Outreach

Your Outreach Librarian can help facilitate evidence-based practice for all NICU staff, as well as assisting with academic study and research. We can help with literature searching, obtaining journal articles and books, and setting up individual current awareness alerts.

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Books can be searched for using SWIMS our online catalogue at www.swims.nhs.uk. Books and journals that are not available on site or electronically may be requested from other locations. Please email requests to: library@uhbristol.nhs.uk
Contents

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2: New NICE Guidance

3: Latest relevant Systematic Reviews from the Cochrane Library

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Tables of Contents from May’s NICU journals

Archives of Disease in Childhood: Fetal and Neonatal
May 2016, Volume 101, Issue 3

Neonatology
2016, Volume 110, Issue 2

Journal of Pediatrics
May 2016, Volume 172

JAMA Pediatrics
May 2016, Volume 170, Issue 5

Pediatrics
May 2016, Volume 137, Issue 5

Journal of Perinatology
May 2016, Volume 36, Issue 5

Upcoming Lunchtime Drop-in Sessions

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New NICE Guidance

QS121  Antimicrobial stewardship
NG46  Controlled drugs: safe use and management

Latest relevant Systematic Reviews from the Cochrane Library

Early removal versus expectant management of central venous catheters in neonates with bloodstream infection

Glutamine supplementation to prevent morbidity and mortality in preterm infants

Co-bedding in neonatal nursery for promoting growth and neurodevelopment in stable preterm twins

Oral immunoglobulin for preventing necrotizing enterocolitis in preterm and low birth weight neonates

Quick exercise

Heterogeneity

Heterogeneity is the extent to which studies brought together in a systematic review demonstrate variation across a range of key variables.

Match the different types of heterogeneity:

1. Statistical heterogeneity (conventionally just known as ‘heterogeneity’)
2. Methodological heterogeneity
3. Clinical heterogeneity

A. Variability in the participants, interventions and outcomes studied
B. Variability in study design and risk of bias
C. Variability in the intervention effects being evaluated in the different studies

ANSWERS: IC 28.3A
Title: Accuracy of a Weight-Based Formula for Neonatal Gastric Tube Insertion Length.
Citation: Advances in neonatal care : official journal of the National Association of Neonatal Nurses, Apr 2016, vol. 16, no. 2, p. 158-161, 1536-0911 (April 2016)
Author(s): Nguyen, Sarah, Fang, Alice, Saxton, Virginia, Holberton, James

Abstract: Gastric tubes are used in nurseries on a daily basis. Various methods of estimating gastric tube length for insertion using anatomical landmarks are used to assist correct placement. Sometimes, however, they can be up to 55% inaccurate. In 2012, we published a weight-based formula to estimate gastric tube length for insertion. This study reviews the rates of correct gastric tube placement, as confirmed by radiography, after the incorporation of this weight-based formula into bedside practice. A 6-month prospective study was performed in a tertiary neonatal intensive care unit. The formula estimating gastric tube length for insertion had been derived in an earlier study. This was incorporated into the hospital’s policies and procedures guideline for the insertion of gastric tubes. Neonates with gastric tubes who required radiography for clinical reasons were included. The infant’s weight and the type (orogastric or nasogastric) and length of tube were documented. A single radiologist assessed the tube position to be high, borderline, correct, or long. A total of 195 chest radiographs were obtained. Correct tube position was found in 84% of instances. This was a statistically and clinically significant improvement. Implementation of a simple weight-based estimate for gastric tube length improves correct position rates. Further studies comparing accuracy of length/height and weight-based estimations for gastric tube insertion lengths in very preterm and extremely preterm infants are needed.

Title: Significant reduction of central line-associated bloodstream infection rates in a tertiary neonatal unit.
Citation: American journal of infection control, Apr 2016, vol. 44, no. 4, p. 485-487, 1527-3296 (April 1, 2016)
Author(s): Rallis, Dimitrios, Karagianni, Paraskevi, Papakotoula, Ifigeneia, Nikolaidis, Nikolaos, Tsakalidis, Christos

Abstract: To evaluate the effectiveness of a quality initiative in reducing central line-associated bloodstream infections (CLABSI) in our neonatal intensive care unit, we designed a prospective study (January 2012-September 2013) estimating CLABSI incidence before and after our implementation. CLABSI rates were significantly decreased after our intervention, from 12 cases per 1,000 central vascular catheter (CVC) days during the preinterventional period to 3.4 cases per 1,000 CVC days during the postinterventional period (P = .004). Copyright © 2016 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

Title: Rooming-in for Infants at Risk of Neonatal Abstinence Syndrome.
Citation: American journal of perinatology, Apr 2016, vol. 33, no. 5, p. 495-501, 1098-8785 (April 2016)
**Author(s):** McKnight, Sarah, Coo, Helen, Davies, Gregory, Holmes, Belinda, Newman, Adam, Newton, Lynn, Dow, Kimberly

