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**Search details**

Early warning or track and trigger scores and observation in recognising the deteriorating neonatal patient.

**Resources searched**

NICE Evidence; TRIP Database; Cochrane Library; BNI; CINAHL; EMBASE; MEDLINE; Google Scholar

**Database search terms:** neonat* exp NEONATES; exp INFANT, NEWBORN, newborn*; "newly born*"; "early warning score*"; "track and trigger*"; trigger*; score*; observation*; deteriorate*; "getting worse"; worsening; retrogress*

**Evidence / Google Scholar search string(s):**

(neonates OR neonatal OR newborns) (observation OR "early warning" OR score OR trigger) (deterioration OR deteriorating OR "getting worse" OR worsening OR retrogression)

(neonates OR neonatal OR newborns) observation ("early warning" OR score OR trigger)

("early warning score" OR NEWS OR EWS OR "track and trigger") (paediatric OR children)

("early warning score" OR NEWS OR EWS OR "track and trigger") observation (paediatric OR children)

**Summary**

There is some research. Not very much of it compares observation and early warning scores directly. I have therefore included research on both observation and early warning
scores in the deteriorating neonatal patient, which hopefully will allow you to compare one method with the other.

Guidelines and Policy

Confidential Enquiry into Maternal and Child Health
Why Children Die: A Pilot Study 2006
1. For paediatric care in hospital we recommend a standardised and rational monitoring system with imbedded early identification systems for children developing critical illness – an early warning score.
2. Early Warning System) score which can reliably identify the acutely ill child. Greater awareness and use of such scoring systems could undoubtedly improve the recognition of children who have a significant risk of dying.

NHS Institute for Innovation and Improvement
Paediatric Early Warning Scores

Patient Safety First
The 'how to guide' for reducing harm from deterioration 2008

Royal College of Paediatrics and Child Health
High dependency care for children: time to move on: a focus on the critically ill child pathway beyond the paediatric intensive care unit 2014
We recommend that a single standardised Paediatric Early Warning Score (PEWS) or system be used across all paediatric wards and CCUs within a PCCN. Whilst there would be advantages in the same system being used across all PCCNs, that is to say in mandating a nationally agreed system for all in-patient paediatrics, we are aware that a number of systems are in use across the UK and do not feel we can recommend this at this time.

SIGN
Care of deteriorating patients 2014

Evidence Reviews

Database of Abstracts of Reviews of Effects
Systematic review of paediatric alert criteria for identifying hospitalised children at risk of critical deterioration 2011
This review found that evidence regarding the validity, reliability and utility of paediatric alert criteria was weak. Studies were needed to determine which physiological parameters or combinations of parameters best predicted serious adverse events. The included studies were limited both in the definition of parameters and their evaluation. Further research was needed. The authors' conclusions reflect the limited evidence.

