O1
Unveiling Blind Spots in Electronic Medication Surveillance: Who Needs a Coffee Break?

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Abstract teaser

Medicatievoorschrijfsystemen zijn ontworpen om medicatieveiligheid te waarborgen. In ons onderzoek hebben we de top 5 medicatie-interactiemeldingen onderzocht, waarbij we een boodschap voor een gratis koffiebon toevoegden aan de meldingen. Van de 32.505 verstuurde notificaties werden slechts 3 koffiebonnen geclaimd. Dit resultaat suggereert dat medicatie-interactiemeldingen alleen getoond zouden moeten worden wanneer ze daadwerkelijk actie vereisen om perceptuele blindheid te voorkomen.

Background

With the increasing digitization of healthcare, automated clinical decision support systems (CDSS) are now commonly used to alert prescribers to potential medication risks, such as drug-drug interactions or allergies. However, the large number of alerts can lead to perceptual blindness, especially in high-pressure environments such as hospitals. This phenomenon occurs when prescribers become desensitized to frequent alerts, reducing their effectiveness and potentially compromising patient safety. This alert fatigue can undermine the effectiveness of these alerts and possibly patient safety. A 2020 Delphi study identified the most clinically relevant drug-drug interactions in intensive care units (ICUs). The goal of this study was to evaluate prescriber perceptual blindness to medication safety warnings by showing only clinically relevant warnings.

Methods

In HIX 6.3, we defined the top 5 drug-drug interaction notifications in the intensive care unit. Over a 3-month period, we added a notification to the drug-drug interaction "the first 10 people who read this message can send an email to '...' for a free coffee voucher." After a 3-month period, we counted the emails sent and evaluated the total number of notifications sent by HIX.

Results

Initially, we defined the top 5 drug interactions sent by HIX 6.3, as shown in Table 1.
Over a 3-month period, we sent 32505 drug interactions with added notification, 1370 of which were for IC prescriptions (Table 1). We received 3 emails (0.009%) to claim the coffee voucher.

Conclusions

The results of this small-scale study highlight an important medication safety issue: despite the presence of prompting stimuli, the volume and frequency of automated alerts fail to capture the prescriber's attention. Perceptual blindness may contribute to overlooking critical safety messages. We recommend reevaluating the need for certain alerts and considering strategies to reduce the overabundance of alerts to increase their effectiveness.

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Drug-drug interaction	Clinically relevant based on Delphi rounds (2)	Total notifications	ICU notifications
Heparin/LMWH and NSAID	n.d.	11707	377
Ace inhibitor and diuretic	No	9396	307
ACE inhibitor and potassium sparing diuretic	No	4150	257
Combination of 2QT-prolonging agents	Yes	3497	216
B-Blocker and Insulin	No	3755	213
Total		32505	1370

Figure 1: Table 1

O2

Optimizing cost-effectiveness of microbiological surveillance during selective digestive decontamination in the intensive care unit – an in silico simulation study

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Abstract teaser

Hoewel microbiologische surveillance een essentieel onderdeel is van SDD, is de optimale surveillancefrequentie onbekend. Wij onderzochten in een simulatiestudie de microbiologische opbrengst en de kosten van verschillende kweekintervallen: twee keer per week, wekelijks, of alleen bij opname. Wij vonden dat met wekelijkse surveillance 94% van de relevante isolaten wordt gedetecteerd tegen een kostenreductie van 30% vergeleken met tweewekelijkse surveillance.

Background

Selective Digestive Decontamination (SDD) is used to prevent infections and reduce mortality in the intensive care unit (ICU). Microbiological surveillance of rectum, throat and sputum is essential for ensuring effective decontamination and detecting antibiotic resistant microorganisms. However, its optimal frequency has not been determined. We explored the cost-effectiveness of various microbiological surveillance intervals during SDD.

Methods

In an in silico simulation study, using data from patients admitted for >48 hours to the ICU of a tertiary care hospital in the Netherlands between 2011 and 2022, three surveillance scenarios were compared: (A) twice-weekly surveillance, (B) once-weekly surveillance, and (C) no surveillance. All three scenarios included SDD admission cultures. The primary outcome was the number of isolates with potential clinical relevance identified in each scenario. Secondary outcomes included detection of colonization persistence (necessitating intensification of SDD administration) and costs associated with SDD culturing.

Results

We included 8,499 ICU admissions (76,964 treatment days) and analysed 52,553 clinical and 75,567 SDD cultures. Scenario A yielded 911 (95% CI 905-917) isolates per 1,000 days, of which 90 (88-94) were adjudicated clinically relevant: 9 (9-10) multidrug-resistant microorganisms, 68 (66-71) microorganisms resistant to standard therapy, and 13 (12-14) infection-related microorganisms. Scenarios B and C yielded 85 (82-88) and 77 (75-80) relevant isolates, corresponding to 94% and 86% of all relevant isolates detected in scenario A, respectively. Scenario A identified 56 (55-58) cases of colonization persistence per 1,000 days that would prompt SDD intensification, while scenario B detected 43 (42-45) and scenario C detected 12 (11-12). The total expenditure of SDD surveillance was €78,774, €55,208 and €31,522 per 1,000 days for scenarios A, B and C, corresponding to €1,452, €1,199 and €824 per clinically relevant isolate.

