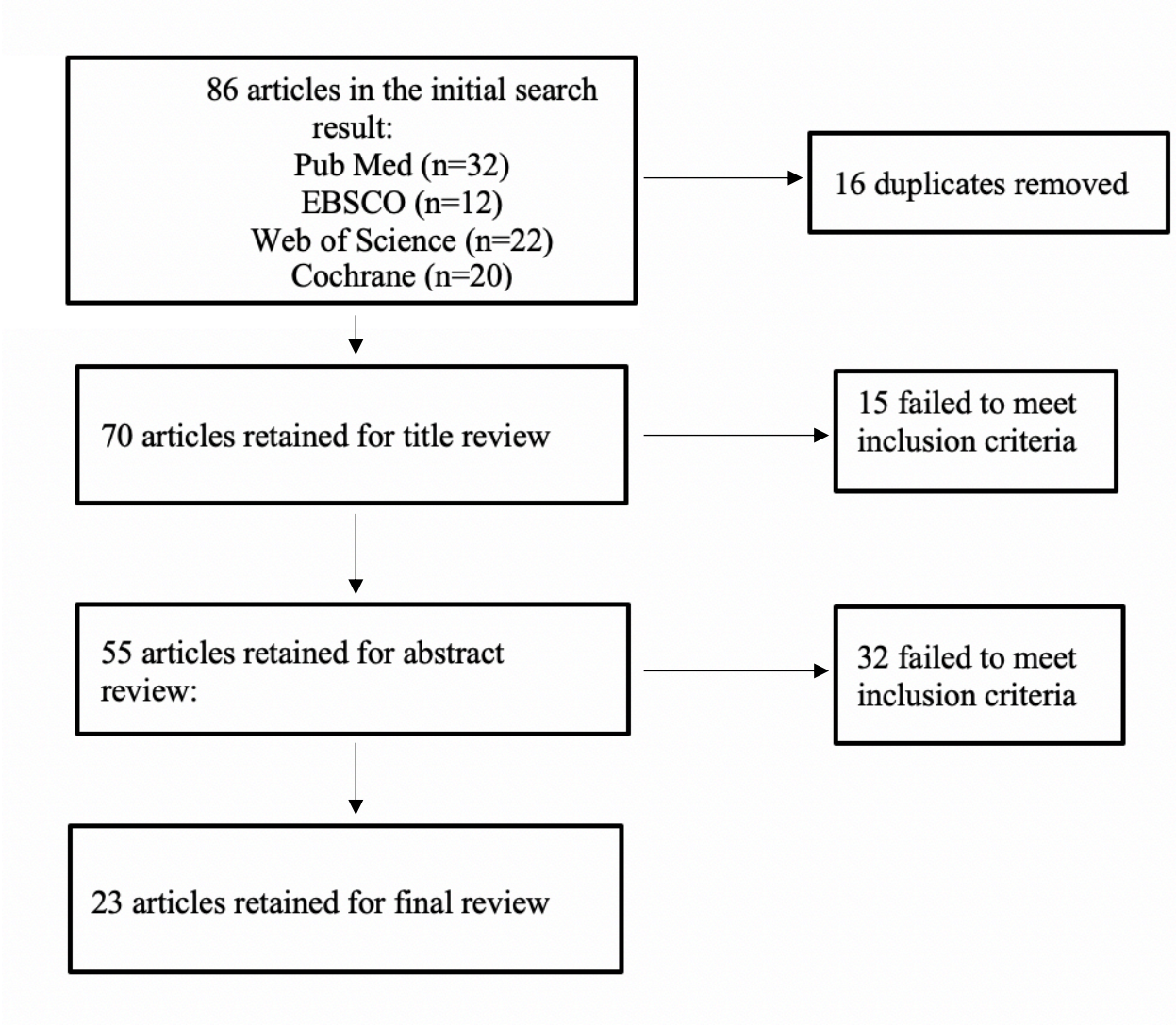
Appendix A. Prisma Table



Appendix B. Literature Review Matrix

Reference	Design, Sample Size	Setting, Subjects, Intervention	Outcomes	Quality and Limitations
Ahmed, R. A., Botsch, A., Ballas, D., Benner, A., Hammond, J., Schnick, T., Khobrani, A., George, R., & Polansky, M. (2019). Advanced Practice Provider Critical Care Boot Camp: A Simulation-Based Curriculum. *Journal of medical education and curricular development*, *6*, Article 2382120519840350. https://doi.org/10.1177/2382120519840350	Before and after design Self-efficacy for learners and faculty evaluations 9 APPs	Tertiary-care, university-affiliated center. 10-hour bootcamp for mixed roles, 9 total APPs, 8 without prior critical care experience	Improvement in self-efficacy scores from pre-intervention Faculty reported "consistently or extremely effective" for all items	Level II Quasi experimental Small sample size Single site study No long-term evaluation
Allan, C. K., Thiagarajan, R. R., Beke, D., Imprescia, A., Kappus, L. J., Garden, A., Hayes, G., Laussen, P. C., Bacha, E., & Weinstock, P. H. (2010). Simulation-based training delivered directly to the pediatric cardiac intensive care unit engenders preparedness, comfort, and decreased anxiety among multidisciplinary resuscitation teams. *Journal of Thoracic and Cardiovascular Surgery*, *140*(3), 646-652.	Before and after design Usefulness, self-perceived ability to run codes, confidence in voicing concerns 182 provider, 3 NPs	Tertiary-care, university-affiliated center. Simulation-based Crisis Resource Management training course; running codes, placing on ECMO Multidisciplinary including RNs, MDs, RTs, NPs	Participants scored usefulness 4 of 5 or higher Improvement in self-perceived ability to function as code team member Improved confidence in raising management concerns to code leader	Level II Quasi experimental Single site study No long-term evaluation or objective data that team function improved during real codes
Bowen, R., Lally, K. M., Pingitore, F. R., Tucker, R., McGowan, E. C., & Lechner, B. E. (2020). A simulation based difficult conversations intervention for neonatal intensive care unit nurse practitioners: A randomized	RCT w/ intervention arm-flipped order of test and intervention	Level II, IV NICU Difficult conversations workshop Control group (n=5)- test	Intervention group improved empathy, objective communication skills perceived by expert observer	Level I RCT Small sample size

