

AKI

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1. Risk factors for acute kidney injury in patients hospitalized with COVID-19.

Authors: Arenas, C. L.;Forero, A. C. P.;Angel, D. C. V.;Lopez, P. M. R.;Diaz, L. V. G.;Aguilar, D. K. N. and Yate, H. C. M.

Publication Date: 2024

Journal: Brazilian Journal of Nephrology 46(2) (pagination), pp. Article Number: e20230056. Date of Publication: 2024

Abstract: Introduction: Acute kidney injury (AKI) occurs frequently in COVID-19 patients and is associated with greater morbidity and mortality. Knowing the risks of AKI allows for identification, prevention, and timely treatment. This study aimed to identify the risk factors associated with AKI in hospitalized patients. Method(s): A descriptive, retrospective, cross-sectional, and analytical component study of adult patients hospitalized with COVID-19 from March 1 to December 31, 2020 was carried out. AKI was defined by the creatinine criteria of the KDIGO-AKI guidelines. Information, regarding risk factors, was obtained from electronic medical records. Result(s): Out of the 934 patients, 42.93% developed AKI, 60.59% KDIGO-1, and 9.9% required renal replacement therapy. Patients with AKI had longer hospital stay, higher mortality, and required more intensive care unit (ICU) admission, mechanical ventilation, and vasopressor support. Multivariate analysis showed that age (OR 1.03; 95% CI 1.02-1.04), male sex (OR 2.13; 95% CI 1.49-3.04), diabetes mellitus (DM) (OR 1.55; 95% CI 1.04-2.32), chronic kidney disease (CKD) (OR 2.07; 95% CI 1.06-4.04), C-reactive protein (CRP) (OR 1.02; 95% CI 1.00-1.03), ICU admission (OR 1.81; 95% CI 1.04-3.16), and vasopressor support (OR 7.46; 95% CI 3.34-16.64) were risk factors for AKI, and that bicarbonate (OR 0.89; 95% CI 0.84-0.94) and partial pressure arterial oxygen/ inspired oxygen fraction index (OR 0.99; 95% CI 0.98-0.99) could be protective factors. Conclusion(s): A high frequency of AKI was documented in COVID-19 patients, with several predictors: age, male sex, DM, CKD, CRP, ICU admission, and vasopressor support. AKI occurred more frequently in patients with higher disease severity and was associated with higher mortality and worse outcomes. Copyright © 2024 Sociedade Brasileira de Nefrologia. All rights reserved.

2. Advancing Community Care and Access to Follow-up After Acute Kidney Injury Hospitalization: Design of the AFTER AKI Randomized Controlled Trial.

Authors: Bhatt, M.;Benterud, E.;Palechuk, T.;Bignell, C.;Ahmed, N.;McBrien, K.;James, M. T. and Pannu, N.

Publication Date: 2024

Journal: Canadian Journal of Kidney Health and Disease 11(pagination), pp. Date of Publication: January-December 2024

Abstract: Background: Acute kidney injury (AKI) is a common complication among hospitalized patients with long-term implications including chronic kidney disease (CKD). Although models are available to predict the risk of advanced CKD after AKI, there is limited evidence regarding follow-up for patients with AKI after hospital discharge, resulting in variable follow-up care. A risk-stratified follow-up approach may improve appropriateness and efficiency of management for CKD among patients at risk of declining kidney function following AKI. Objective(s): The objective was to compare and evaluate the use of a risk-stratified approach to follow-up care vs usual care for patients with AKI after hospital discharge. Design(s): This study was a pragmatic randomized controlled trial. Setting(s): This study was conducted in 2 large urban hospitals in Alberta, Canada. Patient(s): Hospitalized patients with AKI (KDIGO stage 2 or 3) not previously under the care of a nephrologist, expected to survive greater than 90 days being discharged home. Measurements: We will evaluate whether guideline-recommended CKD care processes are initiated within 90 days, including statin use, angiotensin-converting enzyme inhibitor (ACEi)/angiotensin II receptor blocker (ARB) use in those with proteinuria or diabetes, and nephrologist follow-up if sustained eGFR Patient(s): Hospitalized patients with AKI (KDIGO stage 2 or 3) not previously under the care of a nephrologist, expected to survive greater than 90 days being

discharged home. Measurements: We will evaluate whether guideline-recommended CKD care processes are initiated within 90 days, including statin use, angiotensin-converting enzyme inhibitor (ACEi)/angiotensin II receptor blocker (ARB) use in those with proteinuria or diabetes, and nephrologist follow-up if sustained eGFR ≥ 2 . We will also assess the feasibility of recruitment and the proportion of patients completing the recommended blood and urine tests at 90 days. Method(s): Patients with AKI will be enrolled and randomized near the time of hospital discharge. In the intervention group, low risk patients will receive information regarding AKI, medium risk patients will additionally receive follow-up guidance sent to their primary care physician, and high-risk patients will additionally receive follow-up with a nephrologist. Participants in the intervention and usual care group will receive a requisition for urine testing and bloodwork at 90 days following hospital discharge. Telephone follow-up will be conducted for all study participants at 90 days and 1 year after hospital discharge. Bivariate tests of association will be conducted to evaluate group differences at the follow-up time points. Limitation(s): We expect there may be challenges with recruitment due to the significant co-existence of comorbidity in this population. Conclusion(s): If the trial shows a positive effect on these processes for kidney care, it will inform larger-scale trial to determine whether this intervention reduces the incidence of long-term clinical adverse events, including CKD progression, cardiovascular events, and mortality following hospitalization with AKI. Copyright © The Author(s) 2024.

3. Decreased Intraoperative Renal Tissue Oxygenation after Cardiopulmonary Bypass Predicts Cardiac Surgery-Associated Acute Kidney Injury in Neonates.

Authors: Condit, Paige E.;Gorski, Daniel P.;Lasarev, Michael R.;Al-Subu, Awni M. and Harer, Matthew W.

