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Abstract

While the clinical disciplines who practice in the pediatric critical care unit are increasing, this chapter focuses primarily on physician career development, because research for the other medical disciplines is currently limited... Nonetheless, many of the career opportunities discussed in this chapter are also available to nurse practitioners and physician assistants. It is important to consider a career in “epochs”, recognizing that career expertise develops over time, and focus may change. Never before have had so many opportunities existed in critical care. It is the skills sets we use as intensivists, which help us develop, not only as clinicians, but as educators, basic scientists, administrators, trialists, implementation scientists, patient safety and quality improvement specialists, and medical informatics officers.

Keywords

Clinical skill • Career development • Work force • Team science • Quality improvement

Introduction

To develop a “career” in pediatric critical care medicine requires a base framework from which to begin. Practitioners of pediatric critical care come from very different starting points as pediatricians, anesthesiologists, surgeons, nurses, physician assistants. For physicians as of 2013, there is no way to become an experienced practitioner in our field, without entering through a general specialty. Throughout this chapter I will highlight areas which I believe are areas open for career growth. While there are an increasing number of nurse practitioners and physician assistants working in pediatric intensive care units (PICUs), the literature primarily focuses on training, and manpower, and little on career development [1–6]. We will need increasing numbers of

nurse practitioners and physician assistants to help staff our PICUs, but we know little of how to attract them, help them grow as clinicians, and retain them in our field (i.e. support their career development).

Developing “Mastery” in Clinical Pediatric Critical Care Medicine

A successful career in pediatric critical care requires that you become a “life-long learner”. Many individuals equate this with opportunities to “teach to keep up their skills.” While many outstanding teachers are life-long learners, there are those who teach who are not. A framework for skills acquisition that describes development stages, based on the Dreyfus and Dreyfus model, has been proposed. This has been particularly helpful to describe development into a skilled clinician [7]. See Table 18.1. Careful review of the table demonstrates that caregivers in the PICU begin their careers at different levels of skill acquisition. While it is possible that a physician assistant or nurse practitioner may begin at the beginner or advanced beginner stage (see Table 18.1), most

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Table 18.1 Principles of the Dreyfus and Dreyfus Model of Skill Development applied to the development of physician competence

Level	Characteristics
Novice	Rules driven, extensively uses ‘analytic reasoning’; cannot easily prioritize information, synthesis is problematic, big picture is often missing
Advanced beginner	Quickly sorts through rules and information to identify relevant information based on past experience; uses analytical reasoning and pattern recognition; can move from concrete information to more general aspects
Competent	Is emotionally engaged and feels appropriate level of responsibility; experiences permit use of pattern recognition of common problems; uses analytic reasoning for complex or uncommon problems;
Proficient	Intuitive problem solving as past experience permits pattern recognition; ambiguity is acceptable; decision making is easier and deviations from “normal pattern” is more common; less experience in management than illness recognition, thereby using analytic reasoning for problem solving
Expert	Open to recognize the unexpected; perceptive to recognize when features do not fit the pattern; intuitive problem solving as well as problem recognition; clever
Master	Exercises practical wisdom; deeply committed to work; emotionally engaged at the highest level and is greatly concerned for right and wrong decisions; pursues ongoing learning and improvement; sees beyond the big picture to the bigger picture of culture and context

Adapted from Carraccio et al. [7]. With permission from Wolter Kluwers Health

pediatric critical care physicians should be “competent” at the completion of fellowship.

The Dreyfuss Model proposes that clinical reasoning is dependent on two processes: (1) the analytic method, and (2) the non-analytic method, or pattern-based recognition [7]. The analytic method refers to the hypothetico-deductive approach characteristic of the scientific method. The pattern recognition approach relies on the learner’s ability to recognize relationships between past clinical experiences and what is currently occurring. These patterns are referred to as “illness scripts”. Learners at all levels use both forms of reasoning in clinical practice. As one progresses through the Dreyfuss Model of Skill Development, use of the hypothetico-deductive lessens, and more pattern recognition increases. Intensivists become “proficient” in their skill development somewhere between 5 and 8 years out of fellowship. This is dependent on their clinical time in the PICU, case complexity, and learning styles. A career clinical intensivist should expect herself/himself to become a “master” somewhere a decade or so after completion of her/his training (Table 18.1). Experts align thoughts, feelings, and actions into intuitive problem recognition and situational responses and management. They are open to the unexpected, are clever, and very perceptive in discriminating features that do not “fit” the illness script [7].