**Abstract:** Objective To examine the impact of a rooming-in program for infants at risk of neonatal abstinence syndrome (NAS) on the need for pharmacologic treatment and length of hospitalization. Study Design Our hospital implemented a rooming-in program for newborns at risk of NAS in June 2013. Previously, standard care was to admit these infants to the neonatal intensive care unit. Charts were reviewed to abstract data on at-risk infants born in the 13-month periods prior and subsequent to implementation of rooming-in (n = 24 and n = 20, respectively) and the groups were compared with the outcomes of interest. Result Rooming-in was associated with a reduced need for pharmacologic treatment and shorter length of stay. Conclusion These findings add to an emerging body of evidence on the health care resource utilization benefits associated with rooming-in for infants at risk of NAS. Future studies should evaluate a broader range of outcomes for this model of care. Thieme Medical Publishers 333 Seventh Avenue, New York, NY 10001, USA.

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**Title:** Antibiotic Stewardship Challenges in a Referral Neonatal Intensive Care Unit.  
**Citation:** American journal of perinatology, Apr 2016, vol. 33, no. 5, p. 518-524, 1098-8785 (April 2016)  
**Author(s):** Shipp, Kimberly D, Chiang, Tracy, Karasick, Stephanie, Quick, Kayla, Nguyen, Sean T, Cantey, Joseph B

**Abstract:** Background Antibiotic overuse in neonates is associated with adverse outcomes. Data are limited to guide antibiotic stewardship in the neonatal intensive care unit (NICU). Our objective was to identify areas for antibiotic stewardship improvement in a referral NICU. Methods Retrospective review of antibiotic use administered to infants admitted to a referral NICU compared with an inborn NICU. Antibiotic use was quantified by days of therapy (DOT) per 1,000 patient-days (PD). Results A total of 78% of referral NICU infants received ≥ 1 course of antibiotics. Infants in the referral NICU received more antibiotic DOT/1,000 PD than in the inborn NICU (558.9 vs. 343.2, p < 0.001), with a higher proportion of broad-spectrum therapy. For infants in the referral NICU, 39% of antibiotic courses were started at the transferring hospital; these were broader in spectrum (28 vs. 20%, p < 0.001) and less likely to be de-escalated or discontinued at 48 to 72 hours (58 vs. 87%, p < 0.001) than courses started after transfer. Conclusions Compared with the inborn NICU, suspected sepsis in the referral NICU accounted for more antibiotic utilization, which was broad-spectrum and less likely to be de-escalated. Stewardship interventions should include reserving broad-spectrum therapy for infants with risk factors and de-escalating promptly once culture results become available. Thieme Medical Publishers 333 Seventh Avenue, New York, NY 10001, USA.

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**Title:** Clinical Utility and Safety of a Model-Based Patient-Tailored Dose of Vancomycin in Neonates.  
**Citation:** Antimicrobial agents and chemotherapy, Apr 2016, vol. 60, no. 4, p. 2039-2042, 1098-6596 (April 2016)  
**Author(s):** Leroux, Stéphanie, Jacqz-Aigrain, Evelyne, Biran, Valérie, Lopez, Emmanuel, Madeleneau, Doriane, Wallon, Camille, Zana-Taieb, Elodie, Virlouvret, Anne-Laure, Rioualen, Stéphane, Zhao, Wei

**Abstract:** Pharmacokinetic modeling has often been applied to evaluate vancomycin pharmacokinetics in neonates. However, clinical application of the model-based personalized vancomycin therapy is still limited. The objective of the present study was to evaluate the clinical utility and safety of a model-based patient-tailored dose of vancomycin in neonates. A model-based vancomycin dosing calculator, developed from a population pharmacokinetic study, has been integrated into the routine clinical care in 3 neonatal intensive care units (Robert Debré, Cochin Port...
Royal, and Clocheville hospitals) between 2012 and 2014. The target attainment rate, defined as the percentage of patients with a first therapeutic drug monitoring serum vancomycin concentration achieving the target window of 15 to 25 mg/liter, was selected as an endpoint for evaluating the clinical utility. The safety evaluation was focused on nephrotoxicity. The clinical application of the model-based patient-tailored dose of vancomycin has been demonstrated in 190 neonates. The mean (standard deviation) gestational and postnatal ages of the study population were 31.1 (4.9) weeks and 16.7 (21.7) days, respectively. The target attainment rate increased from 41% to 72% without any case of vancomycin-related nephrotoxicity. This proof-of-concept study provides evidence for integrating model-based antimicrobial therapy in neonatal routine care. Copyright © 2016, American Society for Microbiology. All Rights Reserved.

Title: Drug-induced acute kidney injury in neonates.