Publication Date: Mar 07 ,2024

Journal: Children 11(3)

Abstract: (1) Background: Near-infrared spectroscopy (NIRS) is a noninvasive tool frequently used during cardiac surgery and postoperatively in the cardiac intensive care unit to monitor regional tissue oxygen saturation. A relationship between trends of intraoperative renal oxygenation and the risk of developing cardiac surgery-associated acute kidney injury (AKI) post-operatively has not yet been established in the neonatal population. The objective of this study is to evaluate the relationship of cerebral and renal oxygenation during cardiopulmonary bypass with cardiac surgery-associated AKI in the first 72 h post-operation in neonates ($p > 0.19$). Renal oxygenation after coming off, but not during, cardiopulmonary bypass steadily decreased with increasing levels of AKI (Jonckheere's test, one-sided $p = 0.024$). (4) Conclusions: Renal oxygenation decreased in proportion to AKI severity after coming off, but not during, cardiopulmonary bypass.

4. Prospective randomized double-blind study to evaluate the superiority of Vasopressin versus Norepinephrine in the management of the patient at renal risk undergoing cardiac surgery with cardiopulmonary bypass (NOVACC trial).

Authors: Guinot, P. G.;Desebbe, O.;Besch, G.;Guerci, P.;Gaudard, P.;Lena, D.;Mertes, P. M.;AbouArab, O. and Bouhemad, B.

Publication Date: 2024

Journal: American Heart Journal (pagination), pp. Date of Publication: 14 Mar 2024

Abstract: BACKGROUND: Cardiac surgery-associated acute kidney injury (CS-AKI) affects up to 30% of patients, increasing morbidity and healthcare costs. This condition results from complex factors like ischemia-reperfusion injury and renal hemodynamic changes, often exacerbated by surgical procedures. Norepinephrine, commonly used in cardiac surgeries, may heighten the risk of CS-AKI. In contrast, vasopressin, a non-catecholaminergic agent, shows potential in preserving renal function by favorably affecting renal hemodynamic. Preliminary findings, suggest vasopressin could reduce the incidence of CS-AKI compared to norepinephrine. Additionally, vasopressin is linked to a lower

incidence of post-operative atrial fibrillation, another factor contributing to longer hospital stays and higher costs. This study hypothesizes that vasopressin could effectively reduce CS-AKI occurrence and severity by optimizing renal perfusion during cardiac surgeries. **STUDY DESIGN:** The NOVACC trial (NCT05568160) is a multicenter, randomized, double blinded superiority-controlled trial testing the superiority of vasopressin over norepinephrine in patients scheduled for cardiac surgery with cardiopulmonary bypass (CPB). The primary composite end point is the occurrence of acute kidney injury and death. The secondary end points are neurological, cardiologic, digestive, and vasopressor related complications at day 7, day 30, day 90, hospital and intensive care unit lengths of stay, medico-economic costs at day 90. **CONCLUSION(S):** The NOVACC trial will assess the effectiveness of vasopressin in cardiac surgery with CPB in reducing acute kidney injury, mortality, and medical costs. **CLINICAL TRIAL REGISTRATION:** NCT05568160. Copyright © 2024 The Author(s). Published by Elsevier Inc. All rights reserved.

5. Acute Kidney Injury and Chronic Kidney Disease and Their Impacts on Prognosis among Patients with Severe COVID-19 Pneumonia: An Expert Center Case-Cohort Study.

Authors: Klimkiewicz, J.;Grzywacz, A.;Michalowski, A.;Gutowski, M.;Paryz, K.;Jedrych, E. and Lubas, A.

Publication Date: 2024

Journal: Journal of Clinical Medicine 13(5) (pagination)

Abstract: Background: Acute kidney injury (AKI) is associated with substantial mortality. In this case-control study, we analyzed the impacts of AKI and chronic kidney disease (CKD) on outcomes in a group of 323 patients with severe COVID-19. The correlation of clinical and laboratory data with AKI and CKD was also analyzed. Method(s): A retrospective case-control study was conducted among AKI, CKD, and normal kidney function (NKF) groups hospitalized in a COVID-19 center in 2021. Result(s): AKI patients had higher in-hospital mortality (55.2 vs. 18.8%, p Result(s): AKI patients had higher in-hospital mortality (55.2 vs. 18.8%, p Result(s): AKI patients had higher in-hospital mortality (55.2 vs. 18.8%, p Result(s): AKI patients had higher in-hospital mortality (55.2 vs. 18.8%, p Result(s): AKI patients had higher in-hospital mortality (55.2 vs. 18.8%, p Conclusion(s): AKI among COVID-19 patients was correlated with more ICU transfers, higher morbidity, and greater markers of severe disease. Patients with CKD had a higher mortality; however, the rate of ICU transfer was not substantially higher due to their poor prognosis. Copyright © 2024 by the authors.

6. Regional variation of COVID-19 admissions, acute kidney injury and mortality in England - a national observational study using administrative data.

Authors: Kolhe, Nitin V.;Fluck, Richard J. and Taal, Maarten W.

Publication Date: Mar 22 ,2024

Journal: BMC Infectious Diseases 24(1), pp. 346

Abstract: BACKGROUND: This study explores regional variations in COVID-19 hospitalization rates, in-hospital mortality, and acute kidney injury (AKI) in England. We investigated the influence of population demographic characteristics, viral strain changes, and therapeutic advances on clinical outcomes. METHODS: Using hospital episode statistics, we conducted a retrospective cohort study with 749,844 admissions in 337,029 adult patients with laboratory-confirmed COVID-19 infection (March 1, 2020, to March 31, 2021). Multivariable logistic regression identified factors predicting AKI and mortality in COVID-19 hospitalized patients. RESULTS: London had the highest number of COVID-19 admissions (131,338, 18%), followed by the North-west region (122,683, 16%). The North-west had the highest population incidence of COVID-19 hospital admissions (21,167 per million population, pmp), while the South-west had the lowest (9,292 admissions pmp). Patients in London were relatively younger (67.0 +/- 17.7 years) than those in the East of England (72.2 +/- 16.8 years).