Conclusions

Once-weekly microbiological surveillance is associated with a 30% cost reduction against only 6% loss of potentially relevant information compared to twice-weekly surveillance.
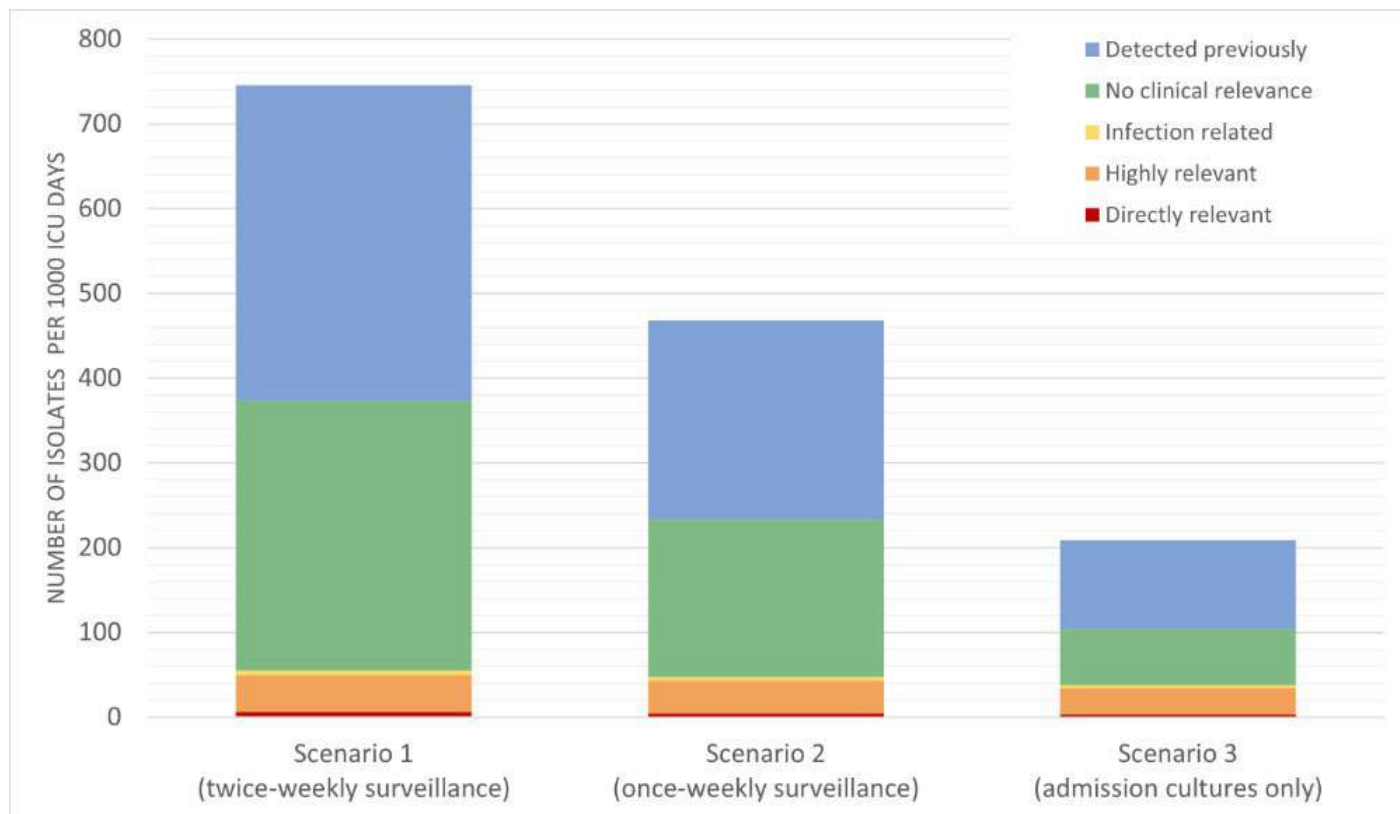
References

None

Figure 1: Number of detected isolates per 1,000 ICU days in each scenario by relevance category

O3

Novel Biomarkers from ECG Waveform Morphology Analysis in Experimental Human Endotoxemia: Insights for Improved Infection and Sepsis Detection through AI

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Abstract teaser

Hoogfrequente ECG-data verzameld op de IC kan helpen bij de detectie van sepsis. We analyseerden ECG-morfologie tijdens menselijke endotoxemie-experimenten en trainden een deep learning-model op MIMIC-data. Dit toont onderscheid tussen patiënten met en zonder (verdenking van) sepsis. Deze resultaten zijn veelbelovend voor de ontwikkeling van nieuwe monitoringalgoritmes voor vroegtijdige detectie van sepsis op de IC.

Background

Due to its heterogeneous nature, sepsis detection remains challenging. Leveraging waveform data, especially in AI applications, offers new diagnostic potential. While heart rate variability (HRV) analysis has shown its limitations, we hypothesize that novel biomarkers within waveform signals can enhance sepsis detection. This study aims to explore novel biomarkers within waveform signals to improve the sensitivity and specificity of early sepsis detection, potentially improving diagnostics and patient outcomes.

Methods

Data were collected from 100 healthy volunteers undergoing experimental human endotoxemia, a model of systemic inflammation induced by injecting 1 ng/kg lipopolysaccharide (LPS), with a control group (n=11) receiving no LPS. ECG waveforms were recorded for 6–8 hours post-injection and analyzed using custom algorithms. Clinical applicability was tested using ECG data from patients with suspected infection (n=2000), no suspicion of infection (n=2000), and sepsis (n=2000) from the Medical Information Mart for Intensive Care (MIMIC) database to train and validate a convolutional neural network for sepsis detection.

Results

Analysis of the ECG waveform during endotoxemia demonstrated an expected 20-30% increase in heart rate and a reduction of 40% in heart rate variability (HRV). Additionally, a clear alteration in ECG morphology of individual heart cycles of 35% was observed, becoming significantly different from controls within the first two hours post-LPS administration. Preliminary results from the deep learning analysis indicate that the model performs well in distinguishing sepsis from non-sepsis cases (AUC=0.82).

