Ensuring that we provide safe, evidence-based, cost-effective care to all patients is an assumption of today’s health care system. All patients and health care providers should expect a health care system that is committed to preventing harm and improving patient care by having clinicians use evidence-based safe practices. The call for evidence-based practice (EBP) was made in the hallmark publication of the Institute of Medicine’s report “To Err Is Human” more than a decade ago. Since this hallmark publication, efforts have been made by multiple organizations to encourage EBP. Organizations such as the Institute for Healthcare Improvement, The National Quality Forum, The Johns Hopkins Medicine Center for Innovation in Quality Care, the Agency for Healthcare Research and Quality, Joanna Briggs Institute, the American Association of Critical-Care Nurses, the...
Critical Evidence to Guide Practice

Critical care nurses must have a good understanding of what EBP is. Multiple definitions of EBP can be found in the literature. Regardless of which definition resonates best with your practice, all definitions have several key tenets. Essential elements of EBP include the integration of best research and other forms of evidence to guide practice, viewing clinical expertise as a component in care effectiveness, and consideration of patients’ preferences, values, and engagement in care decisions as essential to provide optimum evidence-based care to patients and their families. Embracing EBP as a practice norm requires critical care nurses to challenge traditional ways of providing care and move to practice interventions that apply current evidence to meet patient care needs better.

Although it is beyond the scope of this article to provide an in-depth discussion of EBP, a few critical points need to be made as we challenge practice interventions to be based on best evidence. The first point is that evidence is constantly evolving as we learn more about the effectiveness of care interventions. Thus, as critical care nurses, we must remain active learners throughout our career, gaining new knowledge to guide practice. Second, research evidence provides the foundation of care interventions, and EBP could not exist without well-done research. However, research evidence may not always be available to guide practice interventions, so nonresearch evidence should be examined critically to inform practice. Third, not all evidence provides clear answers to clinical questions; thus, the strength of evidence should be evaluated as to the risk or benefit of using the evidence to guide practice. Several tools exist to help clinicians critically evaluate and determine the strength of evidence (ie, level of evidence). AACN’s level of evidence provides criteria to help evaluate the strength of evidence to help clinicians evaluate use of that evidence to support practice.

This article is based on a presentation at the AACN’s 2014 National Teaching Institute that took place in Denver, Colorado. The presentation was the seventh of a series of presentations and articles that challenge critical care nurses to examine the evidence used to guide nursing practice interventions. In this most recent presentation, evidence for 4 critical care nursing practice interventions was examined: (1) weight-based medication administration, (2) chest tube patency maintenance interventions, (3) daily interruption of sedation, and (4) use of chest physiotherapy (CPT) in children. The evidence and implications for practice associated with each topic are discussed.

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Weight-Based Medication Practice

Safe administration of medication often involves knowledge of the patient’s weight to determine the correct dosage. When medication dosage is based on the patient’s weight, the practice is referred to as weight-based medication dosing, as opposed to fixed dosing, which does not factor in weight. Numerous medications administered by critical care nurses use weight-based dosing: opioid, vasoactive, cardiac, corticosteroid, anti-convulsant, sedating, and anti-infective agents, to name a few. The clinical practice question that arises is which...
weight is the best patient weight to use in determining weight-based medication dosages? Pharmacokinetic considerations associated with weight-based dosing of chemotherapeutic and antithrombotic agents are not addressed here. Additionally, weight is influenced by the patient’s overall adiposity, which influences metabolic regulation.26 Multiple elements must be examined when looking at safe weight-based medication administration, including the medication’s hydrophilic or lipophilic properties and end-organ metabolism efficacy25,26; these factors are not discussed here. Rather, this practice question focuses on exploring the evidence supporting best practice for communicating the patient’s weight for optimal decisions about administration of weight-based medications in intensive care units (ICUs).