The shortest length of stay was in the North-east (12.2 +/- 14.9 days), while the longest was in the North-west (15.2 +/- 17.9 days). All eight regions had higher odds of death compared to London, ranging from OR 1.04 (95% CI 1.00, 1.07) in the South-west to OR 1.24 (95% CI 1.21, 1.28) in the North-west. Older age, Asian ethnicity, emergency admission, transfers from other hospitals, AKI presence, ITU admission, social deprivation, and comorbidity were associated with higher odds of death. AKI incidence was 30.3%, and all regions had lower odds of developing AKI compared to London. Increasing age, mixed and black ethnicity, emergency admission, transfers from other providers, ITU care, and different levels of comorbidity were associated with higher odds of developing AKI. CONCLUSIONS: London exhibited higher hospital admission numbers and AKI incidence, but lower odds of death compared to other regions in England. TRIAL REGISTRATION: Registered on National Library of Medicine website (www. CLINICALTRIALS: gov) with registration number NCT04579562 on 8/10/2020. Copyright © 2024. The Author(s).

7. Systemic inflammation and acute kidney injury after colorectal surgery.

Authors: Mannion, John D.;Rather, Assar;Fisher, Adrienne;Gardner, Kelly;Ghanem, Nessreen;Dirocco, Sheila and Siegelman, Gary

Publication Date: Mar 11 ,2024

Journal: BMC Nephrology 25(1), pp. 92

Abstract: BACKGROUND: In this retrospective review, the relative importance of systemic inflammation among other causes of acute kidney injury (AKI) was investigated in 1224 consecutive colorectal surgery patients. A potential benefit from reducing excessive postoperative inflammation on AKI might then be estimated. METHODS: AKI was determined using the Kidney Disease Improving Global Outcomes (KDIGO) criteria. The entire population (mixed group), composed of patients with or without sepsis, and a subpopulation of patients without sepsis (aseptic group) were examined. Markers indicative of inflammation were procedure duration, the first postoperative white blood cell (POD # 1 WBC) for the mixed population, and the neutrophil-to-lymphocyte ratio (POD #1 NLR) for the aseptic population. Multivariable logistic regression was then performed using significant (P : AKI was determined using the Kidney Disease Improving Global Outcomes (KDIGO) criteria. The entire population (mixed group), composed of patients with or without sepsis, and a subpopulation of patients without sepsis (aseptic group) were examined. Markers indicative of inflammation were procedure duration, the first postoperative white blood cell (POD # 1 WBC) for the mixed population, and the neutrophil-to-lymphocyte ratio (POD #1 NLR) for the aseptic population. Multivariable logistic regression was then performed using significant (P RESULTS: AKI occurred in 24.6% of the total population. For the mixed population, there was a link between inflammation (POD # 1 WBC) and AKI (P = 0.0001), on univariate regression. Medications with anti-inflammatory properties reduced AKI: ketorolac (P = 0.047) and steroids (P = 0.038). Similarly, in an aseptic population, inflammation (POD # 1 NLR) contributed significantly to AKI (P = 0.000). On multivariable analysis for the mixed and aseptic population, the POD #1 WBC and the POD #1 NLR were independently associated with AKI (P = 0.000, P = 0.022), as was procedure duration (P : AKI occurred in 24.6% of the total population. For the mixed population, there was a link between inflammation (POD # 1 WBC) and AKI (P = 0.0001), on univariate regression. Medications with anti-inflammatory properties reduced AKI: ketorolac (P = 0.047) and steroids (P = 0.038). Similarly, in an aseptic population, inflammation (POD # 1 NLR) contributed significantly to AKI (P = 0.000). On multivariable analysis for the mixed and aseptic population, the POD #1 WBC and the POD #1 NLR were independently associated with AKI (P = 0.000, P = 0.022), as was procedure duration (P : AKI occurred in 24.6% of the total population. For the mixed population, there was a link between inflammation (POD # 1 WBC) and AKI (P = 0.0001), on univariate regression. Medications with anti-inflammatory properties reduced AKI: ketorolac (P = 0.047) and steroids (P = 0.038). Similarly, in an aseptic population, inflammation (POD # 1 NLR) contributed significantly to AKI (P = 0.000). On multivariable analysis for the mixed and aseptic population, the POD #1 WBC and the POD #1 NLR were independently associated with AKI (P = 0.000, P = 0.022), as was procedure duration (P : AKI occurred in 24.6% of the total population. For the mixed population, there was a link between inflammation (POD # 1 WBC) and AKI (P = 0.0001), on univariate regression. Medications with anti-inflammatory properties reduced AKI: ketorolac (P = 0.047) and steroids (P = 0.038). Similarly,

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CONCLUSIONS: Systemic inflammation is an important cause of AKI. Limiting early postsurgical inflammation has the potential to improve postoperative outcomes. Copyright © 2024. The Author(s).

8. The Impact of Fluid Balance on Acute Kidney Injury in Nontraumatic Subarachnoid Hemorrhage.

Authors: Merrill, D.;Craven, J. M.;Silvey, S.;Gouger, D.;Wang, C.;Patel, R. and Yajnik, V.