Published Research – Databases
1. Evaluating the pediatric early warning score (PEWS) system for admitted patients in the
Objectives The Pediatric Early Warning Score (PEWS) systems were developed to provide a reproducible assessment of a child's clinical status while hospitalized. Most studies investigating the PEWS evaluate its usefulness in the inpatient setting. Limited studies evaluate the effectiveness and integration of PEWS in the pediatric emergency department (ED). The goal of this study was to explore the test characteristics of an ED-assigned PEWS score for intensive care unit (ICU) admission or clinical deterioration in admitted patients. Methods This was a prospective 12-month observational study of patients, aged 0 to 21 years, admitted from the ED of an urban, tertiary care children's hospital. ED nurses were instructed in PEWS assignment and electronic medical record (EMR) documentation. Interrater reliability between nurses was evaluated. PEWS scores were measured at initial assessment (P<sub>0</sub>) and time of admission (P<sub>1</sub>). Patients were stratified into outcome groups: those admitted to the ICU either from the ED or as transfers from the floor and those admitted to the floor only. Clinical deterioration was defined as transfer to the ICU within 6 hours or within 6 to 24 hours of admission. PEWS scores and receiver operating characteristic (ROC) curves were compared for patients admitted to the floor, ICU, and with clinical deterioration. Results The authors evaluated 12,306 consecutively admitted patients, with 99% having a PEWS documented in the EMR. Interrater reliability was excellent (intraclac class coefficient = 0.91). A total of 1,300 (10.6%) patients were admitted to the ICU and 11,066 (89.4%) were admitted to the floor. PEWS scores were higher for patients in the ICU group (P<sub>0</sub> = 2.8, SD +/- 2.4; P<sub>1</sub> = 3.2, SD +/- 2.4; p < 0.0001) versus floor patients (P<sub>0</sub> = 0.7, SD +/- 1.2; P<sub>1</sub> = 0.5, SD +/- 0.9; p < 0.0001). To predict the need for ICU admission, the optimal cutoff points on the ROC are P<sub>0</sub> < 1 and P<sub>1</sub> < 2, with areas under the ROC curve (AUCs) of 0.79 and 0.86, respectively. The likelihood ratios (LRs) for these optimal cutoff points were as follows: P<sub>0</sub> +LR = 2.5 (95% confidence interval [CI] = 2.4 to 2.6, p < 0.05), -LR = 0.32 (95% CI = 0.28 to 0.36, p < 0.05); and P<sub>1</sub> +LR = 6.2 (95% CI = 5.8 to 6.6, p < 0.05), -LR = 0.32 (95% CI = 0.29 to 0.35, p < 0.05). For every unit increase in P<sub>0</sub> and P<sub>1</sub>, the odds of admission to the ICU were 1.9 times greater (95% CI = 1.8 to 1.9, p < 0.0001) and 2.9 times greater (95% CI = 2.7 to 3.1, p < 0.0001) than to the floor. There were 89 patients in the clinical deterioration group, with 36 (0.3%) patients transferred to the ICU within 6 hours of admission and 53 (0.4%) patients transferred within 6 to 24 hours. In this group, an elevated P<sub>0</sub> and P<sub>1</sub> were statistically associated with an increased risk of transfer with optimal cutoff points similar to above; however, there were poorer AUCs and test characteristics. Conclusions A PEWS system was implemented in this pediatric ED with excellent data capture and nurse interrater reliability. The study found that an elevated PEWS is associated with need for ICU admission directly from the ED and as a transfer, but lacks the necessary test characteristics to be used independently in the ED environment. Resumen Objetivos Las puntuaciones del Pediatric Early Warning Score (PEWS) se desarrollaron para proporcionar una valoración reproducible del estado clínico de un niño a la hora de la hospitalización. La mayoría de los estudios que investigaron el PEWS evaluaron su utilidad en los pacientes ingresados. Hay pocos estudios que hayan evaluado la efectividad y la integración del PEWS en el servicio de urgencias (SU) pediátrico. El objetivo de este estudio fue explorar las características de la puntuación asignada por el PEWS en el SU para el ingreso en la unidad de cuidados intensivos (UCI) o el deterioro clínico en los pacientes ingresados. Metodología Estudio observacional prospectivo de 12 meses en pacientes entre 0 y 21 años ingresados desde el SU de un hospital infantil terciario urbano. Se formo a los enfermeros del SU en la asignación del PEWS y la documentacion en la historia clinica electronica (HCE). Se evaluó la variabilidad interobservador entre los enfermeros. Se cuantificaron las puntuaciones del PEWS en la valoracion inicial (P0) y en el momento del ingreso (P1). Los pacientes se clasificaron en grupos de resultado: aquellos ingresados en la UCI (bien desde el SU o como trasladados desde la planta); y aquellos ingresados solo en planta. El deterioro clínico se definió como el traslado a la UCI en las primeras 6 horas, o entre las primeras 6 a 24 horas del ingreso. Se compararon las puntuaciones del PEWS y las curvas ROC de los pacientes ingresados.
en planta, UCI y con deterioro clínico. Resultados Se evaluó a 12.306 pacientes consecutivamente ingresados, de los cuales se obtuvo una puntuación del PEWS en el SU en un 99% de los casos. La variabilidad interobservador fue excelente (coeficiente intraclass [CI] = 0,91). Se ingresaron 1.300 (10,6%) pacientes en la UCI y 11.066 (89,4%) en la planta. Las puntuaciones del PEWS fueron mayores para los pacientes en el grupo de la UCI (P<sub>0</sub> = 2,8, DE 2,4; P<sub>1</sub> = 3,2, DE 2,4; p < 0,0001) frente a los pacientes de la planta (P<sub>0</sub> = 0,7, DE 1,2; P<sub>1</sub> = 0,5, DE 0,9; p < 0,0001). Para predecir la necesidad de ingreso en la UCI, los puntos de corte óptimos en la curva ROC fueron P<sub>0</sub> = 1 y P<sub>1</sub> = 2, con unas áreas bajo la curva (ABC) ROC de 0,79 y 0,86, respectivamente. Los coeficientes de probabilidad positivo y negativo (CP) para estos puntos de corte óptimos para P<sub>0</sub> fueron, respectivamente, 2,5 (IC95% = 2,4 a 2,6, p < 0,05) y 0,32 (IC95% = 0,28 a 0,36, p < 0,05); y para P<sub>1</sub> = 2,6 (IC95% = 5,8 a 6,6, p < 0,05) y 0,32 (IC95% = 0,29 a 0,35, p < 0,05). Por cada incremento de una unidad de P0 y P1, la razón de ventajas para el ingreso en la UCI fue 1,9 (IC95% = 1,8 a 1,9, p < 0,0001) y 2,9 veces (IC95% = 2,7 a 3,1, p < 0,0001) mayor que en la planta. Hubo 89 pacientes en el grupo de deterioro clínico, con 36 (0,3%) pacientes trasladados a la UCI en las 6 primeras horas del ingreso y 53 (0,4%) pacientes trasladados entre las primeras 6 y 24 horas. En este grupo, unos P<sub>0</sub> y P<sub>1</sub> elevados se asociaron de forma estadísticamente significativa con un riesgo incrementado de traslado y con puntos de corte similares a los mencionados anteriormente, aunque las características del test y las ABC fueron peores. Conclusiones Una puntuación del PEWS se implementó en un SU pediátrico con datos excelentes de captura y de variabilidad interobservador en enfermería. El estudio encontro que una puntuación de PEWS elevada se asociaba con la necesidad de ingreso en la UCI directamente desde el SU y con el traslado, pero adolece de las características del test necesarias para ser usado de forma independiente en el entorno del SU.

Source: EMBASE

2. New born observation track and trigger (NOTT) chart-burton experience

Author(s) Ahmed M., Karupah A., Phillips I., Manzoor A.

Citation: Archives of Disease in Childhood, October 2014, vol./is. 99/(A473), 0003-9888 (October 2014)

Publication Date: October 2014

Abstract: Background Use of early warning system scores and track and trigger charts is widespread in adult and paediatric hospitalised patients. Its use in neonatal group is not well recognised. Lack of well established normal ranges for biophysical variables in preterm/term neonates illustrate difficulties in establishing a scoring system that can potentially be used on the neonatal units (NNU) and postnatal wards (PNW). We have recently developed NOTT chart for use in newborn babies on PNW. Aim To validate NOTT chart in order to enable early identification of neonates in need of urgent medical assessment and intervention. Methods A service evaluation was carried out to evaluate the efficacy of NOTT chart. All admissions from PNW to NNU (Feb-Aug 2013) were evaluated. Notes of all babies on PNW (2 weeks duration in Nov 2013) were also reviewed. Results There were 24 NNU admissions from PNW between Feb-Aug 2013. Sensitivity of NOTT chart's 'medium' and 'high' score was 96% (22/23). Charts of 42 babies on PNW were examined in Nov 2013. 7/42 babies scored 'medium' or 'high' out of which, 3 were admitted to NNU. Specificity of NOTT chart was 90%. Positive and negative predictive value was 43% and 100% respectively. Conclusions NOTT is an effective screening tool to identify any deterioration in the condition of a new born so prompt and timely assessment and medical intervention could be carried out. It is a useful tool for information sharing and provides a one stop solution for unifying all neonatal observations on PNW.

Source: EMBASE

Available in fulltext from Archives of disease in childhood at Highwire Press

3. Paediatric early warning scores on a children's ward: a quality improvement initiative.

Author(s) Ennis, Linda
Abstract: The aim of this quality improvement initiative was to incorporate a paediatric early warning score (PEWS) and track and trigger system in the routine care of children in an acute general children's ward at a regional hospital in the Republic of Ireland. In the absence of a nationally recommended specific PEWS strategy, a local plan was developed. The experience of structuring and implementing the PEWS and track and trigger system is presented in this article. Data from the first year of use were collected to evaluate the clinical utility and effectiveness of this system. In the busy acute children's service, the PEWS initiative was found to benefit processes of early detection, prompt referral and timely, appropriate management of children at potential risk of clinical deterioration. Nursing staff were empowered and supported to communicate concerns immediately and to seek rapid medical review, according to an agreed PEWS escalation plan. Outcomes were significantly improved.