**Review of Current Evidence**

Inaccurate weight-based drug calculations result in accidental underdosing or overdosing of patients.24,27 Two populations at greatest risk of inaccurate weight-based medication dosing are elderly patients and obese patients.24,27-30 Elderly patients are at risk of adverse drug reactions most frequently because of changes in renal function,28 and obese patients are at increased risk because of limited data guiding correct dosing in this population.24,26,27,30 Dosages for patients who are overweight are more likely to be too high or too low. Correct dosing in overweight patients is a concern because 68% of adults are overweight or obese, 6.7% are morbidly obese,31 and overweight individuals have a high number of hospital admissions, longer duration of mechanical ventilation, and longer hospital stays.32-35

Weight is a kinetic variable that reflects changes in volume of distribution for assessing the therapeutic effectiveness of a drug better than body mass index (BMI, calculated as weight in kilograms divided by height in meters squared) does.24,26,36 Historically, pharmacokinetic properties of drug therapeutic effectiveness were studied within limited ranges, typically by using an average patient, often described as the “70-kg, 5-foot 5-inch healthy man.”24,17,38 Several weight measurements have been reported as appropriate for use in weight-based medication administration. Research supporting the different weight measurements is sparse; most researchers have explored specific weight metrics with certain medications. Critical care nurses should work closely with pharmacists in reviewing specific weight-based dosing strategies.

BMI has been explored as a metric for weight-based dosing. In a clinical review examining the state of the science and mathematical assumptions associated with weight-based medication administration, Pai24 addresses the concept that BMI is a metric developed to aid categorization of patients by weight and percentage of body fat. BMI was not developed to aid in drug dosing. Thus use of BMI as a standard metric for determining weight-based medication dosing should be avoided.24,27,37 However, knowing a patient’s BMI, specifically if they are in the obese (BMI 30-39.9) or extremely obese (BMI >40) categories, may be helpful in determining weight-based dosing. In a multicenter randomized cohort study27 evaluating the therapeutic effectiveness of vancomycin dosing, researchers reported that incorporating BMI was an important factor to consider as higher dosing was needed in patients who were obese to achieve therapeutic blood levels of the agent.

Ideal body weight (IBW) is a socially determined metric that incorporates height, sex, and age in determining an appropriate weight. Similar to BMI, this metric also was not developed for medication dosing.24,38-40 One instance in which IBW may be helpful with weight-based medication dosing is in the care of morbidly obese patients. To avoid underdosing or overdosing a morbidly obese patient (BMI >40), the clinician or pharmacist may use a formula in which the patient’s IBW is subtracted from the patient’s actual body weight (ABW) and multiplied by 0.4 to obtain an adjusted weight for dosing ([ABW - IBW] × 0.4 = dosing weight).29,26,37 Using an obese patient’s ABW to calculate a medication dosage will on average result in too high a dose, and using an obese patient’s IBW will on average result in a subtherapeutic dose for the patient.27,38

Dry weight is often a misused phrase in the ICU. Nurses may consider a patient’s admission weight to be the person’s dry weight; this is incorrect. Dry weight is a term used for patients with end-stage renal disease, and it is the weight of the patient after dialysis treatment.41 Dry weight is defined as the lowest tolerated postdialysis weight achieved by gradual change in postdialysis weight at which signs or symptoms of hypovolemia or hypervolemia are minimal.41 Dry weight is not a weight
to be used for weight-based medication dosing in patients who do not have end-stage renal failure.

Current evidence suggests that the patient's ABW is the best weight to be communicated for decisions related to weight-based medication dosage. However, caution regarding the ABW needs to be exercised with obese patients. The critical care nurse is essential in obtaining, documenting, and communicating an accurate ABW on which care decisions will be based. Ideally the patient is weighed on admission to the ICU. Although it may not be practical to obtain the patient's weight immediately upon admission, processes to ensure that the patient is weighed shortly after admission should be established. Actually weighing the patient is an important intervention, as research has shown that clinicians are not very good at "estimating" patients' weight. Patient's self-reported weights are more accurate than weight estimations by health care providers. Avoid guessing the patient's weight for medication-dosing purposes. In a recent retrospective cohort study, researchers found that adjusting vasopressin dosing on the basis of ABW resulted in improved vital signs.