Publication Date: 2024

Journal: Journal of Intensive Care Medicine (pagination), pp. Date of Publication: 2024

Abstract: Background: Nontraumatic subarachnoid hemorrhage (SAH) can lead to poor neurologic outcomes, particularly when delayed cerebral ischemia (DCI) occurs. Maintenance of euvolemia following SAH is thought to reduce the risk of DCI. However, attempts at maintaining euvolemia often err on the side of hypervolemia. In this study, we assessed the relationship between fluid balance and acute kidney injury (AKI) in SAH patients, assessing hypervolemia versus euvolemia and their impact on AKI. Method(s): In a quaternary care center, neuroscience intensive care unit we conducted a retrospective longitudinal analysis in adult patients who suffered a nontraumatic SAH. Result(s): Out of 139 patients, 15 (10.8%) patients developed an AKI while hospitalized, with 7 stage I, 3 stage II, and 5 stage III injuries. Acute kidney injury patients had higher peak sodium (150.1 mEq/L vs 142.7 mEq/L, 95% confidence interval [CI]: [2.7-12.1 mEq/L]), higher discharge chloride (109.1 mEq/L vs 104.9 mEq/L, 95% CI: [0.7-7.6 mEq/L]), and lower hemoglobin at discharge (9.3 g/dL vs 11.3 g/dL, 95% CI: [1.0-2.9 g/dL]). At 7 days, AKI patients had a fluid balance that was 1.82 L higher ($P = .04$), and 3.38 L higher at 14 days ($P = .02$), in comparison to day 3. Acute kidney injury was associated with significant mortality increases. This increase in mortality was found at 30 days from admission with a 9.52-fold increase, and at 60 days with a 6.25-fold increase. As a secondary outcome, vasospasm (19 patients, 13.7%) showed no association with AKI. Conclusion(s): Acute kidney injury following SAH is correlated with clinically significant hypervolemia, elevated sodium, elevated chloride, decreased urine output, and decreased hemoglobin at discharge-risk factors for all SAH patients. This study further elucidates the harm of hypervolemia and gives greater practical evidence to physicians attempting to balance the dangers of vasospasm and AKI. Copyright © The Author(s) 2024.

9. Risk of acute kidney injury in critically-ill patients with COVID-19 compared with seasonal influenza: a retrospective cohort study.

Authors: Ng, Pauline Yeung;Ip, April;Ng, Andrew Kei-Yan;Sin, Simon Wai-Ching;Chan, Jasper Fuk-Woo;To, Kelvin Kai-Wang and Yap, Desmond Yat-Hin

Publication Date: Apr ,2024

Journal: EClinicalMedicine 70, pp. 102535

Abstract: Background: The SARS-CoV-2 virus can bind to angiotensin-converting enzyme 2 receptors on host renal cells and may cause acute kidney injury (AKI). The comparative risks of AKI in patients severely ill with COVID-19 and influenza A have not been examined. Methods: This is a retrospective cohort study including patients with positive PCR results for SARS-CoV-2 or influenza A virus admitted to the intensive care units (ICUs) of 15 public hospitals in Hong Kong between 1st January 2013 and 30th April 2023. Patients who were already on chronic dialysis or had missing values in the confounder model were excluded. Data were retrieved from Hong Kong Hospital Authority's electronic healthcare records. The primary outcome was incident AKI during ICU stay. Secondary outcomes included acute kidney disease (AKD) and hospital mortality. All analyses were examined in multivariable regression adjusting for potential confounders (age, sex, baseline eGFR, PaO₂/FiO₂ ratio, baseline comorbidities, APACHE IV predicted risk of death, Charlson Comorbidity Index, emergent hospital admission, admission from elderly home, reason for ICU admission, presence of bacterial co-infections, use of medications [including vasopressors, antiviral medications, steroids and nephrotoxic antibiotics], as well as anaemia and leucocytosis). Patients were matched in a 1:1 ratio using a propensity score generated based on the full confounder model. The analyses were repeated using inverse probability weighting and in propensity-score matched cohorts. Findings: A total of 5495 ICU patients were identified. After excluding 1093 (19.9%) patients who met the exclusion criteria and 74 (1.3%) patients who had one or more missing values in the logistic regression model, a total of 4328 patients were included in the final analysis, with 2787 (64.4%) patients who tested positive for SARS-CoV-2 reverse transcription (RT)-PCR and 1541 (35.6%) patients who tested positive for influenza A virus RT-PCR. The comorbidity burden was greater in patients with COVID-19 (Charlson Comorbidity Index 3 [2-4] vs. 3 [1-4]), but the median APACHE IV predicted risk of death was significantly lower (0.19 [0.08-0.38] vs. 0.25 [0.11-0.52]). A total of 1053 (37.8%) patients with COVID-19 and 828 (53.7%) patients with influenza A developed AKI of any stage during ICU stay. In adjusted analysis, the risk of AKI was significantly lower in patients with COVID-19 compared with influenza A (adjusted odds ratio 0.51, 95% confidence interval 0.42-0.61, P < 0.05). Interpretation: Our results suggest that the risk of AKI in patients severely ill with COVID-19 was lower than in patients with influenza A. The burden of concurrent organ failure complicating respiratory viral infections, such as the higher disease-attributable risk of AKI associated with influenza, should be clarified. Funding: An unrestricted philanthropic donation from Mr and Mrs Laurence Tse, The Wai Im Charitable Foundation, Chan Sui Kau Family Benefits and Charitable Foundation, So Ka Wing and Lee Sau Ying Charitable Foundation, Mr & Mrs Tam Wing Fun Edmund Renal Research Fund, the Theme-Based Research Scheme of the Research Grants Council, Hong Kong Special Administrative Region, The Government of the Hong Kong Special Administrative Region; Programme of Enhancing Laboratory Surveillance and Investigation of Emerging Infectious Diseases and Antimicrobial Resistance for the Department of Health of the Hong Kong Special Administrative Region Government; Emergency COVID-19 Project, Major Projects on Public Security, National Key Research and Development Program; Emergency Collaborative Project of Guangzhou Laboratory; the National Key Research and Development Program of China; Sanming Project of Medicine in Shenzhen China; and the High Level-Hospital Program, Health Commission of Guangdong Province, China. Copyright © 2024 The Author(s).

10. Low-dose Continuous Kidney Replacement Therapy and Mortality in Critically Ill Patients with Acute Kidney Injury: A Retrospective Cohort Study.

Authors: Okamoto, K.;Fukushima, H.;Kawaguchi, M. and Tsuruya, K.