controlled trial [Journal Article; Randomized Controlled Trial]. *PLoS One*, *15*(3), e0229895.	N = 13 neonatal NPs out of 30 recruited	simulation, workshop, Intervention group (n=7)- reverse of control- workshop then test simulation		Single site study Given post-test but no pre-test Low participation in recruited subjects
Bradley, S., Lindquist, L. A., Jones, E. M., Rowe, T. A., O'Brien, K. T., Dobschuetz, D., Argento, A. C., Mitra, D. L., Leonard, C., Cohen, E. R., Wayne, D. B., & Barsuk, J. H. (2021). Development and evaluation of a simulation-based mastery learning maintenance of certification course. *Gerontol Geriatr Educ*, 1-10.	Pretest-posttest N= 16 (5 MDs 11 APPs)	2 day course Skills pretest for procedures; didactic for each skill w/ real-time feedback	Improvement between pre and post test skills, self-confidence	Level II Small sample size Single site study No long term data
Brown, C. E., Back, A. L., Ford, D. W., Kross, E. K., Downey, L., Shannon, S. E., Curtis, J. R., & Engelberg, R. A. (2018). Self-assessment scores improve after simulation-based palliative care communication skill workshops. *Am J Hosp Palliat Care*, *35*(1), 45-51.	RCT N = 472 (residents, fellows, NPs)	Mixed group- residents, fellows, NP students and NPs Control group (n = 240)- standard education Intervention group (n = 232)-	Improvement of self-assessed competency, communication skills	Level I Self-assessment only
Brown, K. M., Hunt, E. A., Duval-Arnould, J., Shilkofski, N. A., Budhathoki, C., Ruddy, T., Perretta, J. S., Keslin, A. N., Stella, A., Slattery, J. M., & Nelson-McMillian, K. (2020). Pediatric critical care simulation curriculum: Training nurse practitioners to lead in	Prospective pre-post test intervention	2 day course N= 25 NPs	Improved knowledge scores by 27%; time to task for resuscitation improved; 3 mo out 100% of participants agreed or	Level II Small sample size Some longer term data

the management of critically ill children. *Journal of Pediatric Healthcare*, *34*(6), 584-590.			strongly agreed course prepared them for critical emergencies	
Brown, K. M., Mudd, S. S., Hunt, E. A., Perretta, J. S., Shilkofski, N. A., Diddle, J. W., Yurasek, G., Bembea, M., Duval-Arnould, J., & Nelson McMillan, K. (2018). A multi-institutional simulation boot camp for pediatric cardiac critical care nurse practitioners. *Pediatric Critical Care Medicine*, *19*(6), 564-571.	Prospective pre/post interventional pilot N = 30 acute care peds NPs	13 academic medical centers in North America 1 day simulation bootcamp	Increase in post-test scores and improvement in median time to recognize/treat acute deterioration	Level II Small sample size
Cashen, K., & Petersen, T. (2016). Pediatric pulseless ventricular tachycardia: A simulation scenario for fellows, residents, medical students, and advanced practitioners. *MedEdPORTAL*, *12*, 10407.	Pre-post written eval N= 110	Module based simulation education Residents, fellows, med students, APNs over 18 sessions	94 total responses Likert scale 1-4, 3.8 said met objectives	Level II Larger sample size than others
Chan, S. Y., Figueroa, M., Spentzas, T., Powell, A., Holloway, R., & Shah, S. (2013). Prospective assessment of novice learners in a simulation-based extracorporeal membrane oxygenation (ECMO) education program.	Pre-post testing on knowledge, ability, confidence N= 26	Fellows, RN, NP, RTs Simulation based educational module	All participants scored 4 for usefulness with 5 being very useful Knowledge, ability, confidence pre and post tests Repeated test in 6-8 months (only 20 participants)	Level II Some longer term data but some lost to f/u
Curtis, J. R., Back, A. L., Ford, D. W., Downey, L., Shannon, S. E., Doorenbos, A. Z., Kross, E. K., Reinke, L. F., Feemster, L. C., Edlund, B., Arnold, R. W., O'Connor, K., & Engelberg, R. A. (2013). Effect of	RCT N = 391 IM, 81 NP	2 academic centers 8 sessions sim based vs usual education	Improvement in Patient/family reported quality of communication and quality of end of life care;	Level I Multiple centers

communication skills training for residents and nurse practitioners on quality of communication with patients with serious illness: a randomized trial. *JAMA*, *310*(21), 2271-2281.			depression scores, communication in intervention arm	
Dains, J. E., & Summers, B. L. (2015). Filling the gap: a postgraduate fellowship in oncology nursing. *J Nurs Adm*, *45*(3), 165-171. https://doi.org/10.1097/nna.0000000000000177	Descriptive			Level V
Dillon, D. L., Dolansky, M. A., Casey, K., & Kelley, C. (2016). Factors related to successful transition to practice for acute care nurse practitioners. *AACN Adv Crit Care*, *27*(2), 173-182.	Descriptive, correlational-comparative design pilot study N=34	ED and ICU setting for new grad ACNP	Organizational support, communication, leadership most important for successful transition	Level II
Fehr, J. J., McBride, M. E., Boulet, J. R., & Murray, D. J. (2017). The simulation-based assessment of pediatric rapid response teams. *Journal of Pediatrics*, *188*, 258-262.e251.	Descriptive Head to head eval of MD vs NP team leader	RN, RT, NP, MD teams 7 acutely decompensating patient scenarios	Ranked by 2 observers No other outcomes	Level II
Gilfoyle, E., Koot, D. A., Annear, J. C., Bhanji, F., Cheng, A., Duff, J. P., Grant, V. J., George-Hyslop, C. E. S., Delaloye, N. J., Kotsakis, A., McCoy, C. D., Ramsay, C. E., Weiss, M. J., Gottesman, R. D., & St George-Hyslop, C. E. (2017). Improved clinical performance and teamwork of pediatric interprofessional resuscitation teams with a simulation-based educational intervention.	Multicenter prospective interventional study	4 tertiary-care children's hospitals in Canada Residents, ICU NPs, RNs, RTs N= 300; 51 teams	Primary outcome-change in adherence to PALS guidelines; secondary change in time to chest compression initiation and teamwork performance	Level II