Conclusions

We discovered morphological changes in the ECG waveforms collected during endotoxemia that show potential for early detection of sepsis. This study substantiates the hypothesis that valuable information resides within waveform morphology during inflammatory conditions. By documenting both inflammation-induced quantitative and qualitative changes in waveform morphology over time in humans, this work represents a significant contribution to the field. Furthermore, the deep learning model demonstrated promising performance in distinguishing sepsis from non-sepsis cases, highlighting its potential for future clinical application. Moreover, it aligns with current research on AI methods for inflammation and sepsis detection from waveforms (Kwon, 2021), offering insights into the underlying patterns detected by these algorithms. Ultimately, this study advances the field of early sepsis detection and contributes to the development of explainable AI in medical diagnostics.

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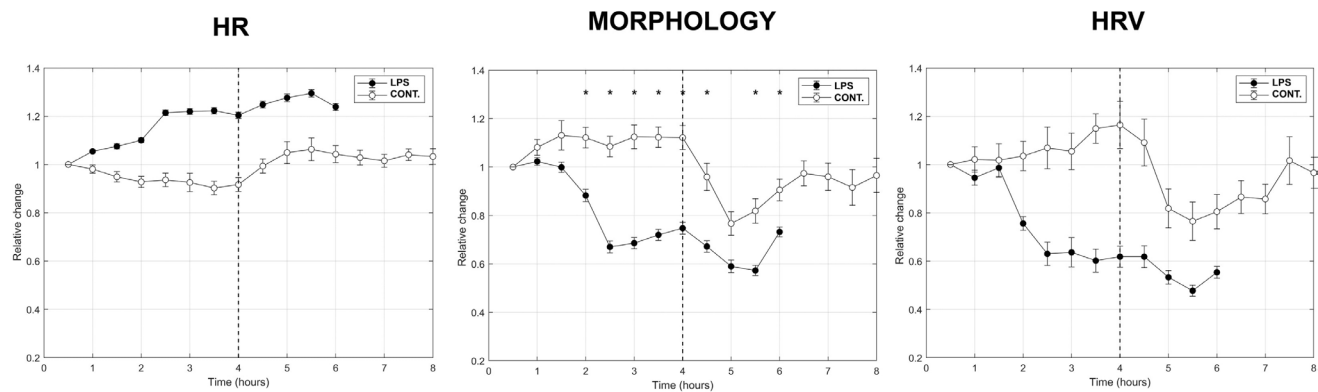
Figure 1: Heart rate (left), ECG morphology (middle), and HRV (right) over time post-LPS and control injection. Data points represent mean ± SEM for endotoxin (black) and control (white) groups. Vertical dashed line indicates moment volunteers consumed a meal.

EP01

Intensive Care Unit Trauma Care over 10 years: a single center cohort study

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Abstract teaser

In dit abstract hebben we gekeken naar effecten van nieuwe traumarichtlijnen en de impact van de COVID-pandemie op de traumazorg op de intensive care van een level 1 traumacentrum. We combineerden registraties van de regionale traumadatabase met de NICE data. Combinatie van deze data levert een meer gedetailleerd beeld van de ziekte ernst van de traumapatient op de IC.

Background

In 2015, the new volume criteria for trauma patients were introduced. These new criteria stated, that level 1 trauma centers required a minimum of at least 240 polytrauma patients annually, instead of the previous 100. In this study, we aim to evaluate the impact of these new volume criteria over time, by focusing on the number of polytrauma patients admitted to the Intensive Care Unit (ICU) and the severity of their injuries in the Dutch province of Limburg during 10 years. As this period included the COVID-19 pandemic, its impact was additionally investigated.

Methods

The ICU trauma cohort patients were selected from the electronic health records database out of all ICU patients admitted between 2013 and 2022. The cohort characteristics included ICU disease severity scores and was enriched with trauma specific scores and diagnoses extracted from the Netwerk Acute Zorg Limburg (NAZL) registry. We then used linear regression analyses to investigate the association between time periods (i.e. period 1, 2013-2015; period 2, 2016-2019; period 3, 2020-2022) and injury severity scores.

Results

18362 patients were admitted to the ICU between the years 2013 and 2022. Of that group, 1062 patients had primarily a trauma diagnoses. The number of polytrauma patients admitted to the ICU increased between 2013 (38) and 2022 (98), although not statistically significant. Compared to period 1, the mean injury severity score was β (95%CI) 1.9 points (-0.3; 4.1) higher in period 2 and 4.2 points (2.0-6.5) higher in period 3. Adjustment for age and sex did not change the results.

Conclusions

Both the number of polytrauma patients and the severity of their injuries, admitted to the single center ICU of a level 1 trauma center, have increased over the years. These results were independent of age and sex.
Combining data of registries provides more detailed insight for the trauma patients' disease severity

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EP02
Performance and Adaptation of the Advanced Alert Monitor in a Dutch Clinical Setting

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Abstract teaser

Het tijdig herkennen van risicopatiënten is essentieel voor snelle interventie en betere resultaten. Dit onderzoek beoordeelde de Advanced Alert Monitor (AAM) in een Nederlands ziekenhuis. De AAM presteerde beter dan de nationale early warning score (NEWS) en verbeterde na hertraining, wat het belang van lokale aanpassing benadrukt.

Background

This study focuses on the generalizability of the Advanced Alert Monitor (AAM), a data-driven Early Warning Score (EWS) system for the general ward. The AAM predicts the risks of unanticipated intensive care admissions and mortality within 12 hours and has shown improved performance over the National Early Warning Score (NEWS) [1]. The AAM showed great promise for prospective clinical use, as it resulted in a consortium-wide reduction of mortality [2].