As highlighted by Carraccio and colleagues, it is possible to become an “experienced non-expert.” In this case, the ease of responding to the majority of clinical encounters leads to clinician complacency, emotional involvement diminishes with each encounter. The “experienced non expert” is at high risk of burn out. The expert (or expert transitioning to master) takes the mental resources “saved” in applying pattern recognition, and reinvests them in tackling the next level of problem. The progressive problem solving pushes one beyond a prior zone of comfort and is the hallmark of a master [7]. A master has a deep knowledge and much

practical wisdom to impart. They recognize the much bigger picture of context and culture, with an intense level of commitment to the work that triggers an automatic and ongoing concern for right and wrong answers. Emotional engagement occurs at every level for the master. As one is developing a career, it is important to partner with a group of individuals who are at least proficient in their care of critically ill children. It is easier to become an expert or master, if one can “model” from colleagues. However, sometimes one must look outside your immediate critical care colleagues, if you do not find an expert or master. While masters of critical care are usually outstanding bedside leaders, they may or may not be division directors or departmental chairs as different skill sets are required for those leadership roles.

Workforce and Career Development

There are currently almost 1,900 individuals who are American Board of Pediatrics-certified subspecialists in Critical Care Medicine [8]. Their average age is 49.2 years with a decrease in the number of clinicians who are older than 60 years of age. In contrast, there are over 5,000 neonatologists, their average age is 55.6 years, with many neonatologists working well into their 70s. This may be as a result of the relative “youth” of critical care medicine as a subspecialty (established in the 1980s) compared to neonatology (which was established in the 1960s). The majority of certified pediatric critical care medicine physicians practice in academic health centers (71 %), while only 49 % of neonatologists do so [9]. Of pediatric subspecialists, only hematology-oncology physicians have a higher percentage of academicians (77 %). The Future of Pediatric Education II survey was sponsored by the American Academy of Pediatrics and American Board of Pediatrics in the early 2000s. Of those pediatricians who responded, 805 were pediatric critical care

medicine physicians [10]. These individuals spent more than 50 % of their time in direct patient care, and the remainder of their time in teaching (15 %), administration (12–20 %), and research (7–14 %). For most critical care physicians, the majority of their time will be spent on clinical service, primarily in the intensive care unit, and it is likely that the majority of physicians will remain in academic health science centers in the near future [10]. Tracking critical care medicine practitioners and their career paths is important, but expensive, and has not been done well enough to adequately inform education/training leaders.

Surveys from 2001 to 2004 demonstrate that most PICUs have 24 h physician coverage (>70 %) with most having intensivist coverage, the larger units \geq (greater than or equal to) 19 beds had the larger proportion of intensivist coverage [11]. A 2001 practices survey demonstrated that up to 42 % of all large PICUs had in house intensive coverage 24 h a day [12]. Outcomes improve with 24 h intensive care coverage, and increased mortality associated with night and weekend admissions appears to be mitigated when pediatric intensivists are present 24 h a day, though more recent data may not be as supportive of that conclusion [13–15]. PICUs will likely be staffed 24 h a day with physicians, and the majority will increasingly be intensivists. The ideal number of intensivists is not known, but the number of children to pediatric critical care physician is twice that of children to neonatologist (43,981 vs 19,262) [8]. Telemedicine has been used to enhance care under critical care physician oversight in non-pediatric units, though results are mixed [16]. Telemedicine has also been shown to be feasible in PICU's, but there is no evidence of its equivalency to in-house care [17]. Thus at a time when critical care physicians remain limited in number, there is an expectation that physicians will continue to have much clinical responsibility, with overnight and in-house responsibilities. However many are also expected to actively contribute to the missions of academic and non-academic health centers: clinical care, education, and research.