Pediatric Critical Care Medicine, *18*(2), e62-e69.				
Jarding, L., Hogden, L. A., Messier, S. E., Kozmenko, V., Simanton, E., Bjornson, K., & Brockmueller, C. O. (2018). Development and validation of simulation-based procedural checklists for evaluation of neonatal nurse practitioner performance. *Advances in Neonatal Care*, *18*(5), 386-392.	N = 17 NNPs Evaluation/descriptive	Simulated performance of 9 high-risk NICU procedures Self and peer assessment tool evaluated once in real time, 2 additional video recording analyses		Level II Small sample size
Kramer, J. A., & Valente, C. P. (2020). Development of a hematology-oncology advanced practice provider fellowship program. *Journal of the Advanced Practitioner in Oncology*, *11*(4), 407-410. https://doi.org/10.6004/jadpro.2020.11.4.7	Descriptive review of oncology APP fellowship	Large tertiary center NPs and PAs in oncology	No report of outcomes	Level V
Leibenguth E., Magdic K., Loeslie V., Yadav H., Guttendorf J (2019). Implementation of pulmonary ultrasound training for critical care advanced practice providers. *J Am Assoc Nurse Pract. 31*(4):247-254. Doi: 10.1097/JXX.0000000000000128. PMID: 30624337.	Comparative design w/ pre and post-implementation; 11 novice APPs across 3 ICUs	Large tertiary teaching hospital in Minnesota 15 month program w/ initial 4 hour pulm US training course, pre and post tests at multiple points	Significant increase in pulm US knowledge after course, overall increase in skill and clinical use of pulm US	Level II Small sample size Quasi experimental Single site study
Luckianow, G. M., Piper, G. L., & Kaplan, L. J. (2015). Bridging the gap between training and advanced practice provider critical care competency. *Journal of the American Academy of*	Descriptive apprenticeship model N=4	New grad PAs (3) and NPs (1) Measured at 3 and 6 months on 6 core competencies	75% remain in acute care setting	Level V No description of outcomes or objectives

PAs, *28*(5), 1-5. https://doi.org/10.1097/01Jaa.0000464711.42477.79				
Nolan, T. S., Hatfield, R., Browning, K. K., Kue, J., & Klemanski, D. L. (2019). Survivorship fellowship: evaluation and evolution of a program for advanced practice providers. *Clin J Oncol Nurs*, *23*(6), 575-578. https://doi.org/10.1188/19.Cjon.575-578	Descriptive review	Oncology APP fellowship at large academic center Program stakeholders n = 10	APP fellowship alumni better able to manage complex cancer survivors	Level II Improved perception of ability of APP fellows to care for cancer patients
Murray, D. J., Boyle, W. A., Beyatte, M. B., Knittel, J. G., Kerby, P. W., Woodhouse, J., & Boulet, J. R. (2018). Decision-making skills improve with critical care training: Using simulation to measure progress. *Journal of Critical Care*, *47*, 133-138.	Comparative design w/ scenarios at beginning and end of training Evaluating validity of simulation to evaluate decision making skills N= 17	ICU Fellows and NPs 16 scenarios 60-90 min sessions beginning and end	Raters served as evaluators Significant increase in scores over time	Level II Small N
Reinarz, S. (2013). Initiation of a neonatal nurse practitioner competency activity in needle thoracostomy. *Adv Neonatal Care*, *13*(4), 238-246.	Descriptive PI project N= 18 (10 review, 8 no review)	Procedural review, simulation 6-week period DNP program in Academic SON	Small impact on performance	Level II Small N Concern that participants shared experiences
Ryan, A., Rizwan, R., Williams, B., Benscoter, A., Cooper, D. S., & Iliopoulos, I. (2019). Simulation training improves resuscitation team leadership skills of nurse practitioners. *J Pediatr Health Care*, *33*(3), 280-287.	Pre and post self-test N=7	4 scenarios NNPs	Improvement in comfort levels, time to sharing	Level II Very small N

Shaw-Battista J, Young-Lin N, Bearman S, Dau K, Vargas J. (2015). Interprofessional obstetric ultrasound education: Successful development of online learning modules; Case-based seminars; And skills labs for registered and advanced practice nurses, midwives, physicians, and Trainees. *J Midwifery Womens Health. 60*(6):727-34. Doi: 10.1111/jmwh.12395. PMID: 26769384.	N= initial course 72 N= 162 for expanded program Descriptive	10 asynchronous web modules RNs, CNMs, NPs, PAs, MDs Modules, 2 hour skills lab Pre and post test for modules	Evaluations were positive No other endpoints or objectives studied or described	Level II No objective evaluation

Appendix C. Quarterly Simulation Evaluation

Advanced Practice Provider Fellowship
Quarterly Simulation Evaluation

APP Fellow
Name:_____

Simulation #: _____Date:_____

Please complete the following assessment of the APP fellow's performance during the quarterly testing simulation. *To be completed quarterly throughout the program.*

Advanced Practice Provider Clinical Role		
Rating Scale **1**-Needs significant level of additional training/teaching **2**-Needs moderate amount of additional training/teaching **3**-Needs limited amount of additional training/teaching **4**-Independent, competent **5**-Skilled, highly proficient **NA**-Not Applicable		
Score the APP Fellow's performance with:		
Teamwork and collaboration with interdisciplinary team members such as nursing, consultants, nutrition, PT/OT, radiology, etc.		
Obtaining a complete health history and physical examination of the patient in a comprehensive and timely manner.		
Identification of normal and abnormal clinical findings and incorporates them into the patient assessment and plan of care.		
Developing differential diagnoses and appropriate plan of care.		
Ordering and interpretation of diagnostic tests and applying its relevance to the patient's condition.		
Monitoring and recognition of ongoing physiologic and clinical changes		
Demonstration of evidence yielding differential diagnoses and contingency plan		
Quickly recognizes and articulates the clinical problem		
Ability to deploy a systematic approach to the problem and treatment plan		
Keeping team members informed about situation		
Utilization of clear, direct, closed-loop communication.		
Seeking and listening to advice and analysis of team members		

Clear and professional communication to nurse/medical team/family		
Overall ability to make appropriate medical decisions		
Exhibiting a sense of urgency for the situation		
Ability to remain focused, calm, and poised despite a patient's clinical deterioration.		
Delegating tasks and coordinating with team/consultants as applicable		
Recognizing signs of neurologic deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of cardiovascular deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of respiratory deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of hemodynamic deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable surgical or trauma patient.		
Recognizing signs of metabolic derangements such as lactic acidosis or acute renal failure and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of endocrine system derangements such as DKA or HHS and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of hemorrhage and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of oncologic complications and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.		
Recognizing signs of distributive shock and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient patient.		
Overall performance in the role of Advanced Practice Provider.		