Methods

Data was extracted from the Catharina Hospital's electronic medical records (EMR) in Eindhoven, Netherlands. The AAM was reproduced, and a locally optimized AAM (LO-AAM) was trained. Both were tested against the NEWS using two outcome definitions. The original definition was based on unanticipated IC admissions and mortality with a full-code care order. This means that mortality was not seen as deterioration if the patient did not consent to certain life-saving treatments. The second definition included mortality regardless of care order status. Furthermore, a feature importance analysis was performed based on the coefficients of the AAM and LO-AAM to examine the effects of the outcome definition.

Results

Results showed that the AAM was still capable of outperforming the NEWS even outside its original patient population with an area under the receiver operating curve (AUROC) of 79.8% vs 74.2%, see Fig. 1. However, when adapting the outcome definition, the NEWS outperformed the AAM, see Fig. 2. The LO-AAM outperformed both the NEWS and AAM for both outcome definitions. The additional feature importance analysis showed that the LO-AAM trained on the adapted outcome focused more on physiological features than the AAM and the LO-AAM trained on the original outcome.
It is clear from this that the LO-AAM outperforms both the NEWS and original AAM, thereby providing more accurate risk stratification. This improvement results in more precise alarms, thus reducing the number of unnecessary alerts and making sure appropriate care is provided to high-risk patients.

Conclusions

The AAM can be generalized outside its original population, but local optimization is required for optimal performance. Moreover, the outcome definition significantly impacted the performance of the NEWS, AAM, and LO-AAM, with the adapted outcome focusing the LO-AAM more on physiological signs of deterioration. This study underscores the importance of local adaptation and careful consideration of outcome definitions to enhance the predictive accuracy and clinical relevance of data-driven early warning systems.

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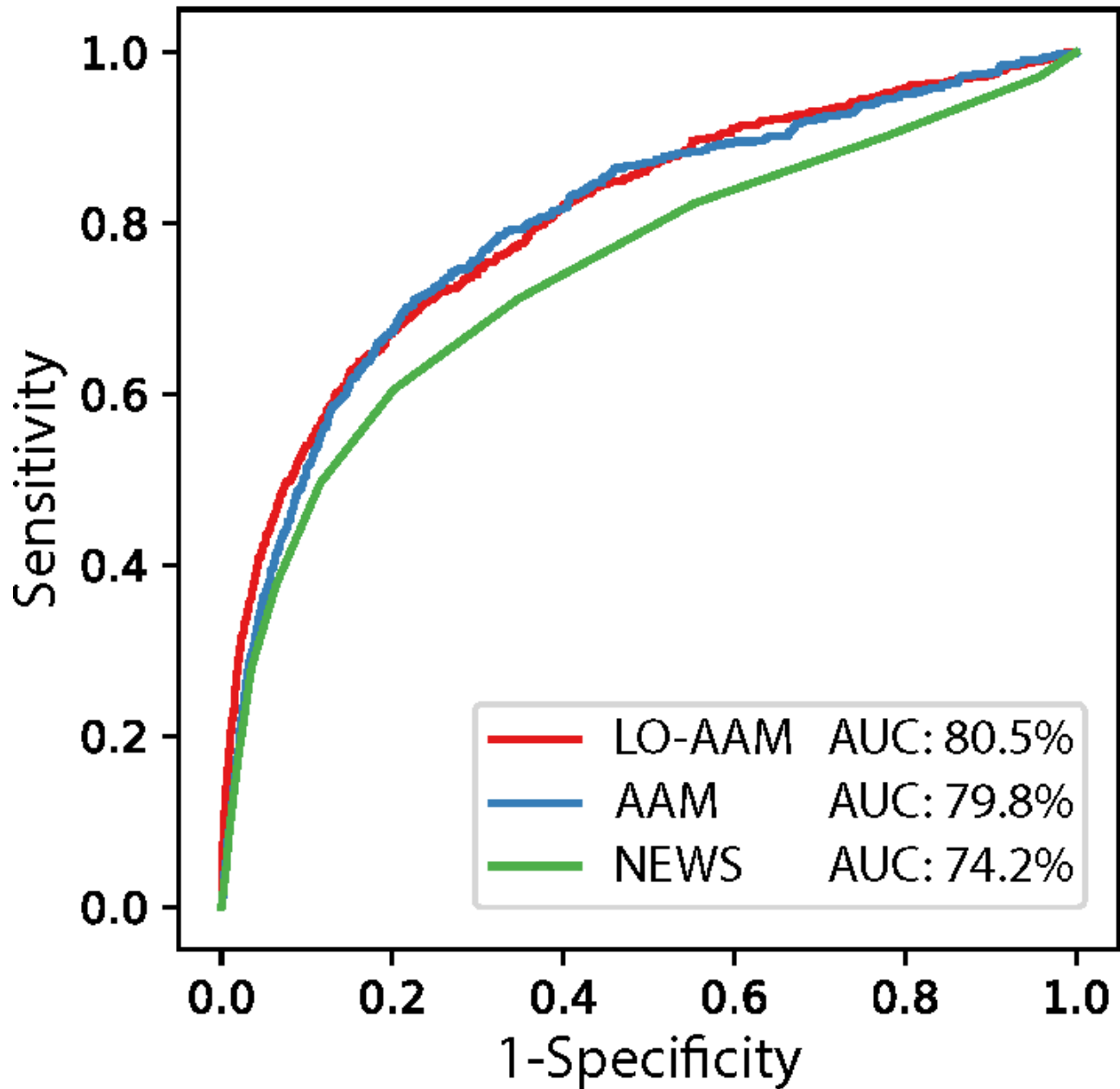
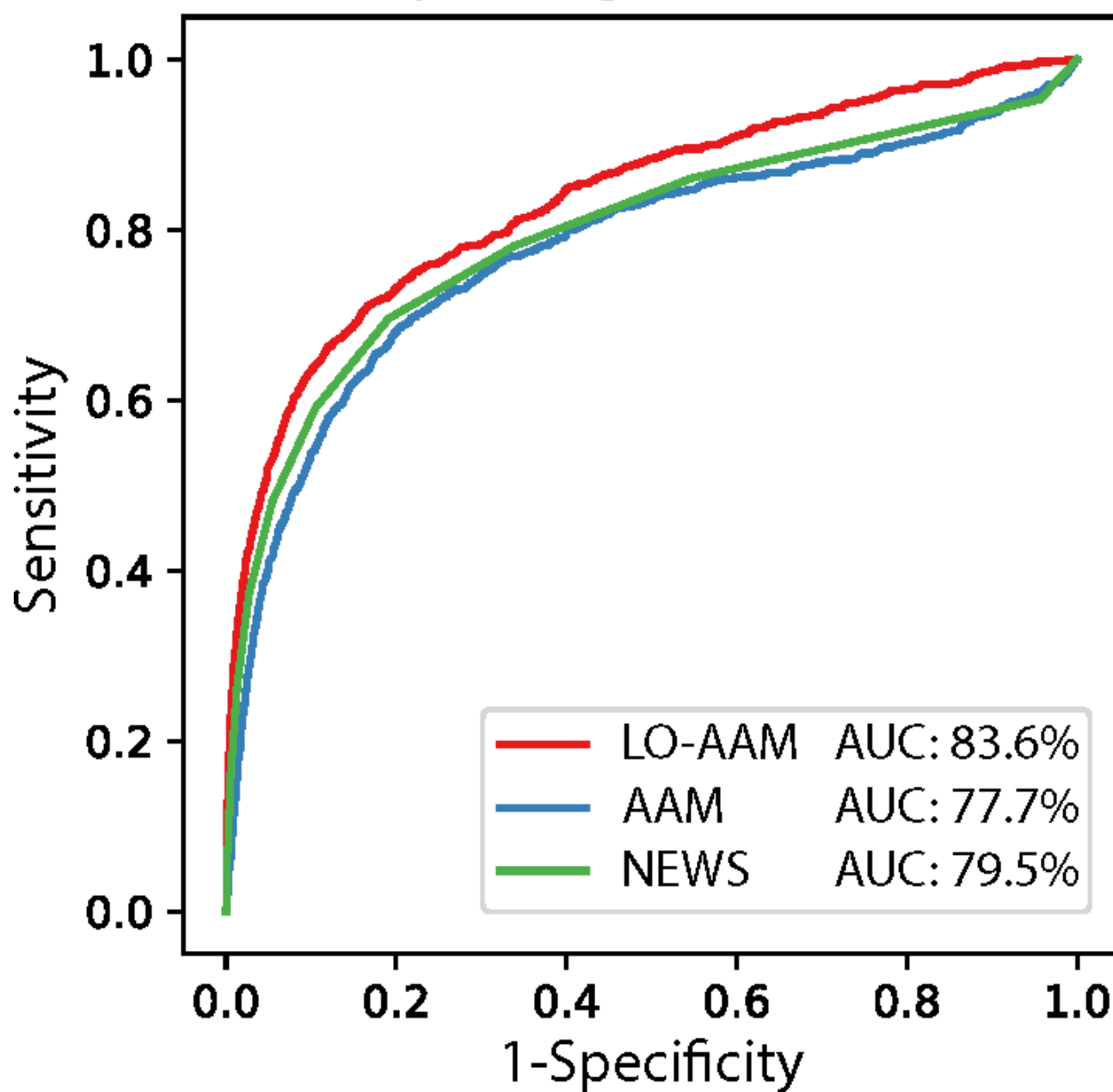Figure 1: ROC curves original outcome