Source: CINAHL
Available in fulltext from Nursing Children & Young People at EBSCOhost

4. Validation of the cardiac children's hospital early warning score: An early warning scoring tool to prevent cardiopulmonary arrests in children with heart disease

Author(s) Mclellan M.C., Gauvreau K., Connor J.A.

Citation: Congenital Heart Disease, May 2014, vol./is. 9/3(194-202), 1747-079X;1747-0803 (May/June 2014)

Publication Date: May 2014

Abstract: Objective: Most inpatient pediatric arrests are preventable by early recognition/treatment of deterioration. Children with cardiac disease have the highest arrest rates; however, early warning scoring systems have not be validated in this population. The objective of this study was to validate the Cardiac Children's Hospital Early Warning Score (C-CHEWS) tool in inpatient pediatric cardiac patients. The associated escalation of care algorithm directs: routine care (score 0-2), increased assessment/intervention (3-4), or cardiac intensive care unit (CICU) consult/transfer (>5). Design: Sensitivity and specificity were estimated based on retrospective review of patients that experienced unplanned CICU transfer/arrest (n = 64) and a comparison sample (n = 248) of admissions. The previously validated Pediatric Early Warning Score (PEWS) tool was used for comparison. Patients' highest C-CHEWS scores were compared with calculated PEWS scores. Area under the receiver operating characteristic (AUROC) curve was calculated for PEWS and C-CHEWS to measure discrimination. Results: The AUROC curve for C-CHEWS was 0.917 compared with PEWS 0.785 (P < .001). The algorithm AUROC curve was 0.902 vs. PEWS of 0.782. C-CHEWS algorithm sensitivity was 96.9 (score >2), 79.7 (>4), and 67.2 (>5) vs. PEWS of 81.1 (>2), 37.5 (>4), and 23.4 (>5). C-CHEWS specificity was 58.1 (>2), 85.5 (>4), and 93.6 (>5) vs. PEWS of 81.1 (>2), 94.8 (>4) and 97.6 (>5). Lead time of elevated C-CHEWS scores (>2) was a median of 9.25 hours prior to event vs. PEWS, which was 2.25 hours and lead time for critical C-CHEWS scores (>5) was 2 hours vs. 0 hours for PEWS (P < .001). Conclusions: C-CHEWS has excellent discrimination to identify deterioration in children with cardiac disease and performed significantly better than PEWS both as an ordinal variable and when choosing cut points to maximize AUROC. C-CHEWS has a higher sensitivity than PEWS at all cut points. 2013 Wiley Periodicals, Inc.

Source: EMBASE

5. Impact of rapid response system implementation on critical deterioration events in children

Author(s) Bonafide C.P., Localio A.R., Roberts K.E., Nadkarni V.M., Weirich C.M., Keren R.

Citation: JAMA Pediatrics, January 2014, vol./is. 168/1(25-33), 2168-6203 (January 2014)
**Publication Date:** January 2014

**Abstract:** Importance: Rapid response systems aim to identify and rescue deteriorating hospitalized patients. Previous pediatric rapid response system implementation studies have shown variable effectiveness in preventing rare, catastrophic outcomes such as cardiac arrest and death. Objective: To evaluate the impact of pediatric rapid response system implementation inclusive of a medical emergency team and an early warning score on critical deterioration, a proximate outcome defined as unplanned transfer to the intensive care unit with noninvasive or invasive mechanical ventilation or vasopressor infusion in the 12 hours after transfer. Design, setting, and participants: Quasi-experimental study with interrupted time series analysis using piecewise regression. At an urban, tertiary care children's hospital in the United States, we evaluated 1810 unplanned transfers from the general medical and surgical wards to the pediatric and neonatal intensive care units that occurred during 370,504 non-intensive care patient-days between July 1, 2007, and May 31, 2012. Interventions: Implementation of a hospital-wide rapid response system inclusive of a medical emergency team and an early warning score in February 2010. Main outcomes and measures: Rate of critical deterioration events, adjusted for season, ward, and case mix. Results: Rapid response system implementation was associated with a significant downward change in the preintervention trajectory of critical deterioration and a 62% net decrease relative to the preintervention trend (adjusted incidence rate ratio = 0.38; 95% CI, 0.20-0.75). We observed absolute reductions in ward cardiac arrests (from 0.03 to 0.01 per 1000 non-intensive care patient-days) and deaths during ward emergencies (from 0.01 to 0.00 per 1000 non-intensive care patient-days), but these were not statistically significant (P = .21 and P = .99, respectively). Among all unplanned transfers, critical deterioration was associated with a 4.97-fold increased risk of death (95% CI, 3.33-7.40; P < .001). Conclusions and relevance: Rapid response system implementation reversed an increasing trend of critical deterioration. Cardiac arrest and death were extremely rare at baseline, and their reductions were not statistically significant despite using nearly 5 years of data. Hospitals seeking to measure rapid response system performance may consider using valid proximate outcomes like critical deterioration in addition to rare, catastrophic outcomes. Copyright 2014 American Medical Association.

**Source:** EMBASE

Available in fulltext from JAMA Pediatrics at the ULHT Library and Knowledge Services' eJournal collection

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**6. Neonatal therapeutic intervention scoring system**

**Author(s)** Massatt S., Tagge E.

**Citation:** Journal of Investigative Medicine, January 2014, vol./is. 62/1(168), 1081-5589 (January 2014)

**Publication Date:** January 2014

**Abstract:** Purpose of Study: The severity of infant illness in the NICU is a largely unexplored field. Severity Scoring Systems are a tool often employed to assess infant health by using different parameters to determine the severity of a patient's condition. These scoring systems have been used extensively in research, but not as clinical tools. As a clinical tool, they could potentially be a valuable resource in tracking the overall trend of decline or improvement in patients over time. Methods Used: In our study, we used the Neonatal Therapeutic Intervention Scoring System (NTISS), which is based on the number and type of therapies being used on an infant at any given time. The therapies are each assigned a value based on therapeutic complexity, and the total sum of all these values for a given 24-hour period gives the NTISS score. The therapies are divided into the categories of respiratory, cardiovascular, drug therapy, monitoring, metabolic/ nutrition, transfusion, vascular access, or procedures. Our patient population consisted of 54 babies in the NICU of the Loma Linda Medical Center. There were equal numbers of males and females, and an average gestational age of 35 weeks. Scores were determined for the days of admission and discharge, as well as for a set of 5 consecutive days in between. Summary of Results: The overall average NTISS score for the day of admission was 17 (range 7-53; SD = 9); 11.5 for the 5 consecutive days (range 4-48; SD = 8); and 7 for the day of discharge (range 4-32; SD = 7). There was a slight decline in NTISS score during the five consecutive days. Healthy babies had a score of 4 (due to minimum NICU requirements), while our worst case had a score of 53. In a comparison of patients who
were deceased vs. alive at discharge (4 vs. 51 patients), the deceased patients showed a significant increase in score during the 5 consecutive days, while scores decreased for patients who survived. Conclusions: Patients in the NICU generally follow a trend of gradual improvement from admission to discharge from the NICU, but there is a significant trend of worsening condition for those patients that do not ultimately survive. The small variation in scores for consecutive days indicates that fewer scores would suffice to determine the overall trend for a patient. This would simplify the potential clinical application of NTISS.

