Nursing Care in the Pediatric Intensive Care Unit

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Abstract

This chapter reviews several key topics in pediatric critical care nursing (PCCN). The complex role of the pediatric critical care nurse is described. First, the nurse is required to continually examine physiologic monitors and treatment devices, along with the child's body. Second, in the event of any irregularity, the nurse must instantly judge the significance of the event and initiate an appropriate response. Third, the nurse has a primary responsibility for ensuring patient safety. Fourth, the nurse is also responsible for maintaining a bedside environment that fosters the psychosocial adaptation of the child and family. Fifth, the nurse also functions as an "integrator" of patient information. Expertly practiced PCCN will help ensure optimal outcomes in terms of patient survival and morbidity, as well as child and family adaptation to the stresses of the experience. Infrastructural supports required to foster the development of PCCN are discussed. These include education programs for junior and senior staff, a medical-nursing co-management administrative structure, adequate staffing (both in terms of quantity and level of PCCN expertise), as well as the promotion and utilization of research to adapt nursing care to new understandings of the needs of critically ill children and their families. The strength of a PICU's service is directly tied to the quality and rigor of care that the nursing team can provide, in collaboration with the entire pediatric critical care team.

Keywords

Nursing administration • Nursing education • Pediatric critical care nursing • Nursing ethics • Nursing research

Role of the Pediatric Critical Care Nurse

The increasing complexity of pediatric critical care has required a corresponding evolution in the sophistication of pediatric critical care nursing (PCCN). The role of the nurse in this setting is multi-faceted [1]. First, the nurse serves as a form of "total systems monitor"—continually examining all the physiologic monitors and treatment devices, along with the child's body. This requires the acquisition of "peripheral vision". A skillful nurse learns to adjust settings on critical care equipment so it can serve as an extension of his/her own sensory system. The nurse has to perform routine "maintenance" activities (e.g., medication preparation, blood procurement, etc.) while remain-

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ing attentive to the child's physiologic status—continually *tuned in* to the immediate recognition of any disruption in the child's condition. Second, in the event of any irregularity, the nurse must instantly judge the significance of the event and initiate an appropriate response. Such irregularities are frequently attributable to equipment artifacts or to "normal" patient functions such as movement or coughing that may trigger a variety of electronic alarms. The nurse has to immediately determine the importance of such events by "scanning" the child's body and surrounding equipment and discerning whether this implies a potential threat to the patient or not. If a significant problem is detected, then the nurse has to implement the required intervention (e.g., manual ventilation, airway suctioning). In cases of uncertainty or serious problems, the nurse will need to notify the physician. However, this notification needs to be done with discretion given the competing demands on the physician's time. Third, the nurse has a primary responsibility for ensuring patient safety [1–4], although this is not exclusively a nursing responsibility. He/she needs to prevent adverse events through the use of appropriate security measures (e.g., bedside rails, restraints, medication preparation procedures, infusion pump settings). Fourth, the nurse is also responsible for maintaining a bedside environment that fosters the psychosocial adaptation of the child and family [5]. He/she has to be attentive to the patient's psychological condition by addressing expressed needs while continually anticipating additional needs, inferred from a strong understanding of children's coping with critical illness. This involves the use of basic comforting skills, play therapies (in collaboration with child life specialists), as well as selected psychotherapeutic interventions (e.g., empathic listening, cognitive reframing), in collaboration with members of the mental health disciplines. He/she is also required to attend to the needs of the child's family, recognizing the extraordinary distress that can result from the illness and the benefit that the child will derive from the family's successful adaptation to the situation. Fifth, the nurse also functions as an "integrator" of patient information. The nurse is in continual contact with a vast body of bedside and laboratory patient information. Consequently, the nursing record serves as an integrated record of patient data that provides (a) a vital reference source for other health care professionals, (b) a log for subsequent shifts that need to compare data against prior events, and (c) a permanent record for retrospective reviews (e.g., morbidity and mortality analyses or quality improvement audits). The nurse also serves as a "live" patient data source. Given the rapid pace with which events unfold in the pediatric intensive care unit (PICU), the nurse is required to keep abreast of all that is going on with his/her assigned patient, to help ensure integrated coordinated patient care.