Figure 2: ROC curves adapted outcome

EP03

Clinical validation of video-based vital sign monitoring in critically ill patients: a prospective cohort study

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Abstract teaser

Nieuwe videotechnologieën maken contactloze monitoring van hart- en ademfrequentie mogelijk. In een prospectieve studie werden video-gebaseerde hart- en ademfrequentie vergeleken met de referentie standaard bij IC-patiënten. Eerste resultaten tonen een goede overeenkomst, wat de potentie van videomonitoring onderstreept voor vroegtijdige detectie van klinische verslechtering.

Background

New video-based technologies enable contactless continuous patient-friendly monitoring of vital signs in medical care. Both video-based heart rate (HR) and respiratory rate (RR) monitoring help to track changes in these vital signs to predict clinical deterioration earlier. These technologies are valid in controlled settings with healthy volunteers in whom the vital signs remain stable, but technical validation in clinical settings with changing trends of these vital signs remains limited. The objective of this study was to assess the agreement and coverage of continuous video-based heart- and respiration rate monitoring in comparison with the reference standard in patients admitted to the intensive care (ICU).

Methods

A prospective observational study was performed in which measurements of HR and RR with a visible light (RGB) and an infrared (IR) camera were compared with continuous ECG and impedance pneumography monitoring on a standard patient monitoring system (Philips MX750) as the reference standards. Video-based HR relies on the principle of remote photoplethysmography (rPPG) by detecting subtle alterations in skin color induced by the cardiovascular pulse wave (1). Video-based RR analysis operates on the principle of discerning respiratory-induced motion patterns (2). The video data and reference data were synchronized to ensure alignment of their timestamps, and 1-minute data pairs were created for comparison. Outcome measures were the duration of valid video recordings and the agreement of HR and RR with the reference standards reported as the mean absolute error.