Source: EMBASE

7. Comparison of three acute care pediatric early warning scoring tools

**Author(s)** Robson M.A.J., Cooper C.L., Medicus L.A., Quintero M.J., Zuniga S.A.

**Citation:** Journal of Pediatric Nursing, November 2013, vol./is. 28/6(e33-e41), 0882-5963 (November 2013)

**Publication Date:** November 2013

**Abstract:** Pediatric Early Warning (PEW) scoring tools effectively identify hospitalized children at risk for clinical deterioration. The study compared the predictability of three previously validated PEW scoring tools. A retrospective case-control design was used that identified the PEW System Score (H. Duncan, J. Hutchison, & C. Parshuram, 2006) as a stronger predictor of cardiopulmonary arrest (CPA) than either the PEW Tool (C. Haines, M. Perrott, & P. Weir, 2006) or the Bedside PEW System Score (C. Parshuram, J. Hutchison, & K. Middaugh, 2009). The PEW System Score (H. Duncan, J. Hutchison, & C. Parshuram, 2006) demonstrated a greater sensitivity (86.6%) and specificity (72.9%) at a score of five. The PEW System Score (H. Duncan, J. Hutchison, & C. Parshuram, 2006) could benefit healthcare providers in potentially averting CPA. 2013 Elsevier Inc.

Source: EMBASE


**Author(s)** Huang EJ, Bonafide CP, Keren R, Nadkarni VM, Holmes JH

**Citation:** Journal of Hospital Medicine (Online), May 2013, vol./is. 8/5(254-60), 1553-5592;1553-5606 (2013 May)

**Publication Date:** May 2013

**Abstract:** BACKGROUND: Medical emergency teams have been shown to reduce mortality in children's hospitals, but there are many potential barriers to their activation. Surveillance tools using electronic health record data help identify children at risk of deterioration. Existing early warning scores primarily include vital signs, but may benefit from the incorporation of medications.OBJECTIVE: We aimed to identify the therapeutic classes of medications temporally associated with clinical deterioration that could be incorporated with vital signs into surveillance tools.DESIGN: Case-crossover study.SETTING: The Children's Hospital of Philadelphia.PATIENTS: Children with clinical deterioration, defined as cardiopulmonary arrest, acute respiratory compromise, or urgent intensive care unit transfer while hospitalized on pediatric wards (n=141).EXPOSURES: Intravenous administrations of medications from therapeutic classes administered in >5% of control periods.RESULTS: Nine therapeutic classes were significantly associated with clinical deterioration: glycopeptide antibiotics, anaerobic antibiotics, third-generation and fourth-generation cephalosporins, aminoglycoside antibiotics, systemic corticosteroids, benzodiazepines, loop diuretics, narcotic analgesics (full opioid agonists), and antidotes to hypersensitivity reactions.CONCLUSIONS: We identified a set of therapeutic classes associated with increased risk of clinical deterioration. Future work should focus on evaluating whether including these therapeutic classes in multivariable models improves their accuracy in detecting early, evolving deterioration. Copyright 2013 Society of Hospital Medicine.

Source: Medline

Available in fulltext from Journal of Hospital Medicine at EBSCOhost
9. The Cardiac Children's Hospital Early Warning Score (C-CHEWS).

**Author(s)**: McLellan MC, Connor JA

**Citation**: Journal of Pediatric Nursing, April 2013, vol./is. 28/2(171-8), 0882-5963;1532-8449 (2013 Apr)

**Publication Date**: April 2013

**Abstract**: Inpatient pediatric cardiovascular patients have higher rates of cardiopulmonary arrests than other hospitalized children. Pediatric early warning scoring tools have helped to provide early identification and treatment to hospitalized children experiencing deterioration thus preventing arrests from occurring. However, the tools have rarely been used and have not been validated in the pediatric cardiac population. This paper describes the modification of a pediatric early warning scoring system for cardiovascular patients, the implementation of the tool, and its companion escalation of care algorithm on an inpatient pediatric cardiovascular unit.

**Source**: Medline


**Author(s)**: Fairchild KD

**Citation**: Current Opinion in Pediatrics, April 2013, vol./is. 25/2(172-9), 1040-8703;1531-698X (2013 Apr)

**Publication Date**: April 2013

**Abstract**: PURPOSE OF REVIEW: Predictive monitoring is an exciting new field involving analysis of physiologic data to detect abnormal patterns associated with critical illness. The first example of predictive monitoring being taken from inception (proof of concept) to reality (demonstration of improved outcomes) is the use of heart rate characteristics (HRC) monitoring to detect sepsis in infants in the neonatal ICU. The commercially available ‘HeRO’ monitor analyzes electrocardiogram data from existing bedside monitors for decreased HR variability and transient decelerations associated with sepsis, and converts these changes into a score (the HRC index or HeRO score). This score is the fold increase in probability that a patient will have a clinical deterioration from sepsis within 24 h. This review focuses on HRC monitoring and discusses future directions in predictive monitoring of ICU patients.

**RECENT FINDINGS**: In a randomized trial of 3003 very low birthweight infants, display of the HeRO score reduced mortality more than 20%. Ongoing research aims to combine respiratory and HR analysis to optimize care of ICU patients.

**SUMMARY**: Predictive monitoring has recently been shown to save lives. Harnessing and analyzing the vast amounts of physiologic data constantly displayed in ICU patients will lead to improved algorithms for early detection, prognosis, and therapy of critical illnesses.

**Source**: Medline

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11. Retrospective evaluation of a new neonatal trigger score.