Citation: Current opinion in pediatrics, Apr 2016, vol. 28, no. 2, p. 180-187, 1531-698X (April 2016)

Author(s): Hanna, Mina H, Askenazi, David J, Selewski, David T

Abstract: Acute kidney injury (AKI) is an independent risk factor for morbidity and mortality in critically ill neonates. Nephrotic medication exposure is common in neonates. Nephrotoxicity represents the most potentially avoidable cause of AKI in this population. Recent studies in critically ill children revealed the importance of recognizing AKI and potentially modifiable risk factors for the development of AKI such as nephrotoxic medication exposures. Data from critically ill children who have AKI suggest that survivors are at risk for the development of chronic kidney disease. Premature infants are born with incomplete nephrogenesis and are at risk for chronic kidney disease. The use of nephrotoxic medications in the neonatal intensive care unit is very common; yet the effects of medication nephrotoxicity on the short and long-term outcomes remains highly understudied. The neonatal kidney is predisposed to nephrotic AKI. Our ability to improve outcomes for this vulnerable group depends on a heightened awareness of this issue. It is important for clinicians to develop methods to minimize and prevent nephrotic AKI in neonates through a multidisciplinary approach aiming at earlier recognition and close monitoring of nephrotoxin-induced AKI.
Title: High positive predictive value of Gram stain on catheter-drawn blood samples for the diagnosis of catheter-related bloodstream infection in intensive care neonates.

Citation: European journal of clinical microbiology & infectious diseases : official publication of the European Society of Clinical Microbiology, Apr 2016, vol. 35, no. 4, p. 691-696, 1435-4373 (April 2016)

Author(s): Deleers, M, Dodémont, M, Van Overmeire, B, Hennequin, Y, Vermeylen, D, Roisin, S, Denis, O

Abstract: Catheter-related bloodstream infections (CRBSIs) remain a leading cause of healthcare-associated infections in preterm infants. Rapid and accurate methods for the diagnosis of CRBSIs are needed in order to implement timely and appropriate treatment. A retrospective study was conducted during a 7-year period (2005-2012) in the neonatal intensive care unit of the University Hospital Erasme to assess the value of Gram stain on catheter-drawn blood samples (CDBS) to predict CRBSIs. Both peripheral samples and CDBS were obtained from neonates with clinically suspected CRBSI. Gram stain, automated culture and quantitative cultures on blood agar plates were performed for each sample. The paired quantitative blood culture was used as the standard to define CRBSI. Out of 397 episodes of suspected CRBSIs, 35 were confirmed by a positive ratio of quantitative culture (>5) or a colony count of CDBS culture >100 colony-forming units (CFU)/mL. All but two of the 30 patients who had a CDBS with a positive Gram stain were confirmed as having a CRBSI. Seven patients who had a CDBS with a negative Gram stain were diagnosed as CRBSI. The sensitivity, specificity, positive predictive value and negative predictive value of Gram stain on CDBS were 80, 99.4, 93.3 and 98.1 %, respectively. Gram staining on CDBS is a viable method for rapidly (<1 h) detecting CRBSI without catheter withdrawal.

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Title: Epidemiology of painful procedures performed in neonates: A systematic review of observational studies.

Citation: European journal of pain (London, England), Apr 2016, vol. 20, no. 4, p. 489-498, 1532-2149 (April 2016)

Author(s): Cruz, M D, Fernandes, A M, Oliveira, C R

Abstract: Procedural pain in neonates has been a concern in the last two decades. The purpose of this review was to provide a critical appraisal and a synthesis of the published epidemiological studies about procedural pain in neonates admitted to intensive care units. The aims were to determine the frequency of painful procedures and pain management interventions as well as to identify their predictors. Academic Search, CINAHL, LILACS, Medic Latina, MEDLINE and SciELO databases were searched for observational studies on procedural pain in neonates admitted to intensive care units. Studies in which neonatal data could not be extracted from the paediatric population were excluded. Eighteen studies were included in the review. Six studies with the same study duration, the first 14 days of the neonate life or admission in the unit of care, identified 6832 to 42,413 invasive procedures, with an average of 7.5-17.3 per neonate per day. The most frequent procedures were heel lance, suctioning, venepuncture and insertion of peripheral venous catheter. Pharmacological and nonpharmacological approaches were inconsistently applied. Predictors of the frequency of procedures and analgesic use included the neonate's clinical condition, day of unit stay, type of procedure, parental presence and pain assessment. The existence of pain protocols was not a predictor of analgesia. Painful procedures were performed frequently and often with inadequate pain management. Unlike neonate clinical factors, organizational factors may be modified to promote a context of care more favourable to pain management. © 2015 European Pain Federation - EFIC®
Title: Active Surveillance Cultures and Decolonization to Reduce Staphylococcus aureus Infections in the Neonatal Intensive Care Unit.