Results

In this preliminary analysis, 35 ICU patients were included, resulting in a total video recording duration of 661 hours. The agreement within 5 beats/minute between video-based HR and ECG was 81.4%, with a coverage of 82.8%. For video-based RR and impedance pneumography, the agreement within 3 breaths/minute was 92.1%, with a coverage of 53.7%.

Conclusions

These preliminary findings demonstrate the feasibility and good agreement for continuous HR and RR measurements through video-based monitoring compared to the reference standard. Further efforts will focus on enhancing informative frame detection to improve coverage and validity. These results could support the development of patient-friendly monitoring solutions in medium care settings to enhance mobilization, as well as on general wards to improve the early identification of high-risk patients who may require intensive care.

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EP04
Plasma Transfusion in the Intensive Care Unit

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Abstract teaser

Huidige richtlijnen ontmoedigen profylactische plasma transfusies bij niet-bloedende patiënten met coagulopathie. Deze sub- studie evalueerde plasma transfusiepraktijken op 233 intensive care afdelingen in 30 landen. Van de 3643 patiënten ontvingen 356 patiënten (10%) een plasma transfusie. 37% van deze transfusies waren voor niet-bloedende indicaties, waarvan 54% een pre-transfusie INR van < 3.0 had. Deze transfusies waren mogelijk te voorkomen.

Background

Current guidelines discourage prophylactic plasma use in non-bleeding patients (1, 2). This study assesses global plasma transfusion practices in the intensive care unit (ICU) and their alignment with current guidelines.

Methods

This was a sub-study of an international, prospective, observational cohort. Primary outcomes were in-ICU occurrence rate of plasma transfusion, proportion of plasma events of total blood products events, and number of plasma units per event. Secondary outcomes included transfusion indications, INR/PT, and proportion of events for non-bleeding indications.

Results

Of 3643 patients included, 356 patients (10%) experienced 547 plasma transfusion events, accounting for 18% of total transfusion events (Figure 1A and 1B). A median of 2 [IQR 1,2] units was given per event excluding Massive Transfusion Protocol (MTP) and 3 [IQR 2,6] when MTP was activated. MTP accounted for 39 (7%) of events. Indications of non-MTP events included active bleeding (54%), prophylactic (25%), and pre-procedure (12%, Figure 1C). Target INR/PT was stated for 43% of transfusion events; pre-transfusion INR/PT or visco-elastic hemostatic assays (VHA) were reported for 73%. Thirty-seven percent of events were administered for non-bleeding indications, 54% with a pre-transfusion INR <3.0 and 30% with an INR <1.5 (Figure 1D).

Conclusions

Plasma transfusions occurred in 10% of ICU patients. Over a third were given for non-bleeding indications and might have been avoidable. Target INR/PT was not stated in more than half of transfusions, and pre-transfusion INR/PT or VHA was not reported for 27%. Further research and education is needed to optimize guideline implementation and to identify appropriate indications for plasma transfusion.

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Remark
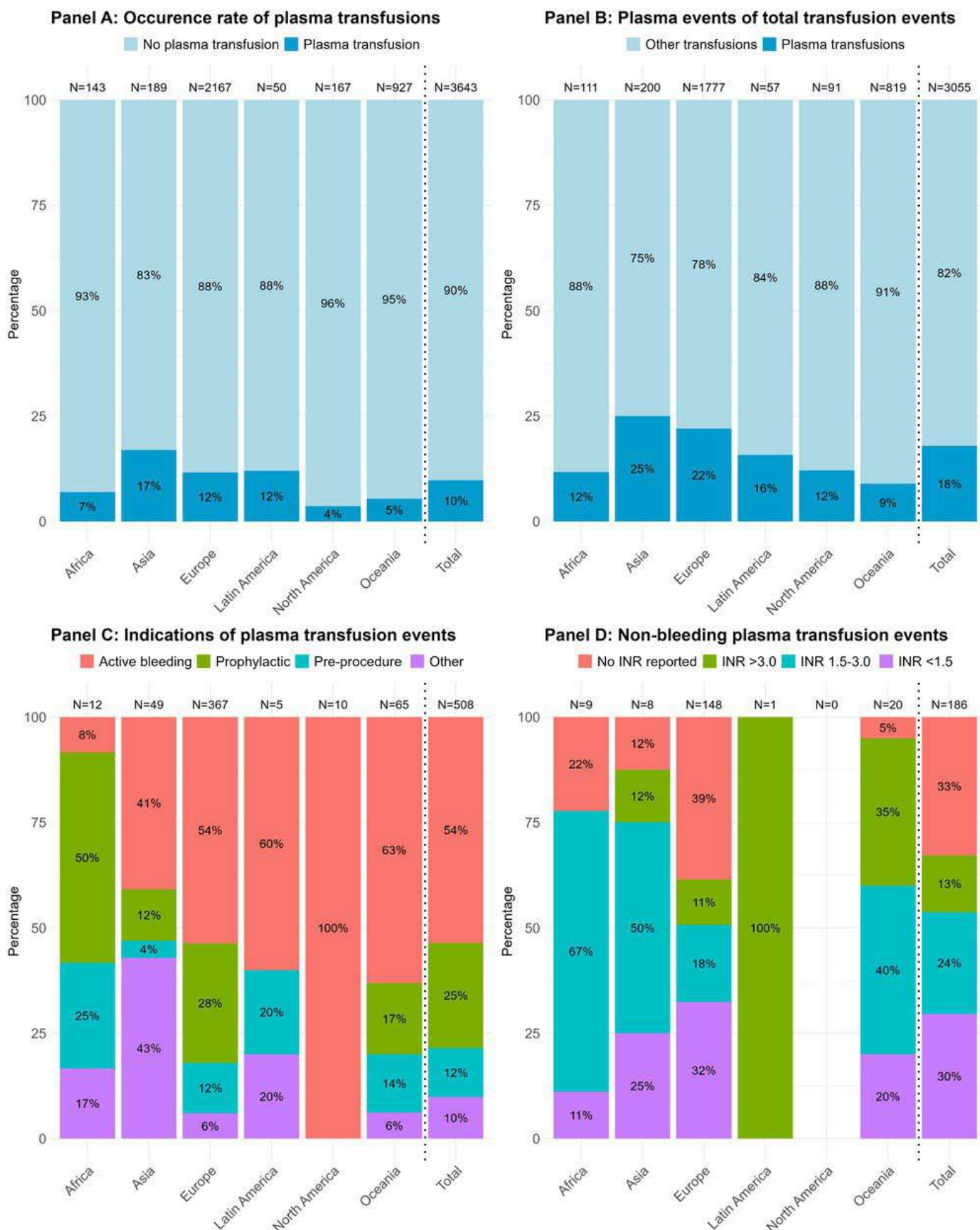
Figure 1: Figure 1: Plasma transfusion practices per continent. Panel A: occurrence rate of plasma transfusion in the ICU per continent and in total, including as part of Massive Transfusion Protocol (MTP). Panel B: Proportion of plasma transfusion events of the total transfusion events of all products (Red Blood Cells, Platelets and Plasma) per continent and in total, including MTP. Panel C: Distrubution of proportions of transfusion indications per continent and in total, excluding MTP. Panel D: Proportions of unknown INR, INR >3.0, INR 1.5 – 3.0 and INR <1.5 of the transfusion events for a non-bleeding indication (defined as prophylatic or pre-procedure) per continent and in total, excluding MTP.