Publication Date: 2024

Journal: American Journal of Kidney Diseases : The Official Journal of the National Kidney Foundation (pagination), pp. Date of Publication: 13 Mar 2024

Abstract: RATIONALE & OBJECTIVE: Continuous kidney replacement therapy (CKRT) is preferred when available for hemodynamically unstable acute kidney injury (AKI) patients in the intensive care unit (ICU). The Kidney Disease: Improving Global Outcomes (KDIGO) guidelines recommend a delivered CKRT dose of 20-25 mL/kg/h, however in Japan, doses are typically below this recommendation due to government health insurance system restrictions. This study investigated the association between mortality and dose of CKRT. STUDY DESIGN: Single-center retrospective cohort study. SETTING: & Participants: Critically ill patients with AKI treated with CKRT at a tertiary Japanese university hospital between January 1, 2012, and December 31, 2021. EXPOSURE: Delivered CKRT doses below or above the median. OUTCOME(S): 90-day mortality after CKRT initiation. ANALYTICAL APPROACH: Multivariable Cox regression analysis and Kaplan-Meier analysis. RESULT(S): The study population consisted of 494 patients. The median age was 72 years, and 309 patients (62.6%) were men. Acute tubular injury was the leading cause of AKI, accounting for 81.8%. The median delivered CKRT dose was 13.2 mL/kg/h. 456 (92.3%) study participants received delivered CKRT doses below 20 mL/kg/h, and 204 (41.3%) died within 90 days after CKRT initiation. Multivariable Cox regression analysis revealed increased mortality in the below-median group (hazard ratio: 1.73, 95% confidence interval: 1.19-2.51, P = 0.004). Additionally, a significant, inverse, non-linear association between 90-day mortality and delivered CKRT dose was observed using delivered CKRT dose as a continuous variable. LIMITATIONS: Single-center, retrospective, observational study. CONCLUSION(S): A lower delivered CKRT dose was independently associated with higher 90-day mortality among critically ill patients who mostly received dosing below current KDIGO recommendations. Copyright © 2024. Published by Elsevier Inc.

11. Artificial intelligence and acute kidney injury.

Authors: Perschinka, F.;Peer, A. and Joannidis, M.

Publication Date: 2024

Journal: Medizinische Klinik - Intensivmedizin Und Notfallmedizin (pagination), pp. Date of Publication: 2024

Abstract: Digitalization is increasingly finding its way into intensive care units and with it artificial intelligence (AI) for critically ill patients. One promising area for the use of AI is in the field of acute kidney injury (AKI). The use of AI is primarily focused on the prediction of AKI, but further approaches are also being used to classify existing AKI into different phenotypes. Different AI models are used for prediction. The area under the receiver operating characteristic curve values (AUROC) achieved with these models vary and are influenced by several factors, such as the prediction time and the definition of AKI. Most models have an AUROC between 0.650 and 0.900, with lower values for predictions further into the future and when applying Acute Kidney Injury Network (AKIN) instead of KDIGO criteria. Classification into phenotypes already makes it possible to categorize patients into groups with different risks of mortality or requirement of renal replacement therapy (RRT), but the etiologies or therapeutic consequences derived from this are still lacking. However, all the models suffer from AI-specific shortcomings. The use of large databases does not make it possible to promptly include recent changes in therapy and the implementation of new biomarkers in a relevant proportion. For this reason, serum creatinine and urinary output, with their known limitations, dominate current AI models for prediction impairing the performance of the current models. On the other hand, the increasingly complex models no longer allow physicians to understand the basis on which the warning of a threatening AKI is calculated and subsequent initiation of therapy should take place. The successful use of AIs in routine clinical practice will be highly determined by the trust of the physicians in the systems and overcoming the aforementioned weaknesses. However, the clinician will remain irreplaceable as the decisive authority for critically ill patients by combining measurable and nonmeasurable parameters. Copyright © The Author(s) 2024.

12. Nephrotoxic Risk Associated With Combination Therapy of Vancomycin and Piperacillin-Tazobactam in Critically Ill Patients With Chronic Kidney Disease.

Authors: Pipkin, T.;Pope, S.;Killian, A.;Green, S.;Albrecht, B. and Nugent, K.

Publication Date: 2024

Journal: Journal of Intensive Care Medicine (pagination), pp. Date of Publication: 2024

Abstract: Background: The combination of vancomycin and piperacillin-tazobactam (VPT) has been associated with acute kidney injury (AKI) in hospitalized patients when compared to similar combinations. Additional studies examining this nephrotoxic risk in critically ill patients have not consistently demonstrated the aforementioned association. Furthermore, patients with baseline renal dysfunction have been excluded from almost all of these studies, creating a need to examine the risk in this patient population. Method(s): This was a retrospective cohort analysis of critically ill adults with baseline chronic kidney disease (CKD) who received vancomycin plus an anti-pseudomonal beta-lactam at Emory University Hospital. The primary outcome was incidence of AKI. Secondary outcomes included stage of AKI, time to development of AKI, time to return to baseline renal function, new requirement for renal replacement therapy, intensive care unit and hospital length of stay, and in-hospital mortality. Result(s): A total of 109 patients were included. There was no difference observed in the primary outcome between the VPT (50%) and comparator (58%) group ($P = .4$), stage 2 or 3 AKI (15.9% vs 6%; $P = .98$), time to AKI development (1.7 vs 2 days; $P = .5$), time to return to baseline renal function (4 vs 3 days; $P = .2$), new requirement for RRT (4.5% vs 1.5%; $P = .3$), ICU length of stay (7.3 vs 7.4 days; $P = .9$), hospital length of stay (19.3 vs 20.1 days; $P = .87$), or in-hospital mortality (15.9% vs 10.8%; $P = .4$). A significant difference was observed in the duration of antibiotic exposure (3.32 vs 2.62 days; $P = .045$ days). Conclusion(s): VPT was not associated with an increased risk of AKI or adverse renal outcomes. Our findings suggest that the use of this antibiotic combination should not be avoided in this patient population. More robust prospective studies are warranted to confirm these findings. Copyright © The Author(s) 2024.