Citation: Infection control and hospital epidemiology, Apr 2016, vol. 37, no. 4, p. 381-387, 1559-6834 (April 2016)

Authors: Popoola, Victor O, Colantuoni, Elizabeth, Suwantarat, Nuntra, Pierce, Rebecca, Carroll, Karen C, Aucott, Susan W, Milstone, Aaron M

Abstract: BACKGROUND Staphylococcus aureus is a common cause of healthcare-associated infections in neonates. OBJECTIVE To examine the impact of methicillin-susceptible S. aureus (MSSA) decolonization on the incidence of MSSA infection and to measure the prevalence of mupirocin resistance. METHODS We retrospectively identified neonates admitted to a tertiary care neonatal intensive care unit (NICU) from April 1, 2011, through September 30, 2014. We compared rates of MSSA-positive cultures and infections before and after implementation of an active surveillance culture and decolonization intervention for MSSA-colonized neonates. We used 2 measurements to identify the primary outcome, NICU-attributable MSSA: (1) any culture sent during routine clinical care that grew MSSA and (2) any culture that grew MSSA and met criteria of the National Healthcare Safety Network’s healthcare-associated infection surveillance definitions. S. aureus isolates were tested for mupirocin susceptibility. We estimated incidence rate ratios using interrupted time-series models. RESULTS Before and after the intervention, 1,523 neonates (29,220 patient-days) and 1,195 neonates (22,045 patient-days) were admitted to the NICU, respectively. There was an immediate reduction in the mean quarterly incidence rate of NICU-attributable MSSA-positive clinical cultures of 64% (incidence rate ratio, 0.36 [95% CI, 0.19-0.70]) after implementation of the intervention, and MSSA-positive culture rates continued to decrease by 21% per quarter (incidence rate ratio, 0.79 [95% CI, 0.74-0.84]). MSSA infections also decreased by 73% immediately following the intervention implementation (incidence rate ratio, 0.27 [95% CI, 0.10-0.79]). No mupirocin resistance was detected. CONCLUSION Active surveillance cultures and decolonization may be effective in decreasing S. aureus infections in NICUs. Infect. Control Hosp. Epidemiol. 2016;37(4):381-387.

Title: ‘Something normal in a very, very abnormal environment’ - Nursing work to honour the life of dying infants and children in neonatal and paediatric intensive care in Australia.

Citation: Intensive & critical care nursing : the official journal of the British Association of Critical Care Nurses, Apr 2016, vol. 33, p. 5-11, 1532-4036 (April 2016)

Authors: Bloomer, Melissa J, Endacott, Ruth, Copnell, Beverley, O’Connor, Margaret

Abstract: The majority of deaths of children and infants occur in paediatric and neonatal intensive care settings. For nurses, managing an infant/child’s deterioration and death can be very challenging. Nurses play a vital role in how the death occurs, how families are supported leading up to and after the infant/child's death. This paper describes the nurses’ endeavours to create normality amidst the sadness and grief of the death of a child in paediatric and neonatal ICU. Focus groups and individual interviews with registered nurses from NICU and PICU settings gathered data on how neonatal and paediatric intensive care nurses care for families when a child dies and how they perceived their ability and preparedness to provide family care. Four themes emerged from thematic analysis: (1) respecting the child as a person; (2) creating opportunities for family involvement/connection; (3) collecting mementos; and (4) planning for death. Many of the activities described in this study empowered parents to participate in the care of their child as death approached. Further work is required to ensure these principles are translated into practice.

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Title: Evaluation of Dry Sensors for Neonatal EEG Recordings.
Citation: Journal of clinical neurophysiology : official publication of the American Electroencephalographic Society, Apr 2016, vol. 33, no. 2, p. 149-155, 1537-1603 (April 2016)

Author(s): Fridman, Igor, Cordeiro, Malaika, Rais-Bahrami, Khodayar, McDonald, Neil J, Reese, James J, Massaro, An N, Conry, Joan A, Chang, Taeun, Soussou, Walid, Tsuchida, Tammy N

Abstract: Neonatal seizures are a common neurologic diagnosis in neonatal intensive care units, occurring in approximately 14,000 newborns annually in the United States. Although the only reliable means of detecting and treating neonatal seizures is with an electroencephalography (EEG) recording, many neonates do not receive an EEG or experience delays in getting them. Barriers to obtaining neonatal EEGs include (1) lack of skilled EEG technologists to apply conventional wet electrodes to delicate neonatal skin, (2) poor signal quality because of improper skin preparation and artifact, and (3) extensive time needed to apply electrodes. Dry sensors have the potential to overcome these obstacles but have not previously been evaluated on neonates. Sequential and simultaneous recordings with wet and dry sensors were performed for 1 hour on 27 neonates from 35 to 42.5 weeks postmenstrual age. Recordings were analyzed for correlation and amplitude and were reviewed by neurophysiologists. Performance of dry sensors on simulated vernix was examined. Analysis of dry and wet signals showed good time-domain correlation (reaching >0.8), given the nonsuperimposed sensor positions and similar power spectral density curves. Neurophysiologist reviews showed no statistically significant difference between dry and wet data on most clinically relevant EEG background and seizure patterns. There was no skin injury after 1 hour of dry sensor recordings. In contrast to wet electrodes, impedance and electrical artifact of dry sensors were largely unaffected by simulated vernix. Dry sensors evaluated in this study have the potential to provide high-quality, timely EEG recordings on neonates with less risk of skin injury.