Turning to a *pilot in a cockpit* metaphor, PCCN typically involves highly routine surveillance functions, vigilantly attending to a multitude of cues to ensure an early recognition of *turbulence* or *system failure*. Such events must be immediately recognized and corrective interventions should be expediently and effectively implemented while ensuring the comfort and safety of the *passengers*. PCCN practiced in this manner will help ensure optimal outcomes in terms of patient survival and morbidity, as well as child and family adaptation to the stresses of the experience. This requires an education, administration, and innovation and research infrastructure that will foster and support expert nursing practice. The remainder of this chapter discusses these infrastructural elements.

Education

Orientation of New Staff

Typically, entry-level nursing education programs provide some basic exposure to general pediatric nursing, but little direct experience in critical care (neither adult nor pediatric) is offered. Academic programs in critical care nursing or PCCN are generally restricted to graduate advanced practice programs for clinical nurse specialists or nurse practitioners. Newly hired PICU nurses typically have little or no prior PCCN training. Such training is usually acquired "on the job". Given the critical condition of the PICU patient population and the need to provide no margin for "learning curve" errors, employers need to develop closely supervised education programs that expediently enable the new PICU nurse to acquire baseline knowledge and skills to manage less critical patients initially. Ultimately there is a gradual advancement in the complexity of assigned patients as expertise evolves.

New recruits, who usually have no prior PICU experience, arrive with (a) related experience such as neonatal critical care, (b) general pediatric experience, (c) adult critical care experience, (d) neither pediatric nor adult critical care experience (e.g., general adult medicine), or (e) no experience at all (i.e., a new graduate). Although the direct hiring of the latter candidates is a hotly contested point, they can successfully adapt to a PICU setting, given adequate educational, mentoring, and administrative support [6, 7]. In light of these commonly diverse backgrounds, every PICU needs to maintain an orientation program for new staff that can be readily tailored to the variable needs of new staff [8]. An orientation program should consist of (a) 1–2 weeks of introductory reviews and (b) a 3- to 4-week clinical preceptorship directly supervised by a senior PICU nurse (4–8 weeks for a new graduate). The introductory reviews should include (a)

assigned readings, drawing selected chapters from seminal PCCN textbooks and recent journal publications [9–11]; (b) lectures that review basic critical care theory (e.g., evaluation of vital functions, hemodynamic evaluation, blood gas interpretation, neurologic evaluation, critical care pharmacology); (c) demonstration and practice of common procedures (e.g., airway suctioning, manual ventilation, blood procurement from arterial catheter); (d) discussion of the role of the PICU nurse; (e) overview of pertinent psychosocial issues; (f) introduction to key members of the PICU team; and (g) review of key PICU policies and procedures and other textual resources available to nurses. Such reviews can be conducted with a cohort group of new recruits [6, 7].

Clinical Preceptorship

The clinical preceptorship should enable new staff to directly care for PICU patients with direct supervision [6–8]. This implies a co-assignment with a senior nurse that serves as a clinical preceptor. Ideally, the new nurse will work with one sole preceptor throughout the preceptorship, to ensure pedagogical continuity. The preceptor–preceptee dyad should be initially counted as one sole nurse, in terms of workload assignment, to ensure that the preceptor can provide the required level of support and supervision. Patient acuity and the level of preceptee autonomy should be gradually increased at a pace where the learner is capable of safely caring for a stable patient without continuous and direct supervision by the final two to three assigned shifts of the preceptorship.

Sometimes, the learner's background and capabilities enable a rapid progression, whereas for others this process may need to be slowed to a point where the preceptorship needs to be extended. In these latter cases, performance limitations need to be explicitly stated for the learner and an additional training plan developed. The preceptorship is formally completed when the learner has fulfilled all of the required skill and knowledge objectives or, on occasion, if it is judged that the learner will not be able to continue his/her employment in the PICU. Candidates successfully completing their preceptorship may benefit from a subsequent (formal or informal) mentorship wherein they can derive ongoing clinical and professional guidance from either their original preceptors or other suitable senior staff. Such mentorships may be organized as a group program, which can foster learning and bonds among new nurses [7, 8, 12, 13].