**Author(s)**: Holme H, Bhatt R, Koumettou M, Griffin MA, Winckworth LC

**Citation**: Pediatrics, March 2013, vol./is. 131/3(e837-42), 0031-4005;1098-4275 (2013 Mar)

**Publication Date**: March 2013

**Abstract**: OBJECTIVES: To design and validate an objective clinical scoring system to identify unwell neonates, by using routinely collected bedside observations.

**METHODS**: A Neonatal Trigger Score (NTS) was designed by using local expert consensus and incorporated into a new observation chart. All neonates >35 weeks’ gestation admitted to the NICU over an 18-month period, and an age-matched “well” cohort, were retrospectively scored by using the newly constructed NTS and all established pediatric early warning system (PEWS) scores.

**RESULTS**: Scores were calculated for 485 neonates. The NTS...
score area under the receiver operating characteristic curve was 0.924 with a score of 2 or more predicting need for admission to the NICU with 77% sensitivity and 97% specificity. Neonates scoring >2 had increased odds of needing intensive care (odds ratio [OR] 48.7, 95% confidence interval [CI] 27.5-86.3), intravenous fluids (OR 48.1, 95% CI 23.9-96.9), and continuous positive airway pressure (OR 29.5, 95% CI 6.9-125.8). The NTS was more sensitive than currently established PEWS scores.

CONCLUSIONS: The NTS observation chart acts as an adjunct to clinical assessment, highlighting unwell neonates. Its simplicity allows successful and safe use by nonpediatric specialists. NTS out-performed PEWS, with significantly better sensitivity, particularly in neonates who deteriorated within the first 12 hours after birth (P < .001) or in neonates with sepsis or respiratory symptoms (P < .001). Neonates with a score of 1 should be reviewed and those scoring >2 should be considered for NICU admission for further management.

Source: Medline

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12. Pediatric RIFLE for acute kidney injury diagnosis and prognosis in pediatric cardiac surgery

Author(s) Ricci Z., Iacoella C., Netto R., Benelli S., Di Nardo M., Picca S., Cogo P.E.

Citation: Pediatric Nephrology, January 2013, vol./is. 28/1(182), 0931-041X (January 2013)

Publication Date: January 2013

Abstract: Objective. Evaluation of performance of pediatric RIFLE (pRIFLE) score for acute kidney injury (AKI) diagnosis and prognosis. Design. Single-center prospective observational study Setting. Tertiary care pediatric cardiac intensive care unit (PCICU). Patients. Consecutive children less than one year old with congenital heart diseases undergoing cardiac surgery with cardiopulmonary bypass (CPB). Interventions. None. Measurements and Main Results. One hundred and sixty patients were enrolled in the study from June 2010 to June 2011. Patients mean age was 134 days (117), mean weight was 5 (2)kg with a mean body surface area of 0.28 (0.07) m<sup>2</sup>. Fifty patients (31 %) were neonates, 88 (55 %) were male, 20 children (12 %) had univentricular anatomy (UVH) and palliative surgery was performed in 53 patients (33 %). Three patients required post-operative extracorporeal membrane oxygenation (1.8 %). Average CPB duration was 199 (88) minutes; enrolled patients required 3.2 (4) mechanical ventilation days; PCICU length of stay was 6 (6.5) days. Four patients died (2.5 %). AKI was diagnosed in 90 patients (56 %): of these, 68 (75 %) achieved an "R" level of AKI severity, 17 (19 %) an "I" level and 5 (5 %) an "F" level. Sixty-five out of 90 patients (72 %) achieved their pRIFLE-max score in the first postoperative day (POD); all the remaining 25 (28 %) patients reached pRIFLE-max between 2nd and 3rd POD. AKI severity decreased from the 4th POD in all patients except one. Longer crossclamp times (p:0.045), higher inotropic score (p:0.02) and RACHS scores (p:0.048) but not lower ages (p:0.27) correlated significantly with pRIFLE-max class severity. Ten patients over 20 UVH (50 %) and 80 over 140 biventricular children (57 %) were diagnosed with AKI by pRIFLE-max (OR 0.75, 95 % C.I. 0.53-1.3; p:0.54). Patients classified with any pRIFLE-max class required a higher number of mechanical ventilation days (p:0.03) and longer PCICU stay (p:0.045). Renal replacement therapy (RRT) was needed in 13 patients (8.1 %): 2 patients received continuous hemofiltration and 11 patients received peritoneal dialysis. RRT and no RRT patients did not show significantly different pRIFLE-max classes (p: 0.44). All deceased patients were classified pRIFLE-max "I" or "F" (p:<=.0001). Conclusion. Pediatric RIFLE is easily and feasibly applied in pediatric patients with congenital heart disease PRIFLE classification showed that AKI incidence in pediatric cardiac surgery infants is high. This may help in AKI medical therapy and prevention of stage worsening, especially after the first post-operative days; pRIFLE does not seem to be feasible for RRT timing.

Source: EMBASE
13. Use of a modified pediatric early warning score in a department of pediatric and adolescent medicine.

Author(s) Solevag AL, Eggen EH, Schroder J, Nakstad B

Citation: PLoS ONE [Electronic Resource], 2013, vol./is. 8/8(e72534), 1932-6203;1932-6203 (2013)

Publication Date: 2013

Abstract: BACKGROUND: Several versions of the Pediatric Early Warning Score (PEWS) exist, but there is limited information available on the use of such systems in different contexts. In the present study, we aimed to examine the relationship between a modified version of The Brighton Paediatric Early Warning Score (PEWS) and patient characteristics in a Norwegian department of pediatric and adolescent medicine. In addition, we sought to establish guidelines for escalation in patient care based on the PEWS in our patient population.

METHODS: The medical records of patients referred for acute care from March to May 2011 were retrospectively reviewed. Children with a PEWS >3 were compared to children with a PEWS 0-2 with regard to age, diagnostic group and indicators of severe disease.

RESULTS: A total of 761 patients (0-18 years of age) were included in the analysis. A younger age and diagnostic groups such as lower airway and cardiovascular disease were associated with PEWS >3. Upper airway disease and minor injury were more frequent in patients with PEWS 0-2. Children with PEWS >3 received fluid resuscitation, intravenous antibiotics, and oxygen supplementation, and were transferred to a higher level of care more often than children with PEWS 0-2.

CONCLUSIONS: A PEWS >3 was associated with severe illnesses and surrogate markers of cardio-respiratory compromise. Patients with PEWS >3 should be carefully monitored to prevent further deterioration.

Source: Medline

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14. The use of a modified pediatric early warning score to assess stability of pediatric patients during transport.