Title: Increased frequency of peripheral venipunctures raises the risk of central-line associated bloodstream infection in neonates with peripherally inserted central venous catheters.

Citation: Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi, Apr 2016, vol. 49, no. 2, p. 230-236, 1995-9133 (April 2016)

Author(s): Cheng, Hao-Yuan, Lu, Chun-Yi, Huang, Li-Min, Lee, Ping-Ing, Chen, Jong-Min, Chang, Luan-Yin

Abstract: Central-line associated bloodstream infection (CLA-BSI), which is mostly caused by coagulase-negative staphylococcus, is an important morbidity in neonatal intensive care units. Our study is aimed to identify the risk factors of CLA-BSI in neonates with peripherally inserted central venous catheters (PICCs). A retrospective cohort study of neonatal intensive care unit patients with a PICC insertion between January 1, 2011 and December 31, 2012 was conducted. We performed univariate and multivariate analyses with a logistic regression model to investigate the risk factors and the association between increased frequency of peripheral venipunctures during PICC use and the risk of CLA-BSI while adjusting for other variables. There were 123 neonates included in our study. Thirteen CLA-BSIs were recorded within the follow-up period. The incidence of PICC-associated CLA-BSI was 4.99 per 1000 catheter-days. There was no statistically significant association between the risk of CLA-BSI and gestational age, birth weight, chronological age, or other comorbidities. However, the odds of CLS-BSI increased to 12 times if the patient received six or more venipunctures within the period without concurrent antibiotic use [odds ratio (OR), 11.94; p < 0.001]. The OR of CLA-BSIs increased by 16% per venipuncture during PICC use (OR, 1.14; p = 0.003). During PICC use, increased frequency of venipunctures, especially when there was no concurrent antibiotic use, substantially raises the risk of CLA-BSI. By decreasing unnecessary venipunctures during PICC use, PICC-associated CLA-BSI and further morbidities and mortalities can be prevented.

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Title: Ultrasound guided percutaneous internal jugular vein access in neonatal intensive care unit patients.

Citation: Journal of pediatric surgery, Apr 2016, vol. 51, no. 4, p. 570-572, 1531-5037 (April 2016)

Author(s): Oh, Chaeyoun, Lee, Sanghoon, Seo, Jeong-Meen, Lee, Suk-Koo

Abstract: Internal jugular vein (IJV) access is commonly performed in neonates and infants with open cut-down method. We report the results of ultrasound guided percutaneous venous access in newborn patients in the neonatal intensive care unit (NICU). We retrospectively examined the medical records of NICU patients who underwent therapeutic percutaneous IJV access under ultrasound guidance from October 2015 to May 2015. Under general anesthesia, IJV was punctured with a 21 gauge needle after identification by ultrasound. Catheter was inserted with Seldinger's technique. Twelve ultrasound-guided percutaneous IJV accesses were performed in eight patients and eleven cases were successful (91.6%). Procedure was performed at the median age of 4.5 days (range 2 days-47 days). Median body weight was 3030 g (range 1760 g-4100 g) and median operative time was 19 minutes (range 8 minutes-80 minutes). Indications for central venous access were hyperammonemia caused by urea cycle defect (four patients) and mitochondrial disease (one patient), acute kidney injury (two patients), and congenital renal dysgenesis (one patient). Catheters were inserted in the right IJV in nine cases while two cases were done on the left IJV. All catheters functioned normally. Seven out of seven cases that were examined for venous patency by ultrasonography after catheter removal showed patent IJV. Among these seven cases, four reinsertions were attempted and successfully performed. There was one complication of hemopericardium with cardiac tamponade which is thought to be caused by direct injury from the guidewire. The patient underwent pericardiocentesis. Ultrasound guided IJV access in NICU patients can be performed safely and is associated with preserved venous patency after catheter removal.

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Title: Surgical site infections in a longitudinal cohort of neonatal intensive care unit patients.