Appendix D. Quarterly POCUS Evaluation

Advanced Practice Provider Fellowship
Quarterly Point of Care Ultrasound Skills Evaluation

APP Fellow Name:_____

Date:_____

The POCUS Skills Evaluator will ask the fellow to do the following:

- ❑ **Preparation**:
  - ❑ Verbalize 2 rationale for using bedside echocardiography in critical care.
  - ❑ Verbalize 2 rationale for using lung ultrasound in critical care.
  - ❑ Verbalize 2 rationale for utilizing FAST/abdominal imaging in critical care.
  - ❑ Verbalize 2 rationale for utilizing vessel imaging in critical care.
  - ❑ Consult the patient on the procedure and purpose of the bedside POCUS exam.
  - ❑ Position the room/equipment/patient appropriately for proper imaging.
  - ❑ Turn on ultrasound, enter patient's information for the purposes of obtaining and saving images.
- ❑ **ECHO**: Perform a full bedside echo exam: PSL, PSS, A4C, SubX views
  - ❑ Adequately obtain images above
  - ❑ Accurately interpret images as above
  - ❑ Accurately obtain a TAPSE measurement utilizing M-Mode (optional)
  - ❑ Accurately obtain a VTI measurement utilizing the calculation feature and pulse-wave doppler (optional)
- ❑ **FAST**: Perform a full FAST exam: Morrison's Pouch, Splenorenal space, Pouch of Douglas, and SubX views
  - ❑ Accurately obtain images as above
  - ❑ Accurately interpret images as above
- ❑ **LUNG**: Accurately obtain adequate anterior and lateral views for lung imaging
  - ❑ Accurately interpret findings of anterior and lateral views for lung imaging.
  - ❑ Accurately utilize M-Mode for evaluation of pneumothorax.
  - ❑ Accurately obtain color flow doppler to assess for valvular regurgitation.
- ❑ **VESSEL**: Accurately obtain adequate transverse and longitudinal views of major vessels, i.e. internal jugular, radial artery, brachial artery, femoral vein, femoral artery.
  - ❑ Accurately interpret findings within major vessels, such as depth, presence of clot, calcifications, lack of blood flow, compressibility, etc.
  - ❑ Utilization of color flow and pulse-wave doppler features to evaluate pulsatile and nonpulsatile vessels.
- ❑ **Completion**:
  - ❑ Properly save images for review.
  - ❑ Demonstrate proper management of the ultrasound machine, including placing in "sleep mode," proper surface and probe cleaning, and restoring the machine to its original location, plugged in.

APP Fellow Name:_____

Date:_____

The POCUS Skills Evaluator will complete evaluation of the APP Fellow based on the listed competencies.

Rating Scale: **1**-Needs additional training/teaching **2**-Requires frequent guidance/developing **3**-Requires occasional guidance **4**-Independent, competent **5**-Skilled, highly proficient	
COMPETENCY: **Patient Care and Procedural Skills** Compassionately identifies, respects, and integrates patient's values and belief systems into clinical decision making. Prescribes, fully informs, and performs necessary medical procedures. **Medical Knowledge** Provides a systematic and investigative approach to learning and medical decision making. Applies medical knowledge to clinical practice. Demonstrates an ability to teach others. **Independent Practice, Direct Clinical Practice** Functions independently practicing within the confines and at the highest scope of practice. Provides comprehensive care including diagnosis, management, medication prescription, health promotion, health maintenance, counseling, referral, procedural, palliative, and end of life care for patients and families. Utilizes clinical and health assessment skills to differentiate between normal, variations of normal, and abnormal findings.	**Evaluator Rating**
APP Fellow can verbalize 2 rationale for utilizing bedside echocardiography in the critical care setting.	1 2 3 4 5 NA
APP Fellow can verbalize 2 rationale for utilizing lung ultrasound in the critical care setting.	1 2 3 4 5 NA
APP Fellow can verbalize 2 rationale for utilizing FAST/abdominal imaging in the critical care setting.	1 2 3 4 5 NA
APP Fellow can verbalize 2 rationale for utilizing vessel imaging in the critical care setting.	1 2 3 4 5 NA
APP Fellow can adequately consult and describe the procedure to the patient and rationale for bedside imaging.	1 2 3 4 5 NA
APP Fellow can position patient, bed, room equipment, and ultrasound appropriately to obtain optimal imaging.	1 2 3 4 5 NA
APP Fellow can turn on the ultrasound and enter the patient's name and MRN to save images.	1 2 3 4 5 NA
ECHO: APP Fellow can accurately obtain PSL, PSS, A4C, and SubX views.	1 2 3 4 5 NA
ECHO: APP Fellow can accurately interpret PSL, PSS, A4C, and SubX views.	1 2 3 4 5 NA
ECHO: APP Fellow can accurately obtain a TAPSE measurement utilizing M-Mode. (Optional)	1 2 3 4 5 NA
ECHO: APP Fellow can accurately obtain a VTI measurement utilizing the calculation feature and pulse-wave doppler. (Optional)	1 2 3 4 5 NA
ECHO: APP Fellow can accurately obtain color flow doppler to assess for valvular regurgitation.	1 2 3 4 5 NA
FAST: APP Fellow can accurately obtain views of Morrison's Pouch, Splenorenal space, Pouch of Douglas, and SubX views.	1 2 3 4 5 NA
FAST: APP Fellow can accurately interpret views of Morrison's Pouch, Splenorenal space, Pouch of Douglas, and SubX views.	1 2 3 4 5 NA
LUNG: APP Fellow can accurately obtain adequate anterior and lateral views for lung imaging.	1 2 3 4 5 NA
LUNG: APP Fellow can accurately interpret findings of anterior and lateral views for lung imaging.	1 2 3 4 5 NA
LUNG: APP Fellow can accurately utilize M-Mode for evaluation of pneumothorax.	1 2 3 4 5 NA

VESSEL: APP Fellow can accurately obtain adequate transverse and longitudinal views of major vessels, i.e. internal jugular, radial artery, brachial artery, femoral vein, femoral artery.	1 2 3 4 5 NA
VESSEL: APP Fellow can accurately interpret findings within major vessels, such as depth, presence of clot, calcifications, lack of blood flow, compressibility, etc.	1 2 3 4 5 NA
VESSEL: APP Fellow can demonstrate utilizing color flow and pulse-wave doppler features to evaluate pulsatile and nonpulsatile vessels.	1 2 3 4 5 NA
APP Fellow can properly save images for review.	1 2 3 4 5 NA
APP Fellow can demonstrate proper management of the ultrasound machine, including placing in "sleep mode," proper surface and probe cleaning, and restoring the machine to its original location, plugged in.	1 2 3 4 5 NA

Appendix E. Central Line Placement Evaluation

Advanced Practice Provider Fellowship
Central Line Placement Evaluation

APP Fellow Name:_____

Date:_____

The Central Line Skills Evaluator will ask the fellow to do the following:

- ☐ **Preparation**:
  - ☐ Verbalize 3 potential indications for central venous catheter placement.
  - ☐ Consult the patient on the procedure and purpose and procedure of CVL placement.
  - ☐ Provide appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.
  - ☐ Describe the appropriate catheter lengths, sizes, and proper site selection based on patient needs (based on a fake patient scenario at the discretion of evaluator)
  - ☐ Position the room/equipment/patient/ultrasound appropriately for optimal placement..
  - ☐ Evaluate vessel for size, depth, and any vascular abnormalities visualized on ultrasound.
  - ☐ Accurately interpret findings within major vessels, such as depth, presence of clot, calcifications, lack of blood flow, compressibility, etc.