Author(s) Petrillo-Albarano T, Stockwell J, Leong T, Hebbar K

Citation: Pediatric Emergency Care, 01 September 2012, vol./is. 28/9(878-882), 07495161

Publication Date: 01 September 2012

Abstract: OBJECTIVE: Pediatric early warning scores (PEWSs) have been used effectively in limited patient care areas. Children's Transport, at Children's Healthcare of Atlanta, transports approximately 5000 children annually. In an effort to consistently assess patient acuity and the impact of our team's interventions, we instituted a modified "transport PEWS" (TPEWS). METHODS: The existing PEWS was modified to reflect the transport environment. A retrospective chart review was conducted of 100 consecutive children transported by Children's Transport in March 2009. Transport PEWS given during triage by the dispatch center (TPEWStri), TPEWS calculated at referring facility by the team (TPEWSref), and final TPEWS at the accepting institution (TPEWSacc) were compared.

RESULTS: Eighty-six patients were transported by ground. The median age was 50.4 months. Sixty patients (60%) received some intervention from the transport team. Median
TPEWSref was 3 (0-9) upon initial assessment, and TPEWSacc was 2 (0-9) on arrival at the accepting facility (P = 0.0001). Seventy-three percent (73/100) of patients were transported to the emergency room; 15 (15%) of 100 to the general inpatient area, and 12 (12%) of 100 to the intensive care unit. In addition, a triage TPEWS (TPEWStri) was calculated from information given from the referring facility in 59 of the 100 patients. A significant difference in TPEWStri and TPEWSref was noted (P = 0.0001).

CONCLUSIONS: In this cohort of pediatric transport patients, TPEWS appears to be a helpful additional assessment tool. Transport PEWS may function as a tool for assessing severity of illness, hence optimizing transport dispatch and patient disposition.

Source: CINAHL

15. A paediatric early warning scoring system for a remote rural area
Author(s) Henderson S.
Citation: Nursing children and young people, July 2012, vol./is. 24/6(23-26), 2046-2336 (Jul 2012)
Publication Date: July 2012
Abstract: Health professionals can fail to identify and treat serious illness or acute deterioration in children because of a lack of relevant training, experience or supervision. In Argyll and Bute in Scotland a standardised, monitoring system was initiated measuring six physiological parameters: temperature, pulse rate, respiratory rate, systolic blood pressure, oxygen saturation and consciousness level. The total score dictates what actions to take. This local system was positively evaluated but a national paediatric early warning scoring system is needed.
Source: EMBASE
Available in fulltext from Nursing Children & Young People at EBSCOhost

Author(s) Bonafide CP, Holmes JH, Nadkarni VM, Lin R, Landis JR, Keren R
Citation: Journal of Hospital Medicine (Online), April 2012, vol./is. 7/4(345-9), 1553-5592;1553-5606 (2012 Apr)
Publication Date: April 2012
Abstract: BACKGROUND: Identification of the characteristics that put hospitalized children at high risk of deterioration may help to target patients whose physiologic status should be intensively monitored for signs of deterioration, and reduce unnecessary monitoring in patients at very low risk. Previous studies have evaluated vital sign-based early warning scores to detect deterioration that has already begun.OBJECTIVE: To develop a predictive score for deterioration using non-vital sign patient characteristics in order to risk-stratify hospitalized children before signs of deterioration are detectable.DESIGN: Case-control study.SETTING: A 460-bed children's hospital.PATIENTS: Cases (n = 141) were children who deteriorated while receiving care on non-intensive care unit (non-ICU) inpatient units. Controls (n = 423) were randomly selected.MEASUREMENTS: The exposures were complex chronic conditions, other patient characteristics, and laboratory studies. The outcome was clinical deterioration, defined as cardiopulmonary arrest, acute respiratory compromise, or urgent ICU transfer.RESULTS: The 7-item score included age <1 year, epilepsy, congenital/genetic conditions, history of transplant, enteral tube, hemoglobin <10 g/dL, and blood culture drawn in the preceding 72 hours. We grouped the patients into risk strata based on their scores. The very low-risk group's probability of deterioration was less than half of baseline risk. The high-risk group's probability of deterioration was more than 80-fold higher than the baseline risk.CONCLUSIONS: We identified a set of characteristics associated with clinical deterioration in children. Used in combination as a score, these characteristics may be useful in triaging the intensity of monitoring and surveillance for deterioration that children receive while hospitalized on non-ICU units.Copyright 2011 Society of Hospital Medicine.
Source: Medline
17. Complexities of developing robust paediatric early warning scores.

**Author(s)**

Citation: Nursing Children & Young People, 01 December 2011, vol./is. 23/10(11-11), 20462336

Publication Date: 01 December 2011

Source: CINAHL

Available in fulltext from Nursing Children & Young People at EBSCOhost

18. Sensitivity of the Pediatric Early Warning Score to identify patient deterioration.

**Author(s)** Akre M, Finkelstein M, Erickson M, Liu M, Vanderbilt L, Billman G

Citation: Pediatrics, 01 April 2010, vol./is. 125/4(0-), 00314005

Publication Date: 01 April 2010

**Abstract:** OBJECTIVE: We evaluated the Pediatric Early Warning Score (PEWS) sensitivity as an early indicator of patients deterioration leading to a Rapid Response Team (RRT)/code event. We hypothesized that at least 80% of patients had a critical PEWS preceding the event. We determined staff awareness of deterioration in patient status prior to the event as evidenced by consults, addition of monitoring equipment or increased frequency of assessment. The timing of these events was compared to critical PEWS times. METHODS: One hundred and seventy non-ICU RRT and 16 code events were identified between October 2006 and February 2008. We completed retrospective PEWS at four-hour intervals or less for twenty-four hours preceding the event. The PEWS algorithm, guiding staff to consult at a critical score >/=4 or a single domain score equal to 3, was applied. RESULTS: For 85.5% of patients the earliest indicator of deterioration, evidenced by a critical PEWS, was a median of 11 hours 36 minutes and the earliest preceding the event was 30 minutes. For 97.1% of patients the earliest median time to a consult was 80 minutes. Oximetry was added 6.9 hours for 43.5% of patients. 7% of patients had increased nursing assessment. A sub-group of patients had 1) critical PEWS, 2) consult and 3) addition of a monitor. The median time for earliest critical PEWS for these was significant (P < 0.001). CONCLUSION: PEWS can potentially provide a forewarning time >11 hours, alerting the team to adapt the care plan and possibly averting an RRT or code.

Source: CINAHL

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Available in fulltext from Pediatrics at Free Access Content

Available in fulltext from Pediatrics at American Academy of Pediatrics

19. Prospective evaluation of a continuous monitoring and quality-improvement system for reducing adverse neonatal outcomes.