13. Acute and chronic kidney diseases in the differential diagnosis of acute renal function disorders: Disguised as AKI.

Authors: Seelow, E. and de Groot, K.

Publication Date: 2024

Journal: Nephrologie (Germany) (pagination), pp. Date of Publication: 2024

Abstract: Background: Many different etiological and morphological kidney diseases first become noticeable through acute kidney dysfunction (acute kidney injury, AKI). Such intrarenal kidney diseases can easily be overlooked or recognized late; however, a rapid diagnosis is important in order to initiate a specific treatment and to prevent chronic kidney damage. Aim(s): To provide an overview of the differential diagnosis in AKI, especially on the intrarenal causes and to develop a diagnostic algorithm to assist in everyday clinical practice. Material(s) and Method(s): Analysis of review articles and case series. Review and discussion of guidelines and expert recommendations. Result(s): AKI is a common complication in patients undergoing inpatient treatment, particularly in intensive care units. It leads to increased morbidity and mortality. Due to the demographic developments, lifestyle habits and climate change, it can be assumed that the frequency of AKI will increase and that many people will have an increased risk of resulting chronic kidney damage due to previous illnesses and age. Conclusion(s): AKI is a clinical sign and not a unique disease entity. A rapid and comprehensive search for the cause is necessary. It is important to correctly differentiate between prerenal, intrarenal and postrenal causes. The specific cause should be identified whenever possible, as from this many therapeutic consequences can be derived. Copyright © The Author(s), under exclusive licence to Springer Medizin Verlag GmbH, ein Teil von Springer Nature 2024.

14. Fast, efficient and accurate prediction of postoperative outcomes using a small set of intraoperative time series.

Authors: Shorten, D. P.;Beckingham, T.;Humphries, M.;Fischer, R.;Soar, N.;Wilson, B. and Roughan, M.

Publication Date: 2024

Journal: medRxiv (pagination), pp. Date of Publication: 29 Feb 2024

Abstract: In the period immediately following surgery, patients are at high risk of various negative outcomes such as Acute Kidney Injury (AKI) and Myocardial Infarction (MI). Identifying patients at increased risk of developing these complications assists in their prevention and management. During surgery, rich time series data of vital signs and ventilator parameters are collected. This data holds enormous potential for the prediction of postoperative outcomes. There is, however, minimal work exploring this potential. Moreover, existing approaches rely on deep learning, which is computationally expensive, often requiring specialized hardware and significant energy consumption. We demonstrate that it is possible to extract substantial value from intraoperative time series using techniques that are extremely computationally efficient. We used recordings from 66 300 procedures at the Lyell McEwin Hospital (Adelaide, South Australia), occurring in 2013 through 2020. The procedures associated with 80% of the patients were used for model training, with the remainder held out for testing. A combination of techniques including MultiRocket, Multitask and logistic regression were used to predict Rapid Response Team (RRT) calls within 48 hours of surgery and mortality, AKI and elevated troponin levels within 30 days of surgery. This approach achieved an Area Under the Receiver Operating Characteristic curve (AUROC) (95% CI) on the test data of 0.96 (0.95-0.97) for mortality, 0.85 (0.84-0.87) for AKI, 0.89 (0.87-0.91) for elevated troponin levels and 0.80 (0.78-0.83) for RRT calls, outperforming the ASA score and Charlson comorbidity index on the test population for all outcomes. These results show that roughly equivalent accuracy to computationally expensive modelling approaches using diverse sources of clinical data can be achieved using highly computationally efficient techniques and only a small set of automatically recorded intraoperative time series. This implies substantial potential in the analysis of these time series for the improvement of perioperative patient care. We also performed an analysis of the measurement sampling rate required to achieve these results, demonstrating the advantage of high-frequency patient vitals monitoring. Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY-NC-ND 4.0 International license.

15. High versus low chloride load in adult hyperglycemic emergencies with acute kidney injury: a multicenter retrospective cohort study.

Authors: Takahashi, K.;Uenishi, N.;Sanui, M.;Uchino, S.;Yonezawa, N.;Takei, T.;Nishioka, N.;Kobayashi, H.;Otaka, S.;Yamamoto, K.;Yasuda, H.;Kosaka, S.;Tokunaga, H.;Fujiwara, N.;Kondo, T.;Ishida, T.;Komatsu, T.;Endo, K.;Moriyama, T.;Oyasu, T., et al

Publication Date: 2024

Journal: Internal and Emergency Medicine (pagination), pp. Date of Publication: 15 Mar 2024

Abstract: Hyperglycemic emergencies frequently lead to acute kidney injury (AKI) and require treatment with large amount of intravenous fluids. However, the effects of chloride loading on this population have not yet been investigated. We conducted a multicenter, retrospective, cohort study in 21 acute-care hospitals in Japan. The study included hospitalized adult patients with diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic syndrome (HHS) who had AKI upon arrival. The patients were classified into high and low chloride groups based on the amount of chloride administered within the first 48 h of their arrival. The primary outcome was recovery from AKI; secondary outcome was major adverse kidney events within 30 days (MAKE30), including mortality and prolonged renal failure. A total of 390 patients with AKI, including 268 (69%) with DKA and 122 (31%) with HHS, were included in the study. Using the criteria of Kidney Disease Improving Global

Outcomes, the severity of AKI in the patients was Stage 1 (n=159, 41%), Stage 2 (n=121, 31%), and Stage 3 (n=110, 28%). The analysis showed no significant difference between the two groups in recovery from AKI (adjusted hazard ratio, 0.96; 95% CI 0.72-1.28; P=0.78) and in MAKE30 (adjusted odds ratio, 0.91; 95% CI 0.45-1.76; P=0.80). Chloride loading with fluid administration had no significant impact on recovery from AKI in patients with hyperglycemic emergencies. Trial Registration This study was registered in the UMIN clinical trial registration system (UMIN000025393, registered December 23, 2016). Copyright © 2024. The Author(s), under exclusive licence to Societa Italiana di Medicina Interna (SIMI).