- ☐ **Set Up:**
  - ☐ Cleanse site (verbalize – 2 minute vigorous, crosshatch surface scrub, wide margins, 3 minute dry-time)
  - ☐ Open sterile packaging and organize tray, flush lumens
  - ☐ Don cap and mask
  - ☐ Wash hands
  - ☐ Don sterile gown and gloves
  - ☐ Recleanse site (optional)
  - ☐ Place sterile drape over patient
  - ☐ Place sterile cover over ultrasound probe
- ☐ **Catheter Placement:**
  - ☐ Visualize vessel under ultrasound
  - ☐ Numb area utilizing SQ lidocaine
  - ☐ Access vessel with 18g needle with proper technique, aspirating throughout procedure
  - ☐ Once accessed and adequate venous blood flow, disconnect syringe and check placement with transducer tubing
  - ☐ Disconnect tubing and thread wire through vessel utilizing seldinger technique
  - ☐ Remove needle, place on tray or in secure sharps location
  - ☐ Visualize wire within vessel lumen in transverse and longitudinal planes
  - ☐ Make skin knick
  - ☐ Place dilator over wire, rotating with advancement
  - ☐ Place central line over wire, thread wire with two fingers backwards through the catheter until it is visualized at the exterior portion of the catheter
  - ☐ Secure wire at exterior portion of the catheter with fingers and then advance central line over wire into vessel
  - ☐ Remove wire
- ☐ **Completion:**
  - ☐ Secure catheter in place with two sutures
  - ☐ Apply dressing
  - ☐ Verbalize: Order CXR, follow up on results to confirm adequate placement
  - ☐ Verbalize: Proper management of the ultrasound machine, including placing in “sleep mode,” proper surface and probe cleaning, and restoring the machine to its original location, plugged in.

APP Fellow Name:_____

Date:_____

The Skills Evaluator will complete evaluation of the APP Fellow based on the listed competencies.

Rating Scale: **1**-Needs additional training/teaching **2**-Requires frequent guidance/developing **3**-Requires occasional guidance **4**-Independent, competent **5**-Skilled, highly proficient	
COMPETENCY: **Patient Care and Procedural Skills** Compassionately identifies, respects, and integrates patient's values and belief systems into clinical decision making. Prescribes, fully informs, and performs necessary medical procedures. **Medical Knowledge** Provides a systematic and investigative approach to learning and medical decision making. Applies medical knowledge to clinical practice. Demonstrates an ability to teach others. **Independent Practice, Direct Clinical Practice** Functions independently practicing within the confines and at the highest scope of practice. Provides comprehensive care including diagnosis, management, medication prescription, health promotion, health maintenance, counseling, referral, procedural, palliative, and end of life care for patients and families. Utilizes clinical and health assessment skills to differentiate between normal, variations of normal, and abnormal findings.	**Evaluator Rating**
APP Fellow can verbalize 3 potential indications for central venous catheter placement.	1 2 3 4 5 NA
APP Fellow consults the patient on the procedure and purpose and procedure of CVL placement.	1 2 3 4 5 NA
APP Fellow provides appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	1 2 3 4 5 NA
APP Fellow describes the appropriate catheter lengths, sizes, and proper site selection based on patient needs (based on a fake patient scenario at the discretion of evaluator)	1 2 3 4 5 NA
APP Fellow positions the room/equipment/patient/ultrasound appropriately for optimal placement.	1 2 3 4 5 NA
APP Fellow evaluates vessel for size, depth, and any vascular abnormalities visualized on ultrasound.	1 2 3 4 5 NA
APP Fellow accurately interprets findings within major vessels, such as depth, presence of clot, calcifications, lack of blood flow, compressibility, etc.	1 2 3 4 5 NA
Set Up • Cleanse site (verbalize – 2 minute vigorous surface scrub, wide margins) • Open sterile packaging and organize tray, flush lumens	1 2 3 4 5 NA

• Don cap and mask • Wash hands • Don sterile gown and gloves • Recleanse site (optional) • Place sterile drape over patient • Place sterile cover over ultrasound probe	
Catheter Placement • Visualize vessel under ultrasound • Numb area utilizing SQ lidocaine • Access vessel with 18g needle with proper technique, aspirating throughout procedure • Once accessed and adequate venous blood flow (if venous placement), disconnect syringe and thread wire through vessel utilizing seldinger technique • Remove needle, place on tray or in secure sharps location • Visualize wire within vessel lumen in transverse and longitudinal planes • Make skin knick • Place dilator over wire, rotating with advancement • Place central line over wire, thread wire with two fingers backwards through the catheter until it is visualized at the hub • Secure wire at end of hub with fingers and then advance central line over wire into vessel • Remove wire	1 2 3 4 5 NA
Completion: • Secure catheter in place with two sutures • Apply dressing • Verbalize: Order CXR, follow up on results to confirm adequate placement • Verbalize: Proper management of the ultrasound machine, including placing in “sleep mode,” proper surface and probe cleaning, and restoring the machine to its original location, plugged in.	1 2 3 4 5 NA

Appendix F. Quarterly Skills Self-Evaluation

Advanced Practice Provider Fellowship
Quarterly Procedural Skills Perceptions Evaluation

APP Fellow Name:
_____Date:_____

Please complete the following assessment of your own perceptions related to the listed technical skills. *To be completed quarterly throughout the program..*

Central Line / Arterial Line Insertion	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Different catheter lengths, sizes, and proper site selection based on patient needs.	
Proper indications and risks associated with central and arterial line insertion.	
Pre-procedure set-up and optimization such as patient positioning, ultrasound utilization, and equipment set-up.	
Evaluation of vessel for size, depth, and any vascular abnormalities visualized on ultrasound.	
Technical skills of central line insertion utilizing ultrasound guidance.	
Technical skills of arterial line insertion utilizing ultrasound guidance.	
Line verification methods/techniques including assessing for accurate placement on CXR.	
Methods and techniques of troubleshooting line placement.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternative therapies?	