**Author(s)** Sibanda T., Sibanda N., Siassakos D., Sivananthan S., Robinson Z., Winter C., Draycott T.J.

Citation: American Journal of Obstetrics and Gynecology, November 2009, vol./is. 201/5(480.e1-480.e6), 0002-9378 (November 2009)

Publication Date: November 2009

**Abstract:** Objective: Our objective was to evaluate a prospective monitoring and quality improvement system for studying trends in the rates of an adverse neonatal outcome, the low Apgar scores (Apgar score <7). Study Design: A cumulative sum (CUSUM) chart-based system was used to monitor the rate of low Apgar scores over 2 years. Root cause analysis (RCA) was used to investigate for causes of periods of increased low Apgar score rates. Results: A period of deteriorated outcome (increased rates of low Apgar) occurred in
August 2006. RCA identified deficiencies in cardiotocograph education, which were addressed by targeted training and mentoring. Prompt resolution followed, with the rates returning to baseline and staying within acceptable limits through to the end of evaluation in December 2007. Conclusion: Prospective and continuous monitoring of clinical outcomes using the CUSUM chart method is feasible and may be beneficial. Early detection of an adverse trend allows for timely corrective action, and may lead to overall improvements in performance. 2009 Mosby, Inc. All rights reserved.

Source: EMBASE

20. Prospective cohort study to test the predictability of the Cardiff and Vale paediatric early warning system.

Author(s) Edwards ED, Powell CV, Mason BW, Oliver A

Citation: Archives of Disease in Childhood, 01 August 2009, vol./is. 94/8(602-606), 00039888

Publication Date: 01 August 2009

Abstract: OBJECTIVE: To develop and test the predictability of a paediatric early warning score to identify children at risk of developing critical illness. DESIGN: Prospective cohort study. SETTING: Admissions to all paediatric wards at the University Hospital of Wales. OUTCOME MEASURES: Respiratory arrest, cardiac arrest, paediatric high-dependency unit admission, paediatric intensive care unit admission and death. RESULTS: Data were collected on 1000 patients. A single abnormal observation determined by the Cardiff and Vale paediatric early warning system (C&VPEWS) had a 89.0% sensitivity (95% CI 80.5 to 94.1), 63.9% specificity (95% CI 63.8 to 63.9), 2.2% positive predictive value (95% CI 2.0 to 2.3) and a 99.8% negative predictive value (95% CI 99.7 to 99.9) for identifying children who subsequently had an adverse outcome. The area under the receiver operating characteristic curve for the C&VPEWS score was 0.86 (95% CI 0.82 to 0.91). CONCLUSION: Identifying children likely to develop critical illness can be difficult. The assessment tool developed from the advanced paediatric life support guidelines on identifying sick children appears to be sensitive but not specific. If the C&VPEWS was used as a trigger to activate a rapid response team to assess the child, the majority of calls would be unnecessary.

Source: CINAHL

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Available in fulltext from Archives of disease in childhood at Highwire Press
Available in fulltext from Archives of Disease in Childhood at EBSCOhost

21. Prospective evaluation of a pediatric inpatient early warning scoring system.

Author(s) Tucker KM, Brewer TL, Baker RB, Demeritt B, Vossmeyer MT

Citation: Journal for Specialists in Pediatric Nursing, 01 April 2009, vol./is. 14/2(79-85), 15390136

Publication Date: 01 April 2009

Abstract: PURPOSE. The present study evaluated the use of the Pediatric Early Warning Score (PEWS) for detecting clinical deterioration among hospitalized children. DESIGN/METHODS. A prospective, descriptive study design was used. The tool was used to score 2,979 patients admitted to a single medical unit of a pediatric hospital over a 12-month period. RESULTS. PEWS discriminated between children who required transfer to the pediatric intensive care unit and those who did not require transfer (area under the curve = 0.89, 95% CI = 0.84-0.94, p < .001). IMPLICATIONS. The PEWS tool was found to be a reliable and valid scoring system to identify children at risk for clinical deterioration.

Source: CINAHL

Available in fulltext from Journal for Specialists in Pediatric Nursing at EBSCOhost
22. The Apgar cycle: A new view of a familiar scoring system

**Author(s)** Pinheiro J.M.B.

**Citation:** Archives of Disease in Childhood: Fetal and Neonatal Edition, January 2009, vol./is. 94/1(F70-F72), 1359-2998;1468-2052 (January 2009)

**Publication Date:** January 2009

**Abstract:** Apgar scores are universally recorded, but they should no longer be used to guide resuscitation; thus, some authorities have suggested that the scores should be abandoned. However, the physiological relationships underlying the elements of the Apgar scoring system can be conceptualised as a cycle, wherein the five functions are linked by cardiorespiratory reflexes and metabolically supported by the oxygen pathway. Respiratory effort represents both the main input into the system and its functional output (sustained respirations). The progressive deterioration of functions during asphyxia, and their recovery during resuscitation, are readily understood within the sequence. This depiction helps in learning concepts such as primary and secondary apnoea and bradycardia. The visual model harmonises the pedagogical and practical values of the Apgar scoring system, by placing the rapid assessment of respirations, heart rate and colour during neonatal resuscitation (as taught in the Neonatal Resuscitation Program) in its broader physiological context. The understanding imparted by the Apgar cycle may directly enhance patient care during resuscitation, apart from the attribution of numerical scores.

**Source:** EMBASE

Available in fulltext from Fetal and Neonatal at Highwire Press

Available in fulltext from Archives of Disease in Childhood -- Fetal & Neonatal Edition at EBSCOhost

23. Development and initial validation of the Bedside Paediatric Early Warning System score.

**Author(s)** Parshuram CS, Hutchison J, Middaugh K

**Citation:** Critical Care (London, England), 2009, vol./is. 13/4(R135), 1364-8535;1466-609X (2009)

**Publication Date:** 2009

**Abstract:** INTRODUCTION: Adverse outcomes following clinical deterioration in children admitted to hospital wards is frequently preventable. Identification of children for referral to critical care experts remains problematic. Our objective was to develop and validate a simple bedside score to quantify severity of illness in hospitalized children. METHODS: A case-control design was used to evaluate 11 candidate items and identify a pragmatic score for routine bedside use. Case-patients were urgently admitted to the intensive care unit (ICU). Control-patients had no ‘code blue’, ICU admission or care restrictions. Validation was performed using two prospectively collected datasets. RESULTS: Data from 60 case and 120 control-patients was obtained. Four out of eleven candidate-items were removed. The seven-item Bedside Paediatric Early Warning System (PEWS) score ranges from 0-26. The mean maximum scores were 10.1 in case-patients and 3.4 in control-patients. The area under the receiver operating characteristics curve was 0.91, compared with 0.84 for the retrospective nurse-rating of patient risk for near or actual cardiopulmonary arrest. At a score of 8 the sensitivity and specificity were 82% and 93%, respectively. The score increased over 24 hours preceding urgent paediatric intensive care unit (PICU) admission (P < 0.0001). In 436 urgent consultations, the Bedside PEWS score was higher in patients admitted to the ICU than patients who were not admitted (P < 0.0001). CONCLUSIONS: We developed and performed the initial validation of the Bedside PEWS score. This 7-item score can quantify severity of illness in hospitalized children and identify critically ill children with at least one hours notice. Prospective validation in other populations is required before clinical application.