16. The Complications of Corticosteroid for Patients with Community-acquired Pneumonia: A Systematic Review and Meta-Analysis.

Authors: Wang, D. and Zhu, Y.

Publication Date: 2024

Journal: Alternative Therapies in Health and Medicine (pagination), pp. Date of Publication: 01 Mar 2024

Abstract: Background: Many randomized controlled trials (RCTs) have reported the complications of corticosteroids for patients with community-acquired pneumonia with inconsistent results. An explicit systematic review and meta-analysis were conducted in this study to evaluate the complications of corticosteroids for patients with community-acquired pneumonia. Method(s): Using PubMed, Embase, the Global Index Medicus of the World Health Organization (WHO), the WHO clinical trial registry, and Clinicaltrials.gov, a thorough literature search of RCTs was carried out. Inclusion criteria included RCTs comparing the use of any kind of a specified corticosteroid with the placebo control group. The complications were analyzed, including gastrointestinal (GI) bleeding, healthcare-associated infection (HAI), acute kidney injury (AKI), hospital readmission, hyperglycemia, neuropsychiatric complications, and adverse cardiac events. Result(s): The result can be concluded that the risk of gastrointestinal (GI) bleeding, healthcare-associated infection (HAI), acute kidney injury (AKI), hospital readmission, neuropsychiatric complications, and adverse cardiac events between the intervention and control groups were not significantly different. However, corticosteroids can increase the risk of hyperglycemia as compared to the control group who did not receive corticosteroids (RR= 1.72, 95 % CI: 1.38-2.14, P Result(s): The result can be concluded that the risk of gastrointestinal (GI) bleeding, healthcare-associated infection (HAI), acute kidney injury (AKI), hospital readmission, neuropsychiatric complications, and adverse cardiac events between the intervention and control groups were not significantly different. However, corticosteroids can increase the risk of hyperglycemia as compared to the control group who did not receive corticosteroids (RR= 1.72, 95 % CI: 1.38-2.14, P Conclusion(s): Through our analysis, the use of corticosteroids can increase the risk of hyperglycemia for patients with community-acquired pneumonia. Further studies are required to be conducted to confirm the findings due to limited clinical trials.

17. Prediction of acute kidney injury after cardiac surgery with fibrinogen-to-albumin ratio: a prospective observational study.

Authors: Xu, Wang;Ouyang, Xin;Lin, Yingxin;Lai, Xue;Zhu, Junjiang;Chen, Zeling;Liu, Xiaolong;Jiang, Xinyi and Chen, Chunbo

Publication Date: 2024

Journal: Frontiers in Cardiovascular Medicine 11, pp. 1336269

Abstract: Background: The occurrence of acute kidney injury (AKI) following cardiac surgery is common and linked to unfavorable consequences while identifying it in its early stages remains a challenge. The aim of this research was to examine whether the fibrinogen-to-albumin ratio (FAR), an innovative inflammation-related risk indicator, has the ability to predict the development of AKI in individuals after cardiac surgery. Methods: Patients who underwent cardiac surgery from February 2023 to March 2023 and were admitted to the Cardiac Surgery Intensive Care Unit of a tertiary teaching hospital were included in this prospective observational study. AKI was defined according to the KDIGO criteria. To assess the diagnostic value of the FAR in predicting AKI, calculations were performed for the area under the receiver operating characteristic curve (AUC), continuous net reclassification improvement (NRI), and integrated discrimination improvement (IDI). Results: Of the 260 enrolled patients, 85 developed AKI with an incidence of 32.7%. Based on the multivariate logistic analyses, FAR at admission [odds ratio (OR), 1.197; 95% confidence interval (CI), 1.064-1.347, $p = 0.003$] was an independent risk factor for AKI. The receiver operating characteristic (ROC) curve indicated that FAR on admission was a significant predictor of AKI [AUC, 0.685, 95% CI: 0.616-0.754]. Although the AUC-ROC of the prediction model was not substantially improved by adding FAR, continuous NRI and IDI were significantly improved. Conclusions: FAR is independently associated with the occurrence of AKI after cardiac surgery and can significantly improve AKI prediction over the clinical prediction model. Copyright © 2024 Xu, Ouyang, Lin, Lai, Zhu, Chen, Liu, Jiang and Chen.

18. The effect of positive pressure ventilation on Acute Kidney Injury in COVID-19 patients with Acute Respiratory Distress Syndrome. An observational study.

Authors: Zacchetti, L.;Brivio, M.;Mezzapesa, M.;Martinelli, A.;Punzi, V.;Monti, M.;Marchesi, F.;Scarpa, L.;Zangari, R.;Longhi, L.;Raimondi, F.;Novelli, L.;Gritti, P.;Grazioli, L.;Villa, G. and Lorini, L.