Kane-Gill and colleagues conducted an observational study of "real world" dosing and adverse drug reactions. The researchers reported that most adverse drug reactions occurred in overweight patients. In a recent Cochrane review, Gillaizeau et al reported that embracing computerized advice on drug dosage decisions to include weight-based dosing was associated with an increase in serum concentrations of anti-infective agents, achievement of physiological effects of prescribed agents more consistently, and reduction in the number of medication errors. A critical element for maximizing computer-assisted weight-based dosing is the accurate entry of the patient's ABW into the electronic health record. Frequently, this essential task is completed during the nurse's admission process, and the accuracy of the admission weight will influence medication administration for that patient.

Implications for Practice

Admission weight, ABW, should be obtained, documented, and communicated for weight-based medication administration decisions throughout the patient's ICU stay. Daily adjustments of the weight for dosing may result in medication errors. When patients have changes in weight because of fluid shifts, medication dosages should be adjusted to achieve the desired pharmacological response. Nurses working collaboratively with the provider and pharmacists may make weight-based decisions depending on the patient's ABW, end-organ function, agent pharmacokinetics, and desired therapeutic effects. Finally, older patients and patients with higher BMIs require more vigilant monitoring by critical care nurses to evaluate the therapeutic effectiveness of medications, as these patients are at greatest risk for adverse drug reactions, including both underdosing and overdosing of medications.

Maintenance of Chest Tube Patency

Chest tubes are ubiquitous in cardiac and thoracic surgery. The chest tube serves as a drain for the removal of air, blood, and other fluids from the pleural and/or mediastinal spaces. Nurses must be knowledgeable and competent in the assessment and care of all things inserted into or attached to their patients. It is essential that the nurses caring for a patient with a chest tube know why and where the tube is placed, how to assess for proper functioning and troubleshoot improper functioning, when and how to measure drainage, what the expected drainage is, and how to assess for the presence of complications and maintain patency. A nurse's failure to know and perform these important skills properly could cause serious harm to patients. The evidence supporting the management of chest tubes dates back to the early 1980s, yet some critical care nurses may still be managing chest tubes by using traditional practice interventions, such as stripping chest tubes, rather than practice based on best evidence.

Review of Current Evidence

The earliest method to maintain patency of chest tubes, primarily mediastinal tubes, was known as stripping. The clinician would grasp the drainage tube very close to the patient's body and while collapsing the tube between the thumb and fingers, pull down the tube from the insertion site. The rationale for this procedure was
to increase the vacuum pressure in the tube to assist in the removal of the drainage within the chest and remove any clots that might be forming within the tube. When stripping was performed, clinicians (the author included) were taught, and probably taught others, that this was a very important procedure to maintain tube function and patency, and to prevent infection, pericardial tamponade and the need for emergent reoperation, and even cardiac arrest. A rolling device was sometimes employed to assist with the stripping procedure for clinicians who might not have the hand strength to ensure consistent pressure.

Nurses and other clinicians who routinely stripped chest tubes saw complications that might have been related to the procedure. Patients complained of pain, some tubes were dislodged and even pulled out, and typically there was more drainage after stripping. The clinical practice question arose as to whether the increase in chest tube drainage was assisted by the stripping or caused by the stripping. Once this question was asked, investigators started looking into whether the stripping or rolling was accomplishing the intended purposes or actually causing injury and harm to patients.

In 1982, Duncan and Erikson examined the effects of stripping chest tubes and reported that the intervention did increase negative pressure in the intrathoracic cavity. This finding brought the procedure into question. Practice evolved from stripping chest tubes to “milking” the tubes to maintain patency. The objective of milking was not to actually collapse the tube but to massage it to break up any clots, to avoid having any dependent loops that could fill up with fluid, and to ensure the tubing and drainage system stayed below the level of the insertion site. In 1986, Isaacson et al reported no difference in drainage quantities between milking and stripping in 211 cardiac surgery patients. Pierce et al validated this finding when they reported no difference between milking and stripping as far as drainage, complications, and vital sign changes. Although the research was limited, more than 2 decades ago, research demonstrated that both stripping and milking served no good purpose related to chest tube patency and probably caused harm. Yet to date this practice tradition may still be performed in the care of patients with chest tubes.