Maintenance of Workforce

Critical care fellowship training has a drop-out rate of about 30 %, which has remained fairly constant for almost two decades [8]. Physician stress and burnout are particularly problematic in intensive care medicine. In a study by Fields and colleagues from 1995, 400 pediatric intensivists were surveyed. Up to 50 % were “burned out” or “at risk” of burnout [18]. There was no association between burnout status and the following: having fellows, having protected time for research and publications, frequency of being called at home, frequency of returning to the hospital when called at home, or the call schedule [18]. Those who were “burned out” or “at risk” reported that their work was not valued by others,

they felt less successful, felt their peers viewed them as less successful, they were less satisfied with their professional life, and they were less likely to routinely exercise or have outside interests. Burnout or burnout risk is also present in large number of adult ICU physicians [19, 20]. While working conditions increase the burnout potential, individual doctors' attitudes toward work are also affected by personality and learning style [21]. In a study of 18–20 year olds in Great Britain, followed longitudinally for 12 years after applying for medical school, researchers found that study habits and learning styles during school were associated with perception of work-related stress, burnout and satisfaction. Stress, burnout and satisfaction also correlated with personality trait [21]. This provocative article suggests working conditions may have less of an effect for an individual physician on burnout risk, than their own personality traits and learning style. As burnout risk is so great for critical care physicians, further work in this area is particularly important for our subspecialty, and will require engagement of educational specialists and psychologists in addition to clinicians.

Leadership and Team Science in Pediatric Critical Care

Evidence is accruing that critical care teams that include physicians, nurses, pharmacists, respiratory and physical therapists have better outcomes [22, 23]. The business world recognizes and values leadership and management skills, but medicine has been slow to embrace leadership training. The American College of Graduate Medical Education now requires critical care medicine fellowships to have curricula on administration, management, and resource utilization. Despite that, few of us feel prepared to handle the many PICU managerial issues. Most report feeling underprepared to manage team conflict, conflict with other groups, and effective stress management [24, 25]. Stockwell and colleagues examined attending leadership in one PICU, and scored these skills against achievement of patient goals. The older and more experienced clinicians had higher leadership scores. Those with the highest leadership scores also achieved the most patient goals [26]. The study highlights that leadership skills can be learned, trainees easily recognize good leaders, and good leadership skills impact patient outcome. Whether you will ever have a “managerial position” at your institution is actually not the point. All intensive care physicians should understand and apply leadership techniques because they are expected to lead the daily activities of the team [22].

The overarching principle of ICU management is building a culture in which all team members feel respected and empowered to participate. There is a list of well-described leadership styles, many of which are “situation-appropriate” [27].

For example an autocratic style (i.e. “top down”) is appropriate when leading a resuscitation team, but not when trying to redesign a patient flow initiative, when a consensus-driven or “democratic” style is required. “Transformational” leaders do not simply direct individuals to complete tasks (as occurs with “transactional” leaders); rather they seek to empower team mates. This reinforces the team shared mission. Providing psychological safety leads to team member engagement and a willingness to “speak up” when there is a failure. The team leaders must be willing to hear, address/solve problems and then broadcast the results. This creates positive reinforcement for team members to continue to provide feedback. Transactive memory involves the division and coordination of responsibilities among team members, and appreciation of what each member brings to the team. Mutual accountability is the reciprocity of responsibility, i.e. tasks or obligations are not identical for each team member, but each member expects others to remain accountable to the team. Will a nurse “speak up” if s/he sees an attending physician not complying with an agreed upon process? The application of team science is ubiquitous across high accountability organization. Yet it remains inadequately explored in the PICU. Three areas that deserve further examination and implementation are: (1) formal education about teams (2) mindfully building strong teams; (3) collection and dissemination of data on high functioning critical care teams [22].

