

# PICU

## Evidence Update

## November 2017



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## Training Calendar 2017

### November (13.00)

2nd Thu	Literature Searching
10th Fri	Critical Appraisal
13th Mon	Statistics
21st Tues	Literature Searching
29th Wed	Critical Appraisal

### December (12.00)

7th Thu	Statistics
15th Fri	Literature Searching

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# Journal Tables of Contents

The most recent issues of key journals. Click on the hyperlinked titles (+ Ctrl) to for contents tables. If you would like any of the papers in full text then get in touch: [library@uhbristol.nhs.uk](mailto:library@uhbristol.nhs.uk)

## **Archives of Disease in Childhood**

[November 2017 - Volume 102 – Issue 11](#)

## **Critical Care Medicine**

[Vol. 45, No. 11, November 2017](#)

[Risk Stratification in Pediatric Acute Respiratory Distress Syndrome: A Multicenter Observational Study\\*](#)

Judith Ju-Ming Wong, MBBCh BAO, MRCPCH; Huu Phuc Phan, MD; Suwannee Phumeetham, MD; et al.

## **Current Opinion in Pediatrics**

[October 2017 - Volume 29 - Issue 5](#)

## **Frontiers in Pediatrics**

Section: ["Pediatric Critical Care"](#)

[Supraclavicular Approach to Ultrasound-Guided Brachiocephalic Vein Cannulation in Children and Neonates](#)

Merchaoui, Z. et al (05 October 2017)

[Glycemia Is Related to Impaired Cerebrovascular Autoregulation after Severe Pediatric Traumatic Brain Injury: A Retrospective Observational Study](#)

Young, A.M.H. et al (25 September 2017)

## **Intensive Care Medicine**

[Volume 43 Number 11](#)

[Paediatric sepsis: old wine in new bottles?](#)

Luregn J. Schlapbach, Etienne Javouhey & Nicolaas J. G. Jansen

[High variability of treatments for paediatric status asthmaticus: a retrospective study in PICUs](#)

Noëlle Lachaussée, François Angoulvant & Stéphane Dauter

**New England Journal of Medicine**

<http://www.nejm.org/>

**Single-Dose Gene-Replacement Therapy for Spinal Muscular Atrophy**

J.R. Mendell and Others | N Engl J Med 2017;377:1713-1722

**Nusinersen versus Sham Control in Infantile-Onset Spinal Muscular Atrophy**

R.S. Finkel and Others | N Engl J Med 2017;377:1723-1732

**Pediatric Anesthesia**

[November 2017 - Volume 27 - Issue 11](#)

**Nurse-driven analgesia and sedation in pediatric patients with univentricular hearts requiring extracorporeal life support after first-stage palliation surgery: A pilot study**

Jörg Michel, Michael Hofbeck, Ines Gerbig, Vanya Icheva, Ellen Heimberg, Walter Jost, Christian Schlensak, Matthias Kumpf, Gunnar Blumenstock and Felix Neunhoeffler

**A quality improvement initiative to increase the safety of pediatric emergency airway management**

Elliot Long, Domenic R. Cincotta, Joanne Grindlay, Stefano Sabato, Emmanuelle Fauteux-Lamarre, David Beckerman, Terry Carroll and Nuala Quinn, On behalf of the Pediatric Research in Emergency Departments International Collaborative (PREDICT)

Version of Record online: 24 OCT 2017 | DOI: 10.1111/pan.13275

**Role of ultrasound measuring position and ventilation pressure in determining correct tube size in children**

Christoph Schramm, Luzie S. Eisleben, Jens Kessler, Katrin Jensen and Konstanze Plaschke

**Pediatric Anesthesia**

[Volume 27, Issue 11 Pages 1067 - 1169, November 2017](#)

**Pharmacokinetics of S-ketamine during prolonged sedation at the pediatric intensive care unit (pages 1098–1107)**

Robert B. Flint, Carole N. M. Brouwer, Anne S. C. Kränzlin, Loraine Lie-A-Huen, Albert P. Bos and Ron A. A. Mathôt

Version of Record online: 13 OCT 2017 | DOI: 10.1111/pan.13239

**Pediatric estimating endotracheal tube “4-3-2-1”: A mnemonic for an age-based endotracheal tube selection (pages 1166–1167)**

Jeremy H. Tsui and Ban C. H. Tsui

Version of Record online: 13 OCT 2017 | DOI: 10.1111/pan.13231

## **Pediatric Critical Care Medicine**

[October 2017 - Volume 18 - Issue 10](#)

### [Time of Admission to the PICU and Mortality\\*](#)

McCrory, Michael C.; Spaeder, Michael C.; Gower, Emily W.; Nakagawa, Thomas A.; Simpson, Sean L.; Coleman, Mary A.; Morris, Peter E.