PA-Catheter Insertion
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all
How confident are you with:

Proper indications and risks associated with PA-Catheter insertion.	
Pre-procedure set-up and optimization such as patient positioning and equipment set-up.	
Technical skills of PA-Catheter insertion utilizing waveform assessment.	
Line verification methods/techniques and accurately validate placement on CXR.	
Methods and techniques of troubleshooting catheter placement.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	

Chest Tube / Pigtail Catheter Insertion	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Different chest tube lengths, sizes, and proper tube selection based on patient needs.	
Proper indications and risks associated with chest tube insertion.	
Pre-procedure set-up and optimization such as patient positioning, ultrasound utilization, and equipment set-up.	
Technical skills of chest tube insertion utilizing ultrasound guidance.	
Accurately validating proper chest tube placement on CXR.	
Methods and techniques of troubleshooting chest tube placement.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	

Fiberoptic Bronchoscopy
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all
How confident are you with:

Proper indications and risks associated with fiberoptic bronchoscopy.	
Pre-procedure set-up and optimization such as patient positioning, patient preparation, and equipment set-up.	
Technical skills of fiberoptic bronchoscopy.	
Anatomical orientation, inspection, and evaluation of conducting airways.	
Obtaining broncheoalveolar lavage specimen for evaluation.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	

Paracentesis	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Proper indications and risks associated with paracentesis and thoracentesis.	
Pre-procedure set-up and optimization such as patient positioning, ultrasound utilization, and equipment set-up.	
Technical skills of paracentesis/thoracentesis tube insertion utilizing ultrasound guidance.	
Drainage of fluid and obtaining fluid specimens for evaluation.	
Management of albumin replacement status post large-volume paracentesis.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	

Lumbar Puncture	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Proper indications and risks associated with lumbar puncture.	

Pre-procedure set-up and optimization such as patient positioning, anatomical evaluation, and equipment set-up.	
Technical skills of lumbar puncture utilizing anatomical knowledge for proper placement.	
Proper technique for obtaining opening pressure.	
Proper technique for obtaining CSF specimens for laboratory evaluation.	
Providing appropriate and comprehensive informed consent for procedures including purpose/rationale, risks, benefits, and alternatives.	

Suturing Techniques	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
1-hand knot technique for securing sutures.	
Purse-string suture for securing devices such as chest tubes or paracentesis drains.	
Suture selection for basic ICU-based procedures.	
Identification of proper suture type based on task/need.	

Point of Care Echocardiography	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Utilizing the ultrasound machine, turning it on, obtaining, and saving images?	
Basic settings and transducers (probes) needed for critical care echocardiography, vessel, lung, and FAST exams.	

Pre-procedure set-up and optimization such as patient positioning, ultrasound utilization, and equipment set-up?	
Establishing correct windows and identifying clinically relevant data during a bedside echocardiogram?	
Accurate interpretation of left ventricular function in a bedside echocardiography exam?	
Accurate interpretation of right ventricular function in a bedside echocardiography exam?	
Accurate interpretation of IVC in a bedside echocardiography exam?	
Accurate interpretation of intravascular volume assessment in a bedside echocardiography exam?	
Accurate assessment of abnormalities such as vegetation, thrombus, or pericardial effusion?	

Point of Care Focused Assessment with Sonography for Trauma (FAST), Vessel, and Lung Imaging	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Establishing correct windows and identifying clinically relevant data during a lung evaluation?	
Evaluating for pneumothorax utilizing M-mode.	
Accurate interpretation of imaging obtained for lung evaluation?	
Pre-procedure set-up and optimization such as patient positioning, ultrasound utilization, and equipment set-up.	
Establishing correct windows and identifying clinically relevant data during vessel evaluation?	
Accurate interpretation of imaging obtained for vessel evaluation?	
Establishing correct windows and identifying clinically relevant data during a FAST exam?	
Accurate interpretation of imaging obtained in a FAST exam.	

Appendix G. Quarterly Clinical Self-Evaluation

Advanced Practice Provider Fellowship
Clinical Practice and Critical Event Management
Quarterly Perceptions Evaluation

APP Fellow Name: _____Date:_____

Please complete the following assessment of your own perceptions related to the clinical environment. *To be completed quarterly throughout the program.*

Advanced Practice Provider Clinical Role	
Rating Scale **5**-Extremely confident **4**-Very confident **3**-Somewhat confident **2**-Minimally confident **1**-Not confident at all	
How confident are you with:	
Determining appropriate consults and specialty services to meet the holistic needs of the patient and family.	
Teamwork and collaboration with interdisciplinary team members such as nursing, consultants, nutrition, PT/OT, radiology, etc.	
Developing relationships with multidisciplinary team members promoting mutual respect and trust.	
Accepting guidance and constructive criticism in a professional manner, recognizing the need for assistance.	
Navigating the clinical healthcare system adeptly to coordinate patient care within specialty.	
Incorporating fiscal awareness and risk/benefit analysis into patient care.	
Obtaining a complete health history and physical examination of the patient in a comprehensive and timely manner.	
Identification of normal and abnormal clinical findings and incorporates them into the patient assessment and plan of care.	
Obtaining and presenting clinical data in a systematic and organized fashion during ICU rounds.	
Obtaining informed consent on necessary procedures in the clinical environment, and identification of risks, benefits, and clinical indications of procedural interventions.	
Developing differential diagnoses and appropriate plan of care.	
Your ability to make independent judgments when developing the plan of care, i.e. not frequently reliant on preceptor.	
Ordering and interpretation of diagnostic tests and applying its relevance to the patient's condition.	
Recognizing signs of neurologic deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	

Recognizing signs of cardiovascular deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of respiratory deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of hemodynamic deterioration and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable surgical or trauma patient.	
Recognizing signs of metabolic derangements such as lactic acidosis or acute renal failure and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of endocrine system derangements such as DKA or HHS and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of hemorrhage and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of oncologic complications and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient.	
Recognizing signs of distributive shock and proceeding with expeditious diagnosis, management, and stabilization of the acutely decompensating or unstable patient patient.	
Your overall assimilation into the role of Advanced Practice Provider.	

Appendix H. Preceptor Clinical Evaluation

Advanced Practice Provider Critical Care Fellowship Clinical Evaluation

APP Fellow Name:
_____Date:_____
_____

Rotation: _____ Primary Preceptor:
_____

The Primary Preceptor will complete evaluation of the APP Fellow based on the listed competencies.