EP05

Clinical and Microbiological Characteristics of Central Line Associated Bloodstream Infections in a tertiary Intensive Care Unit.

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Abstract teaser

Lijnsepsis wordt wereldwijd steeds vaker veroorzaakt door bijzonder resistente micro-organismen (BRMO) of Candida spp. In deze studie wordt een beschrijving gemaakt van alle lijnsepsis die zijn opgetreden in 2022 en 2023 op de IC van een tertiair ziekenhuis in Nederland. Het overgrote deel van de lijnsepsis werd veroorzaakt door coagulase-negatieve stafylokokken. Er werden geen gisten, schimmels of BRMO's gekweekt.

Background

Central Line Associated Bloodstream Infections (CLABSI) with multi-drug resistant micro-organisms or Candida are an emerging problem in ICUs. The aim of this study was to analyse the microbiological and clinical characteristics of CLABSIs in a tertiary intensive care unit in the Netherlands.

Methods

In the ICU of the Leiden University Medical Hospital providing both medical and surgical care all CLABSIs in 2022 and 2023 were recorded. Patient characteristics as well as details about the CVCs were collected. CLABSI was defined as a blood and line tip culture with the same microorganism. Mortality and length of hospital and ICU stay were also registered.

Results

A total of 7082 line days divided over 710 CVC's were recorded. 25 CLABSIs occurred in 18 patients, which is a total of 3,5 events per 1000 line days. The mean age of patients was 59 years (29-75), with the majority being male (78%, $p<0.0001$). A significant majority of the central lines causing a CLABSI were positioned in the internal jugular vein (21/25, $p<0.001$). CVCs causing CLABSI were in situ for an average of 14,3 days (range 2.9-28.5 days), in contrast to all CVCs with an average of 10 days. Lines causing CLABSI in the jugular position were in situ for longer than those placed in the femoral vein (average 14.7 days versus 13.3 days respectively).
In 23 out of 25 CLABSIs a coagulase-negative staphylococcus (CNS) was cultured, sometimes multiple kinds of CNS or a CNS combined with Enterococcus spp. The majority of CNS consisted of Staphylococcus epidermidis (n=20). None of the CLABSIs were caused by fungi, gram-negative bacteria or multidrug-resistant bacteria. 33.3% of patients with proved CLABSI died during their ICU admittance. Of the 6 patients who died, 2 had multiple CLABSIs.

Conclusions

In this study we found that coagulase negative staphylococci are the main causative microorganisms for CLABSI in our ICU, which is in line with ICUs in general hospitals in the Netherlands1. No yeast infections were observed, which is in contrast to ICUs in the United States where the majority of CLABSIs are caused by Candida spp (27.7%)2. This difference might be explained by the use of Selective Decontamination of the Digestive Tract (SDD) in the Netherlands.

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Baseline characteristics	Patients with one or more CLABSI, n=18
Age - year	59 (range 29-75)
Male sex	n=14 (78%)
Reason of admission, surgical	n=9 (50%)
Immunocompromised	n=4 (22%)
Kidney disease	n=5 (28%)
Cardiac failure	n=3 (17%)
BMI>40	n=1 (6%)
COPD	n=1 (6%)
Diabetes mellitus	n=2 (11%)
Multiple events of CLABSI	n=7 (39%)
Length of ICU stay – days	41 (range 7-103)
Length of hospital stay – days	59 (range 15-208)
Diseased	n=6 (33%)

Table 1: Baseline characteristics of patients with (at least one) episode of CLABSI during ICU stay
kidney disease was defined as eGFR<30ml/min/1,72m^2, immunocompromised was defined as received organ transplant prior to admission, chronic use of steroids or other immunosuppressants and/or haematological disease with immunocompromised state. Cardiac failure was defined as left ventricular ejection fraction below 35%.