Citation: Journal of perinatology : official journal of the California Perinatal Association, Apr 2016, vol. 36, no. 4, p. 300-305, 1476-5543 (April 2016)


Abstract: To estimate the incidence and identify risk factors for surgical site infections (SSIs) among infants in the neonatal intensive care unit (NICU). A prospective cohort study of infants undergoing surgical procedures from May 2009 to April 2012 in three NICUs was performed. SSI was identified if documented by an attending neonatologist and treated with intravenous antibiotics. Independent risk factors were identified using logistic regression, adjusting for NICU. A total of 902 infants underwent 1346 procedures and experienced 60 SSIs (incidence: 4.46/100 surgeries). Risk factors for SSIs included younger chronological age (odds ratio (OR) 1.03 per day decrease, 95% confidence interval (CI) 1.01, 1.04), lower gestational age (OR 1.09 per week decrease, CI 1.02, 1.18), male sex (OR 1.17, CI 1.04, 1.34) and use of central venous catheter (OR 4.40, CI 1.19, 9.62). Only 43% had surgical site cultures obtained and Staphylococcus aureus was most commonly isolated. SSIs complicated 4.46% of procedures performed in the NICU. Although few modifiable risk factors for SSIs were identified, future efforts should focus on evaluating the impact of current prevention strategies on the incidence of neonatal SSI.

Title: Optimizing the Use of Antibacterial Agents in the Neonatal Period.

Citation: Paediatric drugs, Apr 2016, vol. 18, no. 2, p. 109-122, 1179-2019 (April 2016)
**Author(s):** Cantey, Joseph B

**Abstract:** Antibiotics are invaluable in the management of neonatal infections. However, overuse or misuse of antibiotics in neonates has been associated with adverse outcomes, including increased risk for future infection, necrotizing enterocolitis, and mortality. Strategies to optimize the use of antibiotics in the neonatal intensive care unit include practicing effective infection prevention, improving the diagnostic evaluation and empiric therapy for suspected infections, timely adjustment of therapy as additional information becomes available, and treating proven infections with an effective, narrow-spectrum agent for the minimum effective duration. Antibiotic stewardship programs provide support for these strategies but require the participation and input of neonatologists as stakeholders to be most effective.

**Title:** Acute Kidney Injury in Neonates in the PICU.
**Citation:** Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies, Apr 2016, vol. 17, no. 4, p. e159., 1529-7535 (April 2016)
**Author(s):** Kriplani, Disha S, Sethna, Christine B, Leisman, Daniel E, Schneider, James B

**Abstract:** Acute kidney injury is an independent risk factor for morbidity and mortality in critically ill children in the PICU. Neonates are a particularly vulnerable subgroup regarding acute kidney injury. The objectives were to define the prevalence of acute kidney injury to assess independent risk factors, for the development of acute kidney injury, and to determine the impact of acute kidney injury on outcomes in critically ill neonates without history of cardiac surgery. A retrospective study of neonates (≤ 28 d old and ≥ 32 wk of gestational age) admitted to a tertiary PICU was conducted. Acute kidney injury was classified using the Kidney Disease: Improving Global Outcomes definition. A total of 80 neonates (62% male neonates) with a median gestational age of 38 weeks (interquartile range, 37-39 wk) were reviewed. None. Acute kidney injury was found in 35% (n = 28) of neonates. Fourteen (50%) reached stage I, 8 (29%) stage II, and 6 (21%) stage III acute kidney injury. Younger age was associated with acute kidney injury (p = 0.016; odds ratio, 0.93; CI, 0.88-0.98). In regression analysis adjusted for age and gender, bacteremia (p = 0.014; odds ratio, 5.4; CI, 1.4-20.4) and maximum sodium concentration (p = 0.02; odds ratio, 1.12; CI, 1.02-1.24) were associated with acute kidney injury. Mortality (p = 0.03) and length of mechanical ventilation (p = 0.001) were significantly higher in neonates with acute kidney injury compared with those without acute kidney injury. In an adjusted regression model, stages 2 and 3 combined were associated with increased mortality (p = 0.02; odds ratio, 5.64; CI, 1.33-23.8), length of ventilation (p = 0.016; β, 12.2; CI, 2.39-22.0), and length of stay (p = 0.049; β, 12.2; CI, 0.073-24.3). Acute kidney injury is common in neonates not requiring cardiac surgery and is associated with increased morbidity and mortality. Age, bacteremia, and maximum sodium concentration are independently associated with the development of acute kidney injury in this population.

**Title:** Diode laser spectroscopy for noninvasive monitoring of oxygen in the lungs of newborn infants.
**Citation:** Pediatric research, Apr 2016, vol. 79, no. 4, p. 621-628, 1530-0447 (April 2016)
**Author(s):** Svanberg, Emilie Krite, Lundin, Patrik, Larsson, Marcus, Åkeson, Jonas, Svanberg, Katarina, Svanberg, Sune, Andersson-Engels, Stefan, Fellman, Vineta

**Abstract:** Newborn infants may have pulmonary disorders with abnormal gas distribution, e.g., respiratory distress syndrome. Pulmonary radiography is the clinical routine for diagnosis. Our aim was to investigate a novel noninvasive optical technique for rapid nonradiographic bedside
detection of oxygen gas in the lungs of full-term newborn infants. Laser spectroscopy was used to measure contents of oxygen gas (at 760 nm) and of water vapor (at 937 nm) in the lungs of 29 healthy newborn full-term infants (birth weight 2,900-3,900 g). The skin above the lungs was illuminated using two low-power diode lasers and diffusely emerging light was detected with a photodiode. Of the total 390 lung measurements performed, clear detection of oxygen gas was recorded in 60%, defined by a signal-to-noise ratio of >3. In all the 29 infants, oxygen was detected. Probe and detector positions for optimal pulmonary gas detection were determined. There were no differences in signal quality with respect to gender, body side or body weight. The ability to measure pulmonary oxygen content in healthy full-term neonates with this technique suggests that with further development, the method might be implemented in clinical practice for lung monitoring in neonatal intensive care.