Rating Scale: **1**-Needs additional training/teaching **2**-Requires frequent guidance/developing **3**-Requires occasional guidance **4**-Independent, competent **5**-Skilled, highly proficient **NA**-Not Applicable	
COMPETENCY: **Professionalism, Teamwork and Collaboration, Working in Interdisciplinary Teams** Works cooperatively, collaboratively and participates in shared decision making with interdisciplinary care team. Demonstrates professional conduct, cultural proficiency, and humanism. Demonstrates accountability as a trusted member of the care team. **Consultation** Utilizes specialties of other disciplines within the care team, including but not limited to social work, psychology, physical therapy, or dietician services to deliver and coordinate comprehensive patient care plans.	**Preceptor Rating**
Maintains professional appearance and demeanor.	1 2 3 4 5 NA
Provides cultural, age and gender appropriate care.	1 2 3 4 5 NA
Consults adjunct and specialty services to meet the holistic needs of the patient and family.	1 2 3 4 5 NA
Demonstrates teamwork and collaboration with interdisciplinary team members such as nursing, consultants, nutrition, PT/OT, radiology, etc.	1 2 3 4 5 NA

Rating Scale: **1**-Needs additional training/teaching **2**-Requires frequent guidance/developing **3**-Requires occasional guidance **4**-Independent, competent **5**-Skilled, highly proficient **NA**-Not Applicable	
COMPETENCY: **Interpersonal and Communication Skills** Fosters and sustains a trusting, compassionate, and therapeutic relationship with patients and families. Communicates effectively, collaboratively, and efficiently with patients, families, and the healthcare team. Develops relationships with multidisciplinary team members promoting mutual respect and trust.	**Preceptor Rating**

Accepts guidance and constructive criticism in a professional manner, recognizing the need for assistance.	1 2 3 4 5 NA
Communicates verbally with clarity and attention to detail.	1 2 3 4 5 NA
Demonstrates relationship-building with multidisciplinary team members	1 2 3 4 5 NA
Provides clear verbal/written reports of changes in patient's condition to all appropriate healthcare team members.	1 2 3 4 5 NA

Rating Scale:

1-Needs additional training/teaching
2-Requires frequent guidance/developing
3-Requires occasional guidance
4-Independent, competent
5-Skilled, highly proficient
NA-Not Applicable

COMPETENCY:	**Preceptor Rating**
Systems-Based Practice, Healthcare Delivery Systems Demonstrates flexibility in working in various healthcare environments. Navigates the clinical healthcare system adeptly to coordinate patient care within specialty. Incorporates fiscal awareness and risk/benefit analysis into patient care. Identifies systems-level errors, gaps, and deficiencies. Works towards implementation of innovative implementation for systems-level issues. **Quality Improvement** Able to evaluate and measure the structure and processes in place as it relates to patient outcomes. Able to design, test, implement change, and re-test processes and systems of care for the purpose of quality improvement. **Safety** Understands and implements basic patient safety principles and can identify potential or actual hazards or gaps in care.	
Demonstrates flexibility and fluidity working in the clinical environment.	1 2 3 4 5 NA
Navigates the clinical healthcare system adeptly to coordinate patient care within specialty.	1 2 3 4 5 NA
Incorporates fiscal awareness and risk/benefit analysis into patient care.	1 2 3 4 5 NA
Incorporates basic patient safety principles into patient care delivery, such as guidance from policies, procedures, and standard work processes.	1 2 3 4 5 NA
Completes a "time out" prior to procedures.	1 2 3 4 5 NA
Abides by infection control policies. Performs appropriate hand hygiene.	1 2 3 4 5 NA

Rating Scale:

1-Needs additional training/teaching
2-Requires frequent guidance/developing
3-Requires occasional guidance
4-Independent, competent
5-Skilled, highly proficient

NA-Not Applicable	
COMPETENCY: **Patient-Centered Care** Compassionately identifies, respects, and integrates patient's values and belief systems into clinical decision making. Prescribes, fully informs, and performs necessary medical procedures. Promotes health management, maintenance, and preventive care guidance. **Independent Practice, Direct Clinical Practice** Functions independently (within constraints of preceptor supervision) practicing within the confines and at the highest scope of practice. Provides comprehensive care including diagnosis, management, medication prescription, health promotion, health maintenance, counseling, referral, procedural, palliative, and end of life care for patients and families. Utilizes clinical and health assessment skills to differentiate between normal, variations of normal, and abnormal findings.	**Preceptor Rating**
Obtains a complete health history and physical examination of the patient in a comprehensive and timely manner.	1 2 3 4 5 NA
Identifies normal and abnormal clinical findings and incorporates them into the patient assessment and plan of care.	1 2 3 4 5 NA
Obtains and presents clinical data in a systematic and organized fashion during ICU rounds.	1 2 3 4 5 NA
Presents patients during ICU rounds in a clear, concise, and accurate format.	1 2 3 4 5 NA
Performs appropriately supervised procedures in the clinical environment within the scope of practice.	1 2 3 4 5 NA
Understands personal strengths and weaknesses through self-reflection and awareness.	1 2 3 4 5 NA
Identifies knowledge deficits and limitations and pro-actively seeks to improve upon limitations and gaps.	1 2 3 4 5 NA
Obtains informed consent on necessary procedures in the clinical environment. Identifies risks and benefits of procedural interventions and lists pertinent clinical indicators for the procedure.	1 2 3 4 5 NA

Rating Scale: **1**-Needs additional training/teaching **2**-Requires frequent guidance/developing **3**-Requires occasional guidance **4**-Independent, competent **5**-Skilled, highly proficient **NA**-Not Applicable	
COMPETENCY: **Medical/Clinical Knowledge** Provides a systematic and investigative approach to learning and medical decision making. Applies medical knowledge to clinical practice. Demonstrates an ability to teach others.	**Preceptor Rating**
Is able to develop differential diagnoses and appropriate plan of care.	1 2 3 4 5 NA
Demonstrates knowledge of anatomy and pathophysiology in assessment and plan of care.	1 2 3 4 5 NA
Prioritizes problems appropriately and incorporates the assessment in the plan of care.	1 2 3 4 5 NA
Responds rapidly and appropriately to immediate problems or signs of clinical deterioration.	1 2 3 4 5 NA
Demonstrates the ability to make independent judgments when developing the plan of care.	1 2 3 4 5 NA

Exhibits ability to identify common abnormalities and diseases, describes pathophysiology and matches symptoms to disease process.	1 2 3 4 5 NA
Is able to order & interpret diagnostic tests and apply its relevance to the patient's condition.	1 2 3 4 5 NA
Demonstrates ability to monitor, evaluate, & document patient response to interventions.	1 2 3 4 5 NA
Manages an appropriate caseload and completes work in clinical time allotted.	1 2 3 4 5 NA

Rating Scale:

1-Needs additional training/teaching
2-Requires frequent guidance/developing
3-Requires occasional guidance
4-Independent, competent
5-Skilled, highly proficient
NA-Not Applicable