Figure 1: Table 1: Baseline characteristics of patients with (at least one) episode of CLABSI during ICU stay

CVC characteristics	
Location – internal jugular vein	n=21 (84%)
Location – femoral vein	n=3 (12%)
Location – superior vena cava	n=1 (4%)
Dialysis catheter	n=5 (20%)
Line days	14,3 (range 2,9-28,5) days
Microorganisms	
Staphylococcus epidermidis	n=20 (80%)
Staphylococcus hominis	n=2 (8%)
Staphylococcus haemolyticus	n=3 (12%)
Enterococcus faecium	n= 4 (16%)
Enterococcus faecalis	n=1 (4%)
Two micro-organisms cultured	n=5 (20%)
Multidrug-resistance	n=0 (0%)

Table 2: characteristics of CVCs that caused a CLABSI including the cultured microorganisms (both in blood and line culture).

Figure 2: Table 2: characteristics of CVCs that caused a CLABSI including the cultured microorganisms (both in blood and line culture).

EP06
Nationwide effects of the new donor act: increase in number of donors and consent rates, and remaining challenges

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Abstract teaser

Sinds de nieuwe donorwet in juli 2020 staat de donatiewens van iedereen vanaf 18 jaar geregistreerd in het Donorregister, maar maakt dit het donatiegesprek met nabestaanden eenvoudiger?
Deze studie onderzocht de uitkomsten van donatiegesprekken bij de verschillende registraties in het Donorregister. Hoewel het instemmings/toestemmingspercentage voor orgaandonatie en het aantal orgaandonoren is gestegen, blijven donatiegesprekken een uitdaging.

Background

In July 2020, the Netherlands changed its organ donation consent system from an opt-in model to an active donor registration (ADR). The new donor act aimed to register the donor preferences of 7 million previously unregistered residents and increase the number of organ donors. The aim of the present study is to evaluate the effectiveness of this new donor act in improving the family consent rates for organ donation.

Methods

National data on deceased patients in intensive care units, collected by the Dutch Transplant Foundation from 2021 to 2024 under the new donor act, were compared to data from the opt-in system (2019) to assess changes in family consent rates.

Results

After the implementation of the new donor act, 14 million Dutch residents were registered with: "Yes" (34%), "No" (31%), "No objection" (24%), and "Decision by next of kin" (11%).
For potential organ donors registered with "Yes," family support for donation was observed in 86% of cases in 2021 and remained consistent at 86% through 2024 (Table 1). Among "No objection" registrations, family support was obtained in 47% of cases in 2021 and decreased slightly to 44% in 2024. Cases requiring "Decision by next of kin", family consent rates dropped from 46% in 2021 to 27% in 2024.
The overall consent rate increased from 42% in 2019 under the opt-in system to 60% in 2021 and remained at 59% in 2024.1

The number of organ donors increased from 250 in 2019 to 271 in 2021, and further to 331 in 2024 (reference date 25th November 2024).

Conclusions

In conclusion, since the implementation of the new donor act, the number of donation registrations doubled from 7 million to 14 million, which should provide more clarity in the family approach for organ donation. The overall consent rate under the new donor act increased to 60% compared to the rate of 42% observed under the opt-in system.
Although the number of organ donors increased since the new donor act, families often override the donor's registered wishes in cases of a "Yes" or "No objection". However, this is less frequently compared to the non-registered cases during the opt-in system. Despite the improved clarity provided by the registrations for both the public and physicians, the family approach for donation remains challenging.

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Table 1. Outcome of the family approach for organ donation based on the registration in the Donor Register

Year	Yes, I want to be a donor – family support (%)	No objection - family support (%)	Decision by next of kin – family consent (%)	No registration (%)	Overall support/consent rate (%)
2019	81	NA	35	31	42
2021	86.4	47.4	45.5	NA	60.2
2022	84.4	42.1	32.9	NA	59.6
2023	83	45.5	35.5	NA	61.5
2024*	86.1	44.3	26.6	NA	59.1

*Reference date: 25th November 2024, NA= not applicable

Figure 1: Table 1. Outcome of the family approach for organ donation based on the registration in the Donor Register

EP07

Dyspnea is related to Clinical Outcomes in Patients Weaning from Invasive Mechanical Ventilation with Tracheostomy – a multicenter prospective study

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Abstract teaser

Dyspneu is een traumatiserende sensatie. Voornamelijk IC- patiënten die ontwennen van beademing met een tracheostoma lopen risico dyspneu te ervaren. In dit prospectieve onderzoek uit 13 Nederlandse IC's laten we zien dat dyspneu een groot probleem is, met gevolgen voor klinische uitkomst op korte en lange termijn.

Background

Dyspnea is a traumatizing experience, and is increasingly acknowledged and prioritized as relevant outcome for critically ill patients(1). Tracheostomized critically ill patients weaning from invasive mechanical ventilation (IMV) are at particular risk for dyspnea and adverse post-ICU outcomes. This study aims to determine the burden of dyspnea during the tracheostomized weaning and to evaluate the association between dyspnea and weaning outcomes.

Methods

A prospective observational study was performed in 13 Dutch hospitals and included adult tracheostomized patients weaning from IMV. Main exclusion criteria were neuromuscular disease, chronic ventilation and tracheostomy for upper airway obstruction. Dyspnea was evaluated daily in communicative patients during the first 28 days from first disconnection session with tracheostomy. The ability to communicate was defined as negative delirium screening and Richmond Agitation Sedation Scale score between -2 and +2. Post-ICU quality of life and psychological sequelae were evaluated at 90 days after ICU discharge using validated questionnaires (EQ-5D for quality of life, IES-R for probable PTSD, and HADS for anxiety and depression). The co-primary endpoints were 1) weaning duration (days between the first disconnection session and definitive liberation) and 2) days with dyspnea, and 3) the severity of dyspnea on a visual analog scale (D-VAS). Associations between dyspnea and weaning outcomes were analyzed with linear regression