Clinical preceptors supporting such a preceptorship program should be provided with the educational and administrative support that is necessary to fulfill this critical role. In addition to advanced expertise in PCCN, preceptorship also requires a body of knowledge and skills that are not readily acquired through clinical care. This includes an understanding of (a) adult learning principles, (b) bedside instructional techniques, (c) clinical performance appraisal, and (d) dynamics of the preceptee–preceptor relationship. This can be acquired through a combination of classroom activities and direct coaching from an experienced nursing educator. Preceptors require administrative support wherein they can readily negotiate preceptee patient assignments (*workload* as well as *type* of patient) according to the preceptee's learning needs, discuss any performance problems that arise, and review general issues that may help improve the unit's preceptorship program.

Senior Staff Development

This discussion has focused exclusively on the learning needs of newly hired staff. However, orientation and preceptorship programs provide a basic level of PCCN preparation. Additional educational programs are therefore required to ensure the ongoing development of PICU nursing staff [1, 8]. Most importantly, nurses need ready access to advanced experts in PCCN (e.g., exemplary senior nurses, clinical nurse specialists, and nurse practitioners) as well as pediatric critical care physicians and other experts (e.g., respiratory therapists) who can provide bedside coaching for the management of emerging issues in everyday practice. Structured classroom-type and simulation programs should also be developed. These can be topic specific, such as: (a) Pediatric Advanced Life Support course; (b) an intermediate level workshop examining selected PCCN functions (e.g., stabilization of a postoperative cardiac surgery patient, continuous renal-replacement therapy); (c) review session on analgesia and sedation; or (d) trauma management workshop.

Advanced senior staff development programs are also required. For example, the Montreal Children's Hospital PICU has a 10-day PCCN course for senior nursing staff (which has been running for over 25 years) that provides an advanced review of critical care topics. This includes a thorough review of recent practices, ongoing debates, and emerging trends through lectures, case reviews, assigned readings, homework exercises, and student presentations (Table 5.1). Such programs help prepare senior staff to manage the most complex PICU patients while serving as clinical leaders and mentors for junior staff. Some universities offer postgraduate programs in pediatric critical care. These include courses that aim to advance the nurse's repertoire of knowledge, skills, attitudes and professional values. It may also prepare them for formal credentialing exams such as the Canadian Nurses Association certification in pediatric critical care [14].

Table 5.1 Senior staff development course for pediatric intensive care unit nursing: principal topics

Mechanics of ventilation
Control of breathing
Gas exchange and transport
Myocardial mechanics
Cardiac electrophysiology
Hemodynamic physiology
Critical care pharmacology
Fluids, electrolytes, and nutrition
Cerebral injury
Seizures
Sepsis
Immune function
Coagulopathies
Shock
Trauma
Hepatic dysfunction
Renal dysfunction
Analgesia and sedation
Extracorporeal membrane oxygenation and ventricular assist devices
Ethics

Administration

Structure

The PICU nursing manager needs to understand the complexity of the nursing service required in a PICU [15]. The manager commonly determines (a) the number of staff required for a given mix of patients, (b) support services available to nurses, (c) access to educational programs and resources, and (d) the number and type of new staff targeted for recruitment. Thus, the manager can profoundly enable or disable the functioning of a PICU nursing team. Such a manager should ideally have a strong background in PCCN as well as nursing management. The PICU should be co-managed by the medical director and nursing manager, each holding primary responsibility for his/her respective discipline while jointly managing areas of common concern (e.g., quality improvement). This structure facilitates reciprocal problem solving and support, which have been associated with improved patient outcomes [16, 17]. The inclusion of other professionals, such as child life specialist, physiotherapist, social worker, in regular meetings will help the nursing and medical managers to establish care priorities in light of the critically ill child's many needs.

Staffing

The most prominent administrative problem raised in PCCN relates to nursing staffing levels. What nurse/patient ratios are required to provide necessary care? This problem is related to increasing concerns about cost containment and nursing shortages in the face of rising demands for PICU services [17]. Nurse/patient ratios have obvious implications for nursing staff satisfaction and morale but have also been linked to patient outcomes. Evidence emerging out of other settings indicates that low nursing staffing levels are directly related to increased patient morbidity [2–4, 15–19]. This problem has been scarcely examined within the PICU setting, although one study reported that patients are more likely to experience unplanned extubations if they are assigned to a nurse caring for two patients rather than one [18].