Publication Date: 2024

Journal: Blood Purification (pagination), pp. Date of Publication: 25 Feb 2024

Abstract: INTRODUCTION: Acute kidney injury (AKI) is frequent in critically ill COVID-19 patients and is associated with a higher mortality risk. By increasing intrathoracic pressure, positive pressure ventilation (PPV) may reduce renal perfusion pressure by reducing venous return to the heart or by increasing renal venous congestion. This study's aim was to evaluate the association between AKI and hemodynamic and ventilatory parameters in COVID-19 patients with ARDS. METHOD(S): this is a single-centre retrospective observational study. Consecutive patients diagnosed with COVID-19 who met ARDS criteria and required invasive mechanical ventilation were enrolled. The relationship between respiratory and hemodynamic parameters influenced by positive pressure ventilation and AKI development was evaluated. AKI was defined according to KDIGO criteria. AKI recovery was evaluated a month after ICU admission and patients were classified as "recovered", if serum creatinine (sCr) value returned to baseline, or as having "acute kidney disease" (AKD), if criteria for AKI stage 1 or greater persisted. The 6-month all-cause mortality was collected. RESULT(S): 144 patients were included in the analysis. AKI occurred in 69 (48%) patients and 26 (18%) required Renal Replacement Therapy (RRT). In a multivariate logistic regression analysis, sex, hypertension, cumulative dose of furosemide, fluid balance, and plateau pressure were independently associated with AKI. Mortality at 6 months was 50% in the AKI group and 32% in the non-AKI group ($p=0.03$). Among 36 patients who developed AKI and were discharged alive from the hospital, 56% had a full renal recovery after a month, while 14%, 6% and 14% were classified as having an Acute Kidney Disease (AKD) of stage 0, 2 and 3, respectively. CONCLUSION(S): in our cohort, AKI was independently associated with multiple variables, including high plateau pressure, suggesting a possible role of positive pressure ventilation on AKI development. Further studies are needed to clarify the role of mechanical ventilation on renal function. Copyright S. Karger AG, Basel.

19. Using kinetic eGFR to identify acute kidney injury risk in children undergoing cardiac transplantation.

Authors: Dasgupta, M. N.;MontezRath, M. E.;Hollander, S. A. and Sutherland, S. M.

Publication Date: 2021

Journal: Pediatric Research 90(3), pp. 632-636

Abstract: Background: Acute kidney injury (AKI) is common following pediatric cardiac transplantation. Since no treatments exist, strategies focus on early identification and prevention. Kinetic glomerular filtration rate (kGFR) was developed to assess renal function in the non-steady state. Although used to predict AKI in adults, kGFR has not been explored in children. Our study examines AKI and the ability of kGFR to identify AKI risk in pediatric heart transplant recipients. Method(s): One hundred and seventy-five patients under 21 years who underwent cardiac transplantation at Lucile Packard Children's Hospital between September 2007-December 2017 were included. kGFR1 was calculated using pre-operative and immediate post-operative creatinines; kGFR2 was calculated with the first two post-operative creatinines. The primary outcome was AKI as defined by the Kidney Disease: Improving Global Outcomes criteria. Result(s): One hundred and thirty-one (75%) and 78 (45%) patients developed AKI and severe AKI, respectively; 5 (2.9%) required dialysis. kGFR was moderately associated with post-operative AKI risk. The adjusted area under the curve (AUC) for kGFR1 was 0.72 (discovery) and 0.65 (validation). The AUC for kGFR2 was 0.72 (discovery) and 0.68 (validation). Conclusion(s): AKI is pervasive in children undergoing cardiac transplant, particularly in the 24 h after surgery. kGFR moderately identifies AKI risk and may represent a novel risk stratification technique. Impact: Our research suggests that kGFR, a dynamic assessment of renal function that uses readily available laboratory values, can moderately identify AKI risk in children undergoing cardiac transplantation. Current published studies on kGFR are in adult populations; this study represents the first formal study of kGFR in a pediatric population. kGFR may serve as an early AKI indicator, allowing providers to implement preventative strategies sooner in a patient's clinical course. Copyright © 2021, The Author(s), under exclusive licence to the International Pediatric Research Foundation, Inc.

20. Mortality and associated risk factors in perioperative acute kidney injury treated with continuous renal replacement therapy.

Authors: Uusalo, P.; Hellman, T. and Jarvisalo, M. J.

Publication Date: 2021

Journal: Perioperative Medicine 10(1) (pagination), pp. Article Number: 57. Date of Publication: December 2021

Abstract: Background: Perioperative acute kidney injury (AKI) is associated with multiple postoperative complications leading to prolonged hospital stay and higher costs. AKI requiring continuous renal replacement therapy (CRRT) after surgery has an incidence of 2-6% and mortality approximates 40-60%. Previous studies examining mortality in perioperative AKI patients managed with CRRT have concentrated on cardiac surgery patients and there are very limited data on broad surgical patient populations requiring CRRT. We examined long-term mortality and factors associated with poor outcome in a broad surgical population requiring CRRT for perioperative AKI during a 10-year period. Method(s): Surgical patients admitted to the intensive care unit (ICU) of academic tertiary hospital requiring CRRT between years 2010-2019 were included. CRRT was performed using regional citrate-calcium-anticoagulation. Extracted data included patient demographics, comorbidities, and clinical parameters at ICU admission and at the initiation of CRRT. Creatinine and estimated glomerular filtration rate (eGFR) were measured at 1 year after ICU admission. Result(s): A total of 157 patients were included in the study. ICU mortality was 42.7%, 90-day mortality 58.0% and 1-year mortality 62.4%. Blood lactate at ICU admission and CRRT initiation were independently associated with mortality in the multivariate models. Patients with lactate > 4 mmol/l had higher mortality than patients with normal lactate (77% vs. 21%) (p < 0.001). Result(s): A total of 157 patients were included in the study. ICU mortality was 42.7%, 90-day mortality 58.0% and 1-year mortality 62.4%. Blood lactate at ICU admission and CRRT initiation were independently associated with mortality in the multivariate models. Patients with lactate > 4 mmol/l had higher mortality than patients with normal lactate (77% vs. 21%) (p < 0.001). Result(s): A total of 157 patients were included in the study. ICU mortality was 42.7%, 90-day mortality 58.0% and 1-year mortality 62.4%. Blood lactate at ICU admission and CRRT initiation were

independently associated with mortality in the multivariate models. Patients with lactate > 4 mmol/l had higher mortality than patients with normal lactate (77% vs. 21%) (p Conclusion(s): Patients undergoing surgery and requiring perioperative CRRT in the ICU have a high risk of mortality. Mortality appears to be independently associated with lactate levels. Copyright © 2021, The Author(s).

Sources Used:

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