## **Database Articles**

Below is a selection of articles recently added to the healthcare databases. If you would like any of the following articles in full text, or if you would like a more focused search on your own topic, then get in touch: [library@uhbristol.nhs.uk](mailto:library@uhbristol.nhs.uk)

### **1. Risk Stratification in Pediatric Acute Respiratory Distress Syndrome: A Multicenter Observational Study.**

**Author(s):** Wong, Judith Ju-Ming; Phan, Huu Phuc; Phumeetham, Suwannee; Ong, Jacqueline Soo May; Chor, Yek Kee; Qian, Suyun; Samransamruajkit, Rujipat; Anantasit, Nattachai; Gan, Chin Seng; Xu, Feng; Sultana, Rehena; Loh, Tsee Foong; Lee, Jan Hau; Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN)

**Source:** Critical care medicine; Nov 2017; vol. 45 (no. 11); p. 1820-1828

**Publication Date:** Nov 2017

**Publication Type(s):** Multicenter Study Journal Article Observational Study

**PubMedID:** 28749854

Available at [Critical care medicine](#) - from Ovid (Journals @ Ovid)

Available at [Critical care medicine](#) - from Ovid (Journals @ Ovid)

**Abstract:**OBJECTIVEThe Pediatric Acute Lung Injury Consensus Conference developed a pediatric specific definition for acute respiratory distress syndrome (PARDS). In this definition, severity of lung disease is stratified into mild, moderate, and severe groups. We aim to describe the epidemiology of patients with PARDS across Asia and evaluate whether the Pediatric Acute Lung Injury Consensus Conference risk stratification accurately predicts outcome in PARDS.DESIGNA multicenter, retrospective, descriptive cohort study.SETTINGTen multidisciplinary PICUs in Asia.PATIENTSAll mechanically ventilated children meeting the Pediatric Acute Lung Injury Consensus Conference criteria for PARDS between 2009 and 2015.INTERVENTIONSNone.MEASUREMENTS AND MAIN RESULTSData on epidemiology, ventilation, adjunct therapies, and clinical outcomes were collected. Patients were followed for 100 days post diagnosis of PARDS. A total of 373 patients were included. There were 89 (23.9%), 149 (39.9%), and 135 (36.2%) patients with mild, moderate, and severe PARDS, respectively. The most common risk factor for PARDS was pneumonia/lower respiratory tract infection (309 [82.8%]). Higher category of severity of PARDS was associated with lower ventilator-free days (22 [17-25], 16 [0-23], 6 [0-19];  $p < 0.001$  for mild, moderate, and severe, respectively) and PICU free days (19 [11-24], 15 [0-22], 5 [0-20];  $p < 0.001$  for mild, moderate, and severe, respectively). Overall PICU mortality for PARDS was 113 of 373 (30.3%), and 100-day mortality

was 126 of 317 (39.7%). After adjusting for site, presence of comorbidities and severity of illness in the multivariate Cox proportional hazard regression model, patients with moderate (hazard ratio, 1.88 [95% CI, 1.03-3.45];  $p = 0.039$ ) and severe PARDS (hazard ratio, 3.18 [95% CI, 1.68, 6.02];  $p < 0.001$ ) had higher risk of mortality compared with those with mild PARDS. CONCLUSIONS Mortality from PARDS is high in Asia. The Pediatric Acute Lung Injury Consensus Conference definition of PARDS is a useful tool for risk stratification.

## 2. Adaptation and Validation of a Pediatric Sequential Organ Failure Assessment Score and Evaluation of the Sepsis-3 Definitions in Critically Ill Children.