The clinical question to be answered was whether any intervention or procedure was necessary to maintain chest tube patency and avoid complications of chest tube drainage systems. Lim Levy et al compared stripping, milking, and no manipulation for 60 cardiac surgery patients and found no difference in tube occlusion when no manipulation was performed. Kirkwood authored an “Ask the Expert” column in Critical Care Nurse regarding stripping versus milking chest tubes and concluded that both interventions “should be avoided” because they do not improve chest tube patency and may cause an undesired increase in intrathoracic pressures.

In 2002, the Cochrane Database of Systematic Reviews published a review of the literature and evidence-based recommendations for the question of mediastinal chest drain clearance for cardiac surgery. It was updated in 2004. Nine hundred ninety-two papers were narrowed to 3 studies involving a total of 471 patients. The 3 studies did not provide common interventions or outcomes, so data pooling and meta-analysis could not be performed. However, based on “single studies,” the conclusion was that there was no difference in output, cardiac tamponade, or surgical re-entry between stripping, milking, and no manipulation.

Day and colleagues published a best evidence topic discussion to answer the question “Is manipulation of mediastinal chest drains useful or harmful after cardiac surgery?” The authors completed an extensive literature search and identified 681 papers, of which 4 papers provided the best evidence to answer the clinical question. The authors determined that chest drainage system manipulation with stripping or milking demonstrated no safety or efficacy benefits, slightly increased pressure, and risked tissue damage. Their conclusion was that no manipulation of drainage tubes should be done on a routine basis.

Finally, the 6th edition of the AACN Procedure Manual for Critical Care echoes the recommendations offered by Day et al. The manual states, at level C evidence, that stripping and milking of closed chest drainage systems are contraindicated.

Implications for Practice

Although the quantity of research is small, the consistency of the findings is impressive. Chest drainage tubes serve an important function in the care and recovery of cardiothoracic surgery patients. No manipulation
of drainage tubes should be done on a routine basis. The management of these tubes should be based on the best evidence available. If current practice, unit protocols, or even physicians’ orders suggest stripping or milking chest tubes, which does not match the evidence-based practice recommendations, clinicians need to review the evidence and consider changing their practice. The research and evidence available on care of chest tubes clearly indicates that stripping and milking are not necessary to maintain chest tube patency and probably cause more harm than good.

Daily Interruption of Sedation

Administering sedation agents as part of patient care is common in the ICU, and use of sedation agents has been associated with prolonged mechanical ventilation. Sedation is used for a variety of reasons, including supplementing analgesic medications; decreasing anxiety, dyspnea, and delirium; facilitating patient care; reducing oxygen consumption; and producing a state of amnesia. The drawback to sedation is that it can accumulate in the body tissue and prolong the duration of mechanical ventilation. Providing sedation is a common practice in the management of critically ill patients, but the evidence supporting best practice for this intervention has recently been examined.

Related Beliefs and Evidence

The evidence guiding sedation administration practices has been evolving during the past decade. In the past, sedation was administered via continuous intravenous infusion without interruption until the prescriber decided it was time to wake the patient up. In the past few years, that philosophy has changed to one that is more patient focused, and sedation is tailored to the patient’s goals of care. The current recommended practice is to keep a patient more conscious by maintaining a light level of sedation and to use intermittent sedation versus continuous infusions. Both methods of delivery have their advantages and disadvantages. Continuous infusions of sedatives facilitate a steady state of sedation; however, continuous infusions promote the accumulation of the drug in body tissues and may extend the time it takes for the patient to wake up. Intermittent intravenous boluses of sedatives provide the least amount of sedation to achieve the desired effect; however, fluctuations in blood levels may be greater, resulting in peaks and troughs. During the peak, a patient may be oversedated and during the trough undersedation may occur.