Job Activity and Career Development in Pediatric Critical Care

As outlined earlier in the chapter, the majority of pediatric critical care physicians practice in an academic health center [9]. This means that in addition to caring for patients, physicians will likely spend their time in other missions of academic health centers including teaching, research, and administration. There are misconceptions that physicians who work in “private practice” cannot/do not work at academic health centers or those who work in community health centers do not engage in any of the “traditional” missions of academic health centers. While there is a perception that academicians make substantially less than private practitioners, this again is a misconception, and depends on location, and institution. There should be an expectation that programs/institutions measure physician performance individually, and as a group. “Productivity” can and should be tied to “compensation”, as in any business. At the Hospital for Sick Children (HSC) in Toronto, there has been a practice plan in place for most of the last 15 years to provide compensation and career development for all three missions in the Department of Pediatrics known as the Career Development and Compensation Plan (CDCP) [28]. HSC has developed six job activity profiles

under the titles of “Clinician -Specialist, -Administrator, -Investigator, -Scientist, -Educator, -Teacher”, with varying amounts of time dedicated to education, research, administration, and advancing clinical excellence [28]. With annual Departmental reviews (which determines annual financial bonus), and tri-annual peer review (which determines changes in guaranteed base salary), departmental members are compared “using the same stick” to themselves and other members of the department. HSC has now evaluated this pay for performance three times. There have been program modifications over the years, but it continues to have wide department support [29–31].

Intensivist as Educator

You cannot be an expert critical care practitioner without excellent communication skills. We often hone our “education” skills as we learn to improve our “communication skills.” If you are in critical care medicine, you will be educating throughout your whole career, either formally or informally. Through residency and fellowship, there is an opportunity to increase teaching skills, with different level trainees. In addition generally there are “teaching” courses that are offered during fellowship. Almost every academic health center/medical school has an education group responsible for providing educational training opportunities, so these will likely be available to you even after fellowship training. As outlined in the previous section, you should receive compensation for the education you provide to trainees [28]. If your career path is as a clinician-teacher or clinician-educator, you will be expected to expend significant time to the education of trainees and others. For individuals who wish a major commitment to education administration and educational development or research in education, you should consider formal courses that lead to a Masters in Medical Education. There are workshops sponsored by the American Academy of Pediatrics, Accreditation Council for Graduate Medical Education, Association of American Medical Colleges, and the Pediatric Academic societies at their national meetings. Most departments will require an “educational portfolio” for promotion or evidence of productivity. So, early in your career, seek out what information that should be included in the portfolio, and add to the portfolio regularly. Keep a record of all learner evaluations in the portfolio, as invariably promotion or productivity quotas require you to have evidence that you have incorporated feedback into your educational activities. Many critical care physicians are the directors and associate directors of pediatric house staff education. If you wish to move your career along this path, visit the Association of Pediatric Program Directors web site and explore professional educational opportunities [32]. As residency clinical hours continue to

decrease and as we look to build new teams of individuals (and train in those teams) there are significant opportunities to explore/study new models of care, training and evaluation [33–36].

RESEARCH...research...Translational Research and Implementation Science... and Mentoring

As pediatric subspecialists, we should improve the care of children. There have never been so many opportunities to do so, than at present. There has been a seismic shift in the definition of “research” over the last 15–20 years. While discoveries still begin “at the bench” with basic investigations at the molecular and cellular level, there is a new (renewed?) focus on translating the finding to the bedside (bench to bedside) which then “re-informs” studies at the bench. This is referred to often as “translational” research (or T1). T1 research requires input from specialists in molecular biology, genetics, and other basic sciences. However T1 research cannot occur in isolation. It also requires input from expert clinicians and individuals with “trial expertise” (or trialist) to ensure that new discoveries are brought to the patients. This has been the focus of the National Institutes of Health, with the development of the Clinical Translational Research Awards [37]. T1 Research has traditionally been the focus of training for many pediatricians, and the NIH is the leading (but not only) source of funding. If you choose to focus your career in this area you will require the following: (1) Time. This path requires substantial amounts of time and effort to successfully transition to a clinician/scientist. (2) Commitment. Commitment is needed by you, but also entails the commitment of your departmental chairperson, your division leader, your partners at work and your life-partner and family. These individuals are your support team. Pragmatically if your support team is not “behind you”...it is not going to happen. (3) Mentorship. Senior scientists are needed to help guide you initially. As you mature in your science, mentors are often replaced by “co-investigators”, or “peer mentors”. (4) Educational opportunities. You should search out courses that will help develop research skills. Many institutions have clinical scientist training programs (or a similar program with a different name). These programs provide training to clinicians who wish to become clinical scientists, often they are a master’s level program. (5) Money. Your department should fund you initially. Nonetheless you should expect to obtain internal funding (from your school/health science center) or external funding fairly early in your career. There are specific funding mechanisms for junior investigators available from the NIH and professional organizations (American Academy of Pediatrics/Section on Critical Care, for example).