ADDITIONAL COMPETENCIES:		**Preceptor Rating**
Clinical and Professional Leadership Serves as a role model and assumes either formal or informal leadership roles demonstrated by interactions with the medical team.	**Examples:** 1. Exhibits respectful demeanor in the clinical environment 2. Demonstrates poise and maturity in the clinical environment 3. Is thought of as a valued member of the care team	1 2 3 4 5 NA
Ethics Utilizes ethical decision-making principles in clinical practice. Applies standards such as informed consent and patients' rights. Is able to identify ethical issues in patient care and understands the process of reporting and addressing these issues as part of professional clinical practice.	**Examples:** 1. Applies consistent standards of care in alignment with "Core Ethical Principles in Modern Western Medicine:" *Beneficence, Autonomy, Nonmaleficence, Patient-Provider Fiduciary Relationship, Justice, Sanctity of Human Life/Human Dignity* *[Olejarczyk JP, Young M. Patient Rights. [Updated 2019 Mar 18]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538279/]*	1 2 3 4 5 NA
Policy Understands the interdependence of policy and healthcare practice, access, equity, quality, and cost. Is able to conceptualize ethical, legal, social, political, and economic factors influencing policy development.	**Examples:** 1. Incorporates cost-consciousness and healthcare stewardship into clinical practice, including the ordering of laboratory studies, diagnostic tests, medications, etc. 2. Demonstrates awareness of medical-legal components of clinical practice and documents findings accordingly.	1 2 3 4 5 NA
Informatics and Information Literacy	**Examples:**	1 2 3 4 5 NA

Able to utilize technology to enhance knowledge and scientific decision making, mitigate error, and promote safety and quality.	1. Utilizes clinical guidelines, policies, and protocols for patient care and safety 2. Utilizes technology applications on the internet and smartphone to support knowledge gaps and aid in clinical decision making during clinical rotations.	

Areas of Strength:	**Opportunities for Growth:**
Specific Goals:	

Preceptor Signature:
_____ Date:
_____

APP Fellow Signature:
_____ Date:
_____

Director Signature:
_____ Date:
_____

Appendix I. Executive Summary of Program Evaluation

EXECUTIVE SUMMARY OF APP FELLOWSHIP PROGRAM EVALUATION

1. PURPOSE STATEMENT

To complete a systematic program evaluation of the practice-based learning (PBL) and development and design PTAP domains of a critical care advanced practice fellowship (CCAPPF) at an academic medical center.

2. MAJOR FINDINGS/REVIEW OF LITERATURE

A. Support for PBL and development and design components in the literature

   i. Skills and simulation labs, "boot camps", communication modules

B. No systematic reviews of formal year-long fellowships

C. No program evaluations of formal year-long fellowships currently exist

3. DESIGN/RESULTS

The CDC 6 Step Framework for Program Evaluation was used as the implementation framework on this project. Completion of a program evaluation of the PBL and development and design PTAP components for the first cohort of a CCAPPF program.

A. Stakeholder assessment

   i. Validated evaluation design and plan to focus on PBL and development and design aspects of fellowship

   ii. Minor themes deduced from responses and pursed; no major themes emerged

B. Evaluation Design and Data

   i. PBL

      1. *Procedural- 5 point of care ultrasound evaluations throughout year, 3 central line placement evaluations*

         a. *POCUS- Evaluation of skills showed improvement of 400% and 115%, respectively, from beginning to end of year by fellows in POCUS evaluation.*

b. *CVC- Procedural improvement of 212% and 82%, respectively, from beginning to end of year by fellows in placement evaluation.*

2. *Simulation- quarterly simulation performance evaluation (simulations performed monthly)*
3. *Clinical performance- self-evaluations from fellows, evaluations from preceptors*

ii. Development and design

1. *Infrastructure- review of structure, comparison to traditional onboarding*
2. *Process- development of curriculum, tools to evaluate competency*
3. *Competency- monthly preceptor clinical evaluations, quarterly self-assessment for clinical and skills*
   a. *Preceptor evaluation- increase of 7% and 9.7%, respectively, throughout the year*
   b. *Clinical self- evaluation- increase of 45% and 35%, respectively, in clinical self-confidence*
   c. *Skills self-evaluation- increase of167% and 184%, respectively, in skills self-confidence*

Onboarding Elements	Traditional Critical Care	Fellowship Critical Care
Training period	3-5 months	12 months
Structured simulation experiences	0	14 sessions
Structured skills experiences	0	14 sessions
Adult ICU rotations	1 ICU	8-9 ICU
Formal POCUS training	None	4 sessions
Critical care lectures w/ CEUs	None	12 lectures
Teach back presentations	None	12 presentations
Self-evaluations	None	Quarterly
Mentoring program	None	Ongoing through year
Case study completion	None	12 sessions
Weekly hours	~ 40 (3 12's)	Full clinical schedule + didactic days
QI project completion	0	1
Committee membership	0	1-2

4. CONCLUSIONS AND RECOMMENDATIONS

A variety of factors including workforce issues, staffing, and high complexity patient needs have led to an increasing need for APPs in the critical care setting. A formal, year-long fellowship program provides the necessary additional training for APPs to care for critically ill patients at the top of their scope of practice. This program evaluation was aimed at addressing this area of need and completed after the graduation of the first successful cohort using the CDC 6-step program evaluation framework for the practice-based learning and design and development

domains of the PTAP structure and showed improved outcomes in the PBL and development and design domains as measured by competencies and evaluations in curriculum, clinical, skills, and simulation arenas. There is evidence from this program evaluation that there is a strong presence of the development and design criteria but stronger evidence of the PBL domain specifically in the simulation and skills results. Current structure and outcomes were validated by stakeholder feedback and evaluation of data from fellows. Small areas of change noted to improve overall robustness of program, therefore there are five recommendations based on these conclusions.

A. Recommendations to

i. Add additional simulations

1. *VV ECMO*
    a. *Increasingly applicable after COVID-19 pandemic*
    b. *Use spreading outside of traditional ICUs*
2. *Emergency Airway Acquisition*
    a. *Applicable to all critical care areas*

ii. Increase the frequency of simulation evaluations

1. *Currently formal evaluations only completed quarterly while simulations are performed at least monthly*

iii. Consider beginning and end of year evaluations for all skills

1. *Central line and POCUS performance measured at multiple times throughout the year*
    a. *Addition of evaluation of skills already practiced- arterial line, bronchcoscopy, etc.*

iv. Develop a formal performance improvement plan for implementation if scenarios reveal deficits in knowledge or action by a fellow.

1. *Implementation for any fellow identified to have deficiencies; will help to provide structure and documentation of progress*

v. Financial analysis in the future

1. *Further justification for continuing the program and expansion into other areas*