Title: Pattern discovery in critical alarms originating from neonates under intensive care.
Citation: Physiological measurement, Apr 2016, vol. 37, no. 4, p. 564-579, 1361-6579 (April 2016)
Author(s): Joshi, Rohan, van Pul, Carola, Atallah, Louis, Feijs, Loie, Van Huffel, Sabine, Andriessen, Peter

Abstract: Patient monitoring generates a large number of alarms, the vast majority of which are false. Excessive non-actionable medical alarms lead to alarm fatigue, a well-recognized patient safety issue. While multiple approaches to reduce alarm fatigue have been explored, patterns in alarming and inter-alarm relationships, as they manifest in the clinical workspace, are largely a black-box and hamper research efforts towards reducing alarms. The aim of this study is to detect opportunities to safely reduce alarm pressure, by developing techniques to identify, capture and visualize patterns in alarms. Nearly 500 000 critical medical alarms were acquired from a neonatal intensive care unit over a 20 month period. Heuristic techniques were developed to extract the inter-alarm relationships. These included identifying the presence of alarm clusters, patterns of transition from one alarm category to another, temporal associations amongst alarms and determination of prevalent sequences in which alarms manifest. Desaturation, bradycardia and apnea constituted 86% of all alarms and demonstrated distinctive periodic increases in the number of alarms that were synchronized with nursing care and enteral feeding. By inhibiting further alarms of a category for a short duration of time (30 s/60 s), non-actionable physiological alarms could be reduced by 20%. The patterns of transition from one alarm category to another and the time duration between such transitions revealed the presence of close temporal associations and multiparametric derangement. Examination of the prevalent alarm sequences reveals that while many sequences comprised of multiple alarms, nearly 65% of the sequences were isolated instances of alarms and are potentially irreducible. Patterns in alarming, as they manifest in the clinical workspace were identified and visualized. This information can be exploited to investigate strategies for reducing alarms.

Full Text: Available from Institute of Physics in Physiological Measurement; Note: ; Collection notes: Only available on NHS networked computers. Not available with Athens username/password.

Title: Hemodynamic instability in the critically ill neonate: An approach to cardiovascular support based on disease pathophysiology.
Citation: Seminars in perinatology, Apr 2016, vol. 40, no. 3, p. 174-188, 1558-075X (April 2016)
Author(s): Giesinger, Regan E, McNamara, Patrick J

Abstract: Hemodynamic disturbance in the sick neonate is common, highly diverse in underlying pathophysiology and dynamic. Dysregulated systemic and cerebral blood flow is hypothesized to have a negative impact on neurodevelopmental outcome and survival. An understanding of the
physiology of the normal neonate, disease pathophysiology, and the properties of vasoactive medications may improve the quality of care and lead to an improvement in survival free from disability. In this review we present a modern approach to cardiovascular therapy in the sick neonate based on a more thoughtful approach to clinical assessment and actual pathophysiology. Targeted neonatal echocardiography offers a more detailed insight into disease processes and offers longitudinal assessment, particularly response to therapeutic intervention. The pathophysiology of common neonatal conditions and the properties of cardiovascular agents are described. In addition, we outline separate treatment algorithms for various hemodynamic disturbances that are tailored to clinical features, disease characteristics and echocardiographic findings. Crown Copyright © 2016. Published by Elsevier Inc. All rights reserved.

**Title:** A case series of neonatal arrhythmias.
**Citation:** The journal of maternal-fetal & neonatal medicine: the official journal of the European Society of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians, Apr 2016, vol. 29, no. 8, p. 1344-1347, 1476-4954 (April 2016)
**Author(s):** Isik, Dilek Ulubas, Celik, Istemi Han, Kavurt, Sumru, Aydemir, Ozge, Kibar, Ayse Esin, Bas, Ahmet Yagmur, Demirel, Nihal