Another area of translation research seeks to close the gap and improve quality by “translating results from clinical studies (T1) into every day clinical practice. It is referred to as T2 research, and it occurs in the community and ambulatory care settings as well as in the hospital [37]. Skill sets required for T2 research are quite different than T1 and include skills in implementation science, clinical epidemiology, behavioral science, and informatics. The transition of paper records to an the electronic health record, and the incorporation of wireless technology [38, 39] provides exciting opportunities for research in evidence based care [40]. Funding opportunities are often sponsored by the Agency for Healthcare Research and Quality and non-governmental organizations. Work in this arena overlaps and in some areas parallels that of quality improvement and patient safety, often confusing clinicians, human subject committees and hospital administrators. Improving quality cannot occur without generating new knowledge. However comparative effectiveness research will not improve outcomes, unless they can rapidly be incorporated into practice. This requires a focus on health delivery research, a science that takes a systems view to improve health outcomes [41]. The Institute of Medicine called for a new “rapid learning healthcare system”, to accelerate the generation of new evidence, apply and evaluate it. This shifts the paradigm from a “top down” approach, and instead incorporates all the stakeholders in the process: researchers, providers and patients [40]. The Patient Protection and Affordable Care Act created the Patient – Centered Outcomes Research Institute (PCORI). PCORI focuses on comparative effectiveness research which informs patients, clinicians, and purchasers in making health decisions [42]. While comparative effectiveness research is not new, PCORI emphasizes a “patient centeredness” approach.

What is clear is that there a plethora of opportunities for pediatric critical care clinicians to impact the care of critically ill children in robust, far ranging ways. However, this will require additional educational opportunities and new partnerships between hospitals and clinicians [43]. Opportunities to learn quality improvement abound, are offered by specific societies, large academic institutions (Mayo, Harvard, Columbia) and online courses such as from the Institute for Healthcare Improvement Open School [44]. As with T1 research, T2 work also requires time and mentoring. However mentors in this arena will more likely be industrial engineers, research psychologists with training in human factors, and individuals with expertise in informatics.

Mentorship is critical throughout one’s work life, but particularly so during the early post fellowship years. There are several outstanding articles regarding the mentor/mentee dyad [45–48]. However, mentoring is not solely “senior clinician/scientist-younger clinician/scientist”, it includes “peer mentoring” and a constellation of other relationships [49]. Healthy, helpful mentoring relationships are respectful

of each other's times, and are focused, realistic and reflective. Mentoring relationships should benefit all involved. Mentors can be found in many corners of your health system and academic institutions. Mentors often are not physicians.

Career Development...beyond Pediatric Critical Care Medicine

As discussed above, burn-out is particularly problematic for intensive care physicians. As we are a "younger" subspecialty than neonatology and cardiology, it is not surprising that we have fewer practitioners who are practicing into their 60s and beyond [8]. What is unclear is to what extent the 'aging intensivist' is providing clinical care. Anecdotally, critical care practitioners are now counted amongst the leaders of academic and non-academic health centers, including chief executive officers, chancellors, and deans of colleges of medicine. In addition, we lead quality improvement, informatics and patient safety initiatives in health systems, and research centers in both large and small academic centers. It is unlikely that many of us began our career with these goals in mind. Nonetheless, as our clinical care naturally aligns our careers with those engaged in systemic and systematic change, and research to improve the care of some of the sickest it is unsurprising that many of us have followed these paths. However, we are just as likely to be authors and artists, and leaders for ethics committees and palliative care teams. Pediatric critical care as a subspecialty is a very big tent, and there are many opportunities to develop careers both aligned with pediatrics and critical care, and in many arenas that are tangential to our primary clinical focus.

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