**Author(s):** Matics, Travis J; Sanchez-Pinto, L Nelson

**Source:** JAMA pediatrics; Oct 2017; vol. 171 (no. 10); p. e172352

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Observational Study Validation Studies

**PubMedID:** 28783810

Available at [JAMA pediatrics](#) - from EBSCO (MEDLINE Complete)

**Abstract:** Importance The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) uses the Sequential Organ Failure Assessment (SOFA) score to grade organ dysfunction in adult patients with suspected infection. However, the SOFA score is not adjusted for age and therefore not suitable for children. Objectives To adapt and validate a pediatric version of the SOFA score (pSOFA) in critically ill children and to evaluate the Sepsis-3 definitions in patients with confirmed or suspected infection. Design, Setting, and Participants This retrospective observational cohort study included all critically ill children 21 years or younger admitted to a 20-bed, multidisciplinary, tertiary pediatric intensive care unit between January 1, 2009 and August 1, 2016. Data on these children were obtained from an electronic health record database. The pSOFA score was developed by adapting the original SOFA score with age-adjusted cutoffs for the cardiovascular and renal systems and by expanding the respiratory criteria to include noninvasive surrogates of lung injury. Daily pSOFA scores were calculated from admission until day 28 of hospitalization, discharge, or death (whichever came first). Three additional pediatric organ dysfunction scores were calculated for comparison. Exposures Organ dysfunction measured by the pSOFA score, and sepsis and septic shock according to the Sepsis-3 definitions. Main Outcomes and Measures The primary outcome was in-hospital mortality. The daily pSOFA scores and additional pediatric organ dysfunction scores were compared. Performance was evaluated using the area under the curve. The pSOFA score was then used to assess the Sepsis-3 definitions in the subgroup of children with confirmed or suspected infection. Results In all, 6303 patients with 8711 encounters met inclusion criteria. Each encounter was treated independently. Of the 8482 survivors of hospital encounters, 4644 (54.7%) were male and the median (interquartile range [IQR]) age was 69 (17-156) months. Among the 229 nonsurvivors, 127 (55.4%) were male with a median (IQR) age of 43 (8-144) months. In-hospital mortality was 2.6%. The maximum pSOFA score had excellent discrimination for in-hospital mortality, with an area under the curve of 0.94 (95% CI, 0.92-0.95). The pSOFA score had a similar or better performance than other pediatric organ dysfunction scores. According to the Sepsis-3 definitions, 1231 patients (14.1%) were classified as having sepsis and had a mortality rate of 12.1%, and 347 (4.0%) had septic shock and a mortality rate of 32.3%. Patients with sepsis were more likely to die than patients with confirmed or suspected infection but no sepsis (odds ratio, 18; 95% CI, 11-28). Of the 229 patients who died during their hospitalization, 149 (65.0%) had sepsis or septic shock during their course. Conclusions and Relevance The pSOFA score was adapted and validated with age-adjusted variables in critically ill children. Using the pSOFA score, the Sepsis-3 definitions were assessed in children with

confirmed or suspected infection. This study is the first assessment, to date, of the Sepsis-3 definitions in critically ill children. Use of these definitions in children is feasible and shows promising results.

### **3. End-of-Life and Bereavement Care in Pediatric Intensive Care Units.**

**Author(s):** Suttle, Markita L; Jenkins, Tammara L; Tamburro, Robert F

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 1167-1183

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941542

**Abstract:**Most childhood deaths in the United States occur in hospitals. Pediatric intensive care clinicians must anticipate and effectively treat dying children's pain and suffering and support the psychosocial and spiritual needs of families. These actions may help family members adjust to their loss, particularly bereaved parents who often experience reduced mental and physical health. Candid and compassionate communication is paramount to successful end-of-life (EOL) care as is creating an environment that fosters meaningful family interaction. EOL care in the pediatric intensive care unit is associated with challenging ethical issues, of which clinicians must maintain a sound and working understanding.

### **4. Morbidity: Changing the Outcome Paradigm for Pediatric Critical Care.**

**Author(s):** Heneghan, Julia A; Pollack, Murray M

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 1147-1165

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941541

**Abstract:**The focus of critical care has evolved from saving lives to preservation of function. Morbidity rates in pediatric critical care are approximately double mortality rates. Morbidity includes complications of disease and medical care. In pediatric critical care, functional status morbidity is an intermediate outcome in the progression toward death and is the result of the same factors associated with mortality, including physiologic profiles and case-mix factors. The Functional Status Scale developed by Collaborative Pediatric Critical Care Research Network is a validated, granular, age-independent measure of functional status that has proved valuable and practical even in large outcome studies.