The American Academy of Pediatrics Section on Critical Care and the American Academy of Pediatrics Committee on Hospital Care have jointly published *Guidelines and levels of care for pediatric intensive care units* [20]. This article indicates that nurse/patient ratios should vary according to patient needs, ranging from 2:1 (2 nurses per patient) to 1:3 (1 nurse per 3 patients). However, no further detail is provided on how specific staffing determinations should be made. Likewise no international guidelines propose widely accepted PICU nursing staffing standards, and a corresponding diversity of viewpoints on how this problem ought to be managed exist [21, 22]. The British Association of Critical Care Nurses has recently published staffing guidelines. They emphasize that patient safety depends on patient access to qualified registered nurses supported by an administrative structure that allows nurses to focus on patient care. Auxiliary workers can play a key role in assisting nurses but the nurse remains responsible for patient care [23]. Findings from a study by the Canadian Health Services Research Foundation support these findings [24].

Ball has examined the utility of nursing workload measures as a means for addressing this problem in critical care in general [25]. She questions the validity of such tools for these purposes, arguing that nursing staffing requirements should be based on patient needs and on the nursing care that would meaningfully address these needs rather than a count of tasks performed. Furthermore, no accepted tool exists for the measurement of PCCN workload. Although validated PICU acuity measures are available, these do not directly correlate with nursing workload. It appears that the best available means for determining workload is the judgment of nursing managers. This further justifies the necessity that such managers possess a strong grasp of PCCN.

Innovation and Research

Although PICU nurses share numerous concerns and interests with physicians and other critical care practitioners, a number of topics have gained particular importance in PCCN. These relate to problems that more immediately con-

cern nurses, although not exclusively. In fact, the PCCN literature has taken the lead in examining topics that are highly relevant to other critical care practitioners as well.

The PCCN literature examines physiologic, psychosocial, and ethical problems, as well as the educational and administrative issues discussed earlier. This literature is accessible through excellent PCCN textbooks [9, 10] and a number of highly respected critical care nursing journals (as well as non-nursing journals). *Pediatric Intensive Care Nursing* is an international journal exclusively devoted to PCCN. PICU nurses needing to consult colleagues about specific clinical problems can do so through the international PCCN Internet discussion group *PICU-Nurse-International* (http://health.groups.yahoo.com/group/PICU-Nurse-International/).

Nursing research on pain management and withdrawal reactions has complemented medical research. As nurses commonly assess when to administer analgesics to children who are intubated and cannot communicate, nursing research has examined the effectiveness of various pain assessment tools [26–31]. Nurses have also advanced knowledge on opioid/benzodiazepine withdrawal reactions, a frequent iatrogenic complication of PICU care [32–34]. Other topics reviewed in this literature include prone positioning [35], pressure ulcers [36], airway suctioning practices [37], environmental noise [38], and PICU ethical dilemmas [39].

Pediatric critical care nursing researchers have demonstrated a particular interest in psychosocial problems. This research has examined parental needs and stressors [40, 41], sibling experiences [41], the experience of the critically ill child [42], the experience of the entire family as a whole [41, 43], and family presence during resuscitation [44, 45]. A major finding of this psychosocial research is that *families are not visitors* [5, 41]. Family members are attempting to fulfill their respective family functions in the PICU (e.g., parenting); they are not visiting. The extent to which the experiences of individual family members can be favorably supported, these members will derive benefits that can also benefit the critically ill child. Family presence and participation in the patient's care can foster the well-being of both the patient and the family. Therefore, the PICU should ensure that families have access to essential physical comforts, as well as supportive psychosocial services. In light of the long-term psychological consequences that critical illness may entail for the child and family, these families could also benefit from integrated long-term follow-up services. Finally, the PICU setting is one of the primary sites of child deaths in pediatrics. The PICU staff should thus be sensitive to caring for the special needs of dying children and their families [46, 47].

Nursing-led research on PICU ethical concerns has highlighted that PICU staff struggle with *moral distress*; this is a malaise that results when situational constraints prevent clinicians from doing what they believe is the right thing to do [48]. Other ethics research has examined PICU decision-making, parental roles, communication [49], as well as concerns relating to the long-term care of PICU "survivors" with complex continuing care needs [50].

Conclusion

Pediatric critical care nursing is a major component of excellent pediatric critical care. The provision of this specialized nursing requires significant educational and administrative support while continually drawing on ongoing PCCN clinical innovations and research to adapt nursing care to new understandings of the needs of critically ill children and their families. The strength of a PICU's service is inescapably tied to the quality and rigor of care that the nursing team can provide, in collaboration with the entire pediatric critical care team.

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