Another change in sedation administration practice is the incorporation of infusions that have a daily interruption of sedation (DIS). DIS is also referred to as daily awakening, sedation vacation, and a spontaneous awakening trial. During a DIS, all continuous infusions of sedatives being administered to a patient receiving mechanical ventilation are stopped and the patient is allowed to wake up to assess his/her level of consciousness and readiness for a spontaneous breathing trial. The anticipated outcomes from a DIS are to decrease the duration of mechanical ventilation and to decrease the ICU length of stay (LOS). The DIS has gained a lot of popularity; however, it is not for all patients. Patients who have been receiving mechanical ventilation for a prolonged period, have profound neurological deficits, or who may have life support withdrawn should not have a DIS.

Recent research indicates that although DIS reduces the duration of mechanical ventilation and ICU LOS in certain groups of patients, there are perceived barriers to its implementation. Tanios et al administered a web-based survey to 12,994 nurse, physician, and pharmacy members of the Society of Critical Care Medicine. Nine hundred four (904) responders identified their perceived barriers to the use of a DIS. The top 3 perceived barriers were the potential for respiratory compromise (26%), the lack of acceptance by nursing (22%), and the increased risk of patients’ removing devices (19%).

Evidence to support the use of a DIS to reduce the duration of mechanical ventilation is mixed. Two randomized controlled trials reported a significant decrease in the duration of mechanical ventilation. Similarly, in a performance improvement project, Jones et al reported that the duration of mechanical ventilation was shortened after the implementation of a spontaneous awakening trial and spontaneous breathing trial protocol was implemented. In contrast, researchers in 2 different studies reported no difference in the duration of mechanical ventilation, and in a third study, de Wit and colleagues reported that the group that received the DIS exhibited a longer duration of mechanical ventilation. Augustes and

Judicious use of sedating agents, patient-specific goals for sedation, and daily interruption of sedation should be part of treatment goals for most patients receiving mechanical ventilation.
Ho conducted a meta-analysis of randomized controlled trials on the use of a DIS, in isolation, in critically ill adult patients. Fourteen studies were identified; however, only 5 studies involving 699 critically ill adult patients were identified and included in the meta-analysis. The results of the meta-analysis indicated that a DIS in isolation does not decrease the mean duration of mechanical ventilation in critically ill adult patients ($P = .66$; 95% confidence interval, -2.49-3.92).

Research exploring the impact of a DIS on ICU LOS has yielded mixed results. Five studies were done to evaluate the effect of a DIS on ICU LOS. In 2 of the studies, a shorter ICU LOS was reported; in 2 studies, no difference was reported; and in 1 study, a longer ICU LOS in patients who received the DIS was reported.

One perceived barrier to the implementation of a DIS is the risk of the patient removing invasive catheters and tubes. Three studies were done to evaluate the effect of a DIS on self-extubation. One study showed an increased frequency of self-extubation without reintubation, and 2 studies showed no difference in the frequency of self-extubation. In the meta-analysis exploring the impact of a DIS, Augustes and Ho reported that a DIS does not increase the odds of self-extubation (odd ratio, 1.30; $P = .65$; 95% confidence interval, 0.41-4.10). Thus current evidence suggests that fear of patients’ self-extubation if sedation is discontinued has not been substantiated by research.

### Implications for Practice

The practice of DIS, or sedation awakening, is based on limited scientific data; however, it has been implemented in many organizations along with EBP efforts to reduce oversedation of critically ill patients. The research evidence that supports this practice included patients in medical ICUs, with limited or no other patient populations studied. Based on the limited data available, it appears that DIS is safe in medical ICU patients. Further evidence is needed to determine the benefit of a DIS in other populations of patients. Nurses should continue to conduct and publish outcome evaluations to evaluate the positive effects of a DIS in more diverse patient populations and on the duration of mechanical ventilation, ICU LOS, and the incidence of self-extubation. A large randomized controlled trial in varied populations is needed to evaluate more effectively the safety and effectiveness of a DIS across all critical care practice settings. Additionally current practice evidence suggests that sedation should be used judiciously and that goals of sedation should be patient-specific to avoid overuse of sedating agents.