### **5. Delirium in Pediatric Critical Care.**

**Author(s):** Patel, Anita K; Bell, Michael J; Traube, Chani

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 1117-1132

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941539

**Abstract:**Delirium occurs frequently in the critically ill child. It is a syndrome characterized by an acute onset and fluctuating course, with behaviors that reflect a disturbance in awareness and cognition. Delirium represents global cerebral dysfunction due to the direct physiologic effects

of an underlying medical illness or its treatment. Pediatric delirium is strongly associated with poor outcomes, including increased mortality, prolonged intensive care unit length of stay, longer time on mechanical ventilation, and increased cost of care. With heightened awareness, the pediatric intensivist can detect, treat, and prevent delirium in at-risk children.

#### **6. Sedation Analgesia and Neuromuscular Blockade in Pediatric Critical Care: Overview and Current Landscape.**

**Author(s):** Zuppa, Athena F; Curley, Martha A Q

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 1103-1116

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941538

**Abstract:** Sedation is a mainstay of therapy for critically ill children. Although necessary in the care of the critically ill child, sedative drugs are associated with adverse effects, such as disruption of circadian rhythm, altered sleep, delirium, potential neurotoxicity, and immunosuppression. Optimal approaches to the sedation of the critically ill child should include identification of sedation targets and sedation interruptions, allowing for a more individualized approach to sedation. Further research is needed to better understand the relationship between critical illness and sedation pharmacokinetics and pharmacodynamics, the impact of sedation on immune function, and the genetic implications on drug disposition and response.

#### **7. Mechanical Ventilation and Decision Support in Pediatric Intensive Care.**

**Author(s):** Newth, Christopher John L; Khemani, Robinder G; Jouvett, Philippe A; Sward, Katherine A

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 1057-1070

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941535

**Abstract:** Respiratory support is required in most children in the pediatric intensive care unit. Decision-support tools (paper or electronic) have been shown to improve the quality of medical care, reduce errors, and improve outcomes. Computers can assist clinicians by standardizing descriptors and procedures, consistently performing calculations, incorporating complex rules with patient data, and capturing relevant data. This article discusses computer decision-support tools to assist clinicians in making flexible but consistent, evidence-based decisions for equivalent patient states.

#### **8. Management Issues in Critically Ill Pediatric Patients with Trauma.**

**Author(s):** Ahmed, Omar Z; Burd, Randall S

**Source:** Pediatric clinics of North America; Oct 2017; vol. 64 (no. 5); p. 973-990

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28941544

**Abstract:** The management of critically ill pediatric patients with trauma poses many challenges because of the infrequency and diversity of severe injuries and a paucity of high-level evidence

to guide care for these uncommon events. This article discusses recent recommendations for early resuscitation and blood component therapy for hypovolemic pediatric patients with trauma. It also highlights the specific types of injuries that lead to severe injury in children and presents challenges related to their management.

**Database:** Medline

### 9. 'Best interests' in paediatric intensive care: an empirical ethics study.

**Author(s):** Birchley, Giles; Gooberman-Hill, Rachael; Deans, Zuzana; Fraser, James; Huxtable, Richard

**Source:** Archives of disease in childhood; Oct 2017; vol. 102 (no. 10); p. 930-935

**Publication Date:** Oct 2017

**Publication Type(s):** Journal Article

**PubMedID:** 28408466

Available at [Archives of disease in childhood](#) - from BMJ Journals

**Abstract:**OBJECTIVEIn English paediatric practice, English law requires that parents and clinicians agree the 'best interests' of children and, if this is not possible, that the courts decide. Court intervention is rare and the concept of best interests is ambiguous. We report qualitative research exploring how the best interests standard operates in practice, particularly with decisions related to planned non-treatment. We discuss results in the light of accounts of best interests in the medical ethics literature.DESIGNWe conducted 39 qualitative interviews, exploring decision making in the paediatric intensive care unit, with doctors, nurses, clinical ethics committee members and parents whose children had a range of health outcomes. Interviews were audio-recorded and analysed thematically.RESULTSParents and clinicians indicated differences in their approaches to deciding the child's best interests. These were reconciled when parents responded positively to clinicians' efforts to help parents agree with the clinicians' view of the child's best interests. Notably, protracted disagreements about a child's best interests in non-treatment decisions were resolved when parents' views were affected by witnessing their child's physical deterioration. Negotiation was the norm and clinicians believed avoiding the courts was desirable.CONCLUSIONSSensitivity to the long-term interests of parents of children with life-limiting conditions is defensible but must be exercised proportionately. Current approaches emphasise negotiation but offer few alternatives when decisions are at an impasse. In such situations, the instrumental role played by a child's deterioration and avoidance of the courts risks giving insufficient weight to the child's interests. New approaches to decision making are needed.