**Abstract:** Neonatal arrhythmias (NAs) are defined as abnormal heart rates in the neonatal period. They may occur as a result of various cardiovascular, systemic and metabolic problems. A retrospective chart review was performed on newborns who were diagnosed with NA during hospitalization in a neonatal intensive care unit (NICU), or who were admitted to the NICU because of an arrhythmia diagnosis in two NICUs in Turkey from May 2011 to June 2013. Seventeen neonates with arrhythmias were identified. The incidence of NA was 0.4% and 0.3% in the two NICUs, and was 0.37% in the study population as a whole. Mean gestational age was 37 (29-40) weeks. Nine of the infants (53%) were diagnosed with fetal arrhythmia (FA) during the last week of gestation. The distribution of NA types was as follows: six (35%) supraventricular tachycardia (SVT), six (35%) premature atrial contractions (PACs), two (11%) premature ventricular contractions (PVCs), two (11%) multiple arrhythmias such as SVT + PAC and AV block + PVC, and one (5%) AV block. Wolff-Parkinson-White syndrome was present in one patient. An association of NA with congenital heart malformations was identified in five cases. Cardiac arrhythmias are important causes of infant morbidity, and an occasional cause of infant mortality if undiagnosed and untreated. It is important for the physician to be aware of the etiology, development and natural history of arrhythmias in the fetal and neonatal period.

**Title:** Clinical Data of Neonatal Systemic Thrombosis.
**Citation:** The Journal of pediatrics, Apr 2016, vol. 171, p. 60, 1097-6833 (April 2016)
**Author(s):** Saracco, Paola et al.

**Abstract:** To evaluate clinical data and associated risk conditions of noncerebral systemic venous thromboembolism (VT), arterial thromboembolism (AT), and intracardiac thromboembolism (ICT) in neonates. Data analysis of first systemic thromboembolism occurring in 75 live neonates (0-28 days), enrolled in the Italian Registry of Pediatric Thrombosis from neonatology centers between January 2007 and July 2013. Among 75 events, 41 (55%) were VT, 22 (29%) AT, and 12 (16%) ICT; males represented 65%, and 71% were preterm. In 19 (25%), thromboembolism was diagnosed on the first day of life. In this "early onset" group, prenatal-associated risk conditions (maternal/placental disease) were reported in 70% and inherited thrombophilia in 33%. Postnatal risk factors were present in 73%; infections and central vascular catheters in 56% and 54% VT, respectively, and in
67% ICT vs 27% AT (<.05). Overall mortality rate was 15% and significant thromboembolism-related sequelae were reported in 16% of discharged patients. This report from the Registro Italiano Trombosi Infantili, although limited by representing an uncontrolled case series, can be used to develop future clinical trials on appropriate management and prevention of neonatal thrombosis, focusing on obstetrical surveillance and monitoring of critically ill neonates with vascular access. A thrombosis risk prediction rule specific for the neonatal population should be developed through prospective controlled studies. Copyright © 2016 Elsevier Inc. All rights reserved.


Citation: The Journal of perinatal & neonatal nursing, Apr 2016, vol. 30, no. 2, p. 139-147, 1550-5073 (2016 Apr-Jun)

Author(s): Lefrak, Linda

Abstract: Neonates are at high risk for developing an infection during their hospital stay in the neonatal intensive care unit. Increased risk occurs because of immaturity of the neonate’s immune system, lower gestational age, severity of illness, surgical procedures, and instrumentation with life support devices such as vascular catheters. Neonates become colonized with bacteria prior to or at delivery and also during their hospital stay. They can then become infected with those bacteria if there is a breakdown in the primary defenses such as tissue injury due to skin breakdown, nasal erosion, or trauma to the respiratory tract. Neonates are also at high risk for bacterial translocation due to the altered permeability of the intestinal mucosa, loss of commensal flora, and bacterial overgrowth. The unit-based neonatal care team must implement global care delivery and safety practices, utilize published care guidelines, know and apply evidence-based practices from collaborative quality improvement efforts and other sources, and use auditing and monitoring practices that can identify risks and lead to better practice options to prevent infections. This article presents several aspects of global neonatal care delivery, including vascular access, which may reduce the risk of systemic infection during the hospitalization.


Author(s): Pogorzelska-Maziarz, Monika

Abstract: Central line-associated bloodstream infections (CLABSI) are an important cause of increased morbidity, mortality, and costs in neonatal intensive care unit (NICU) patients. In recent years, central line bundles have been developed and implemented as a means to reduce infection rates in intensive care units. The objective of this review was to describe central line bundles that are utilized in the neonatal population and evaluate the current evidence on the effectiveness of bundles for prevention of CLABSI in the NICU. This review shows that care bundles have been successfully used in NICUs (as part of both single-site quality improvement initiatives and large multisite collaboratives) to decrease CLABSI rates. The individual components that comprise the bundle between individual studies varied, but all studies showed a significant reduction in CLABSI rates. The pre- and postintervention design employed by these studies does not allow for conclusions to be drawn as to what specific bundle components are most effective in reducing rates. Further research is needed both to examine the effectiveness of specific components or combinations of components in the bundle and to examine factors that are associated with implementation and adherence to bundles.
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