### Use of Chest Physiotherapy in Children

CPT is a common sight in pediatric units. It is performed by nurses, respiratory therapists, physical therapists, and parents for children of all ages and diagnoses. CPT was first described in 1901 for treatment of bronchiectasis in adults. In the 1960s and into the 1970s, the use of CPT increased significantly in response to the criticism of positive-pressure breathing therapy. However, despite the increase in the use of CPT, evidence supporting this intervention is lacking.

CPT is the term commonly used to describe the manual percussion or chest clapping over both anterior and posterior lung fields. Percussion is thought to loosen secretions from the bronchial walls, enabling children to move secretions out of the airways with coughing. Loosening secretions aids in airway clearance, decreases the work of breathing, improves gas exchange, and decreases the duration of illness. The evidence regarding conventional CPT, involving percussion, postural drainage, and coughing in various common pediatric respiratory diagnoses is reviewed. Limitations in evaluating the evidence include the fact that early studies often used custom-made respiratory scores and subjective measures such as less coughing or improved oral intake making it difficult to compare study findings. Additionally, because of the active components of CPT, blinded trials are nearly impossible.

### Review of Current Evidence

**Pneumonia.** The World Health Organization reports that pneumonia is the leading cause of death for children less than 5 years old. CPT has been used as an adjunct to decrease severity, length of illness, and improve outcomes of this serious disease. However, De Boeck and colleagues found little evidence to support use of CPT to treat pneumonia. Studies that supported the use of CPT to treat pneumonia did not have well-defined inclusion criteria and were published in the 1980s. Studies have not demonstrated improvement in signs and symptoms, decreased length of illness, decreased LOS, or reduction in duration of fever. Furthermore, pneumonia occurs in the peripheral airways; therefore, secretions are...
not located in an area where CPT could facilitate movement of secretions out of the airways.73,74

In a Cochrane database review, Chaves et al72 looked at CPT in the treatment of pneumonia in which the primary outcome criteria were mortality, LOS, and time to clinical resolution. The signs used for clinical resolution were absence of fever and work of breathing as evidenced by decreased retractions, nasal flaring, tachypnea, and normalized oxygen saturation levels. Three randomized clinical trials that involved 255 children from 29 days to 12 years old met study inclusion criteria. Researchers in 2 of the studies reported significant improvement in respiratory rate and oxygen saturation, but the third study failed to demonstrate a decrease in length of illness or LOS, and a meta-analysis could not be performed. The Cochrane review77 concluded that the evidence is insufficient to support the use of CPT in pneumonia. In another study,75 researchers randomized 72 hospitalized children 1 to 12 years old to receive standard respiratory care or CPT. No significant difference in severity of respiratory rate or duration of hospitalization was found between the 2 treatment groups. Additionally, the American Association of Respiratory Care does not recommend routine CPT in the treatment of pneumonia.72 Despite the widespread practice, the evidence does not support the use of CPT in the treatment of pediatric pneumonia.

Bronchiolitis. Bronchiolitis is a disease of the small airways of the lower respiratory tract, most commonly caused by viruses such as respiratory syncytial virus. It can cause significant symptoms of respiratory distress manifested by cough, tachypnea, retractions, and wheezing. The symptoms of bronchiolitis are a result of lower airway obstruction from the exudate and debris produced as a result of the necrosis of the epithelial layer of the airways.73 The goal of CPT is to relieve the airway obstruction and reduce the symptoms of respiratory distress. De Boeck and colleagues73 report the results of 3 randomized clinical trials of infants with bronchiolitis. CPT did not decrease LOS or need for supplemental oxygen and did not reduce illness severity. In another study78 of 601 children with lower respiratory infections admitted to 10 children’s hospitals, researchers compared use of CPT and length of illness. The use of CPT in these institutions varied from 45% to 71%, but the time to recovery did not differ.78 Thus CPT does not seem to shorten the course of illness.