**Source:** Medline

Available in fulltext from Critical Care at Free Access Content

Available in fulltext from Critical Care at National Library of Medicine
24. Can paediatric early warning score be used as a triage tool in paediatric accident and emergency?

**Author(s)** Bradman K, Maconochie I

**Citation**: European Journal of Emergency Medicine, December 2008, vol./is. 15/6(359-60), 0969-9546;1473-5695 (2008 Dec)

**Publication Date**: December 2008

**Abstract**: The UK paediatric early warning score (PEWS) was developed for inpatients, looking at admission to the HDU and PICU and trying to produce a system which would recognize those children at risk of admission. Since the introduction of the ‘4-h wait’, accident and emergency (A&E) departments have been under increasing strain to assess, treat and admit patients (if required) as quickly as possible. We designed this study with the view of identifying if the PEWS score could be used as a triage tool, to detect those patients who will need admission and therefore speed up the process of admitting children to the ward. All patients who visited A&E from 1st October-16th October 2006 were audited. The PEWS scores were collated after the study period. 774 children attended A&E during the study period. 316 patients were sent home from triage following nurse-led treatment or sent to another facility. Of the 458 patients remaining, 424 (93%) were included in the study - the only exclusion criterion was the failure of complete documentation of observations. The sensitivity [the probability of a child being admitted with a score of (n)] and the specificity (the probability of a patient not being admitted with a score of 0) were calculated. For all children aged 0-16 years, a PEWS score of $\geq 4$ had a sensitivity of 24% and a specificity of 96%. A PEWS score of $\geq 2$ had a sensitivity of 37% and a specificity of 88%. PEWS is of limited value in predicting admission (in a triage setting) in a population of undifferentiated disease. However, a low PEWS score has a high specificity, that is, a patient scoring $< 2$ is unlikely to need admission.

**Source**: Medline

25. The CUSUM chart method as a tool for continuous monitoring of clinical outcomes using routinely collected data.

**Author(s)** Sibanda T, Sibanda N

**Citation**: BMC Medical Research Methodology, 2007, vol./is. 7/(46), 1471-2288;1471-2288 (2007)

**Publication Date**: 2007

**Abstract**: BACKGROUND: The lack of robust systems for monitoring quality in healthcare has been highlighted. Statistical process control (SPC) methods, utilizing the increasingly available routinely collected electronic patient records, could be used in creating surveillance systems that could lead to rapid detection of periods of deteriorating standards. We aimed to develop and test a CUmulative SUM (CUSUM) based surveillance system that could be used in continuous monitoring of clinical outcomes, using routinely collected data. The low Apgar score (5 minute Apgar score $< 7$) was used as an example outcome.METHOD: A surveillance system based on the Observed minus Expected (O-E) as well as the 2-sided Log-Likelihood CUSUM charts was developed. The Log-Likelihood chart was designed to detect a 50% rise (deterioration) and halving (improvement) in the odds of low Apgar scores. Baseline rates were calculated from data for 2001 to 2004, and were used to monitor deliveries for 2005. Deliveries for nulliparous and multiparous women were monitored separately. All analyses were retrospective.RESULTS: The CUSUM system detected periods of increased rates of low Apgar scores for each of the nulliparous and multiparous cohorts. The overall rate for 2005 was eventually found to be 0.67%, which was higher than the baseline reference rate of 0.44% from 2001 to 2004.CONCLUSION: CUSUM methods can be used in continuous monitoring of clinical outcomes using routinely collected data.
collected data. Used prospectively, they could lead to the prompt detection of periods of suboptimal standards.

Source: Medline

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... Arch Dis Child Fetal Neonatal Ed.2004;89 :F419—F422. Richardson D, Tarnow-Mordi WO, Lee SK. Risk adjustment for quality improvement. ... Richardson score predicts short-term adverse respiratory outcomes in newborns ≥34 weeks’ gestation. ... Cited by 57 Related articles All 7 versions Cite Save

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Adverse events in the neonatal intensive care unit: development, testing, and findings of an NICU-focused trigger tool to identify harm in North American NICUs PJ Sharek, JD Horbar, W Mason, H Bisarya... - Pediatrics, 2006 - Am Acad Pediatrics ... including chart review, voluntary reporting by health care providers, direct observation, and review of ... A neonatal nurse or neonatologist trained in chart review methods was designated ... an effective voluntary anonymous, Internet-based occurrence database for neonates and to ...
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The use of score for neonatal acute physiology perinatal extention II (SNAPPE II) in predicting neonatal outcome in neonatal intensive care unit RA Mia, R Etika, A Harianto... - Paediatrica ..., 2005 - paediatricaindonesiana.org ... To assess the validity of SNAPPE II in predicting morbidity at neonatal intensive care ... Methods Eighty newborns were admitted during a four-month period and were evaluated with the ... Neonates admitted >48 hours of age or after having been discharged, who were moved to ...
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59 MEDLINE (trigger* OR score*).ti,ab 703791
60 MEDLINE 37 AND 44 AND 59 296
61 MEDLINE 60 [Limit to: English Language and Humans and Publication Year 2005-2015] 146
62 CINAHL (trigger* OR score*).ti,ab 102999
63 CINAHL 4 AND 11 AND 62 50
64 CINAHL 63 [Limit to: Publication Year 2005-2015 and (Language English)] 39
65 BNI exp INFANT, NEWBORN/ 0
66 BNI (neonat* OR newborn* OR "newly born**").ti,ab 4244
67 BNI ("early warning score**" OR "track and trigger**").ti,ab 68
68 BNI 65 OR 66 0
69 BNI 67 AND 68 0
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