### 10. Variability of Care in Infants with Severe Bronchiolitis: Less-Invasive Respiratory Management Leads to Similar Outcomes.

**Author(s):** Essouri, Sandrine; Baudin, Florent; Chevret, Laurent; Vincent, Mélanie; Emeriaud, Guillaume; Jouvret, Philippe

**Source:** The Journal of pediatrics; Sep 2017; vol. 188 ; p. 156

**Publication Date:** Sep 2017

**Publication Type(s):** Multicenter Study Journal Article Observational Study

**PubMedID:** 28602381

**Abstract:**OBJECTIVETo compare the management of children with severe bronchiolitis requiring intensive care (based on duration of ventilatory support and duration of pediatric intensive care

unit [PICU] stay) in 2 countries with differing pediatric transport and PICU organizations. **STUDY DESIGN** This was a prospective observational care study in 2 PICUs of tertiary care university hospitals, 1 in France and 1 in Canada. All children with bronchiolitis who required admission to the PICU between November 1, 2013, and March 31, 2014, were included. **RESULTS** A total of 194 children were included. Baseline characteristics and illness severity were similar at the 2 sites. There was a significant difference between centers in the use of invasive ventilation (3% in France vs 26% in Canada;  $P < .0001$ ). The number of investigations performed from admission to emergency department presentation and during the PICU stay was significantly higher in Canada for both chest radiographs and blood tests ( $P < .001$ ). The use of antibiotics was significantly higher in Canada both before (60% vs 28%;  $P < .001$ ) and during (72% vs 33%;  $P < .0001$ ) the PICU stay. The duration of ventilatory support, median length of stay, and rate of PICU readmission were similar in the 2 centers. **CONCLUSION** Important differences in the management of children with severe bronchiolitis were observed during both prehospital transport and PICU treatment. Less invasive management resulted in similar outcomes with in fewer complications.

## Latest Evidence

**NICE** National Institute for  
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Searched but nothing to add



[Postoperative epidural analgesia versus systemic analgesia for thoraco-lumbar spine surgery in children](#)

Joanne Guay, Santhanam Suresh, Sandra Kopp, Rebecca L Johnson

Online Publication Date: October 2017

**UpToDate**<sup>®</sup>

**PEDIATRIC RESUSCITATION**

**Video laryngoscopy for endotracheal intubation of critically ill children (October 2017)**

The role of video laryngoscopy (VL, providing indirect laryngoscopy and a display of the glottic view on video monitor) for endotracheal intubation in children has been uncertain.

In prior studies comparing VL with direct laryngoscopy (DL) for intubation of non-critically ill children by experienced providers, intubation times were longer for VL and adverse events and successful first pass rates were not improved. A new observational report, based on data from an international registry of airway management in pediatric intensive care units, compares outcomes for over 900 endotracheal intubations using VL with 8875 intubations performed by DL, although children were not randomized to undergo VL or DL and thus likely to have had differing prognostic characteristics [23]. VL was associated with fewer tracheal intubation adverse events (eg, mainstem bronchial intubation, recognized esophageal intubation, or vomiting without aspiration) but not fewer severe events (eg, cardiac arrest, laryngospasm, esophageal intubation with delayed recognition, or aspiration) or need for multiple ( $\geq 3$ ) attempts. Based on this and evidence from other studies, VL may improve the chance of successful intubation in children with difficult airways (eg, limited mouth opening, cervical spine immobility, or severe micrognathia) but may have less benefit when compared with DL for intubation of children with otherwise normal airways. (See "[Devices for difficult endotracheal intubation in children](#)", section on 'Efficacy'.)



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