Traditional passive CPT has been compared with forced passive exhalation as an adjunct to improve secretion clearance. Rochat and colleagues79 studied 98 infants less than 1 year old who had a diagnosis of bronchiolitis. The control group received routine supportive care with nasopharyngeal suctioning and oxygen. The experimental group received supportive care but also received 2 daily sessions of CPT consisting of bimanual compression over the chest and abdomen at the end of expiration. The researchers reported that this method of CPT did not demonstrate any benefit compared with nasopharyngeal suctioning alone. A 2012 Cochrane review80 updated the appraisal of evidence on the effectiveness of using CPT including passive forced exhalation to treat bronchiolitis. The researchers evaluated 9 clinical trials with 891 subjects and reported no decrease in length of illness, length of hospitalization, or severity of illness regardless of type of CPT used compared with no treatment. Some evidence suggests that there is a benefit of the forced exhalation technique, but additional research is needed.81 The current evidence does not support routine use of CPT to treat bronchiolitis in children.

Asthma. Asthma is a common pediatric diagnosis with exacerbations requiring hospitalization for 30% to 40% of children seen in emergency rooms.82 Asthma consists of airway narrowing and inflammation that can allow secretions to be trapped in the airways. A prospective trial included 40 children 4 to 18 years old who were hospitalized with asthma.83 Children were randomized to receive CPT. Measurements of oxygen saturations and work of breathing showed no difference between the control and experimental groups. In another study, hospitalized children 6 to 13 years old were randomized to either receiving CPT or receiving standard pharmacological therapy alone.84 No improvement in lung function was seen in the group receiving CPT compared with the group receiving only drug therapy.

The physiology of asthma can result in trapping of secretions that can further exacerbate air trapping. Many providers believe that CPT can facilitate the movement of secretions to larger airways to be expelled. DiDario et al85 surveyed pediatricians in the United States about how often they prescribe CPT for patients with asthma. They reported that 58% of pediatricians believed that CPT was beneficial in asthma treatment. Despite the belief that CPT may be a helpful treatment
for asthma, research evidence has not shown the therapy to affect patients’ outcomes.

**Atelectasis.** The transition from mechanical ventilation to spontaneous respiration in children can be challenging. The smaller diameter airways as well as the more compliant rib cage can result in airway collapse and atelectasis. In 1979, Finer and colleagues published the results of a study on routine CPT, positioning, and suctioning that demonstrated a significant decrease in postextubation atelectasis. Following this publication, routine postextubation CPT to prevent atelectasis and resultant respiratory failure became common practice. Historically, this study was done before the advent of surfactant therapy and the more advanced invasive and noninvasive ventilation techniques that are currently available. Bagley et al conducted a trial to reevaluate the effectiveness of routine CPT after extubation compared with positioning and routine suctioning in neonates. The presence of atelectasis was determined by evaluation by a radiologist who was blinded to the group assignment. Interim analysis was done after 177 infants owing to newly published concern for adverse effects linking CPT and intracranial abnormalities. The interim analysis showed no significant difference between the groups; therefore, the study was terminated early. A Cochrane review exploring the efficacy of a CPT intervention in infants requiring mechanical ventilator support concluded that there was no benefit to CPT in preventing postextubation atelectasis; however, the reintubation rate was lower in the patients who received CPT.

Postoperative atelectasis following mechanical ventilation is a concern for pediatric patients of all ages. CPT is routinely employed by clinicians to encourage deep breathing and coughing and prevent development of postextubation atelectasis. Reines and colleagues reported significantly more atelectasis in cardiac surgery patients who received prophylactic postoperative CPT compared with patients who did not have CPT. The American Association of Respiratory Care does not recommend CPT as a part of routine care but encourages early ambulation.

Implications for Practice

Traditional CPT has limited benefit in the management of children with pneumonia, bronchiolitis, and asthma or as a prophylactic therapy to prevent atelectasis following extubation. The American Association of Respiratory Care does not recommend chest physiotherapy as a part of routine care but encourages early ambulation. There may be some benefit for patients with neuromuscular disease, but cough assist is more effective. CPT is not without risk. Rib fractures, intraventricular hemorrhage, atelectasis development as well as increased pain and splinting have been reported in postoperative patients. Airway suctioning alone is effective in airway clearance. Patients’ tolerance of CPT must be considered as well as the best use of clinicians’ resources. It is important to evaluate each child’s signs and symptoms on an individual basis when considering CPT as a possible treatment intervention. However, little evidence suggests that CPT should be a routine practice.

Summary

Patients deserve to be provided care that is based on current best evidence. Yet barriers to consistent implementation of EBP continue to be reported. Common challenges for failing to implement practices that are based on best evidence consistently include lack of knowledge of current best evidence, perception that EBP is time consuming and burdensome, and resistance to
Changing practice among coworkers and leaders. On the other hand, elements that foster effective translation of best evidence into daily practice are influenced by nurses’ understanding and believing that EBP improves patient care outcomes, clinical leaders’ modeling EBP in daily practice, and a culture that supports practice change based on best evidence. It is time to change the culture in our critical care units to one that embraces the translation of evidence into daily practice.

AACN honored Lucian Leape, MD, with the AACN Pioneering Spirit Award at the 2014 National Teaching Institute. Dr Leape helped author the Institute of Medicine’s report, “To Err Is Human” and has been foundational in the national patient safety movement. His commitment to improving patient outcomes by embracing EBP has helped to transform health care. Keeping with the pioneering spirit for which AACN honored Dr Leape, critical care nurses need to continually survey their individual practice, critically evaluate the evidence supporting practice interventions, and strive to provide safe, effective, EBP interventions as part of daily practice. CCN

Financial Disclosures
None reported.

References
Facts

Critical care nurses need to continually survey their practice, critically evaluate the evidence supporting practice interventions, and strive to provide safe, effective, evidence-based practice interventions as part of daily practice. Four common practice interventions are reviewed in this article.

Weight-Based Medication Practice

Admission weight, actual body weight, should be documented for weight-based medication administration decisions throughout the patient’s intensive care unit (ICU) stay. Daily adjustments of the weight for dosing may result in medication errors. When patients have changes in weight because of fluid shifts, medication dosages should be adjusted to achieve the desired pharmacological response. Nurses working with the provider and pharmacists may make weight-based decisions depending on the patient’s actual body weight, end-organ function, agent pharmacokinetics, and desired therapeutic effects. Older patients and patients with higher BMIs require more vigilant monitoring by critical care nurses to evaluate the therapeutic effectiveness of medications, as these patients are at greatest risk for adverse drug reactions.

Maintenance of Chest Tube Patency

Chest drainage tubes serve an important function in the care and recovery of cardiothoracic surgery patients. No manipulation of drainage tubes should be done on a routine basis. If current practice, unit protocols, or physicians’ orders suggest stripping or milking chest tubes, which does not match the evidence-based practice recommendations, clinicians need to review the evidence and consider changing their practice.

Daily Interruption of Sedation

Daily interruption of sedation (DIS) has been implemented in many organizations along with evidence-based practice efforts to reduce oversedation of critically ill patients. Based on the limited data available, it appears that DIS is safe in medical ICU patients. Nurses should continue to conduct and publish outcome evaluations to evaluate the positive effects of a DIS in more diverse patient populations and on the duration of mechanical ventilation, ICU length of stay, and the incidence of self-extubation. Additionally, current practice evidence suggests that sedation should be used judiciously and that goals of sedation should be patient-specific to avoid overuse of sedating agents.

Use of Chest Physiotherapy in Children

Traditional chest physiotherapy (CPT) has limited benefit in the management of children with pneumonia, bronchiolitis, and asthma or as a prophylactic therapy to prevent atelectasis following extubation. CPT is not without risk. Rib fractures, intraventricular hemorrhage, atelectasis development as well as increased pain and splinting have been reported in postoperative patients. Airway suctioning alone is effective in airway clearance. Patients’ tolerance of CPT must be considered as well as the best use of clinicians’ resources. It is important to evaluate each child’s signs and symptoms on an individual basis when considering CPT. However, little evidence suggests that CPT should be a routine practice.

Continuing to Challenge Practice to Be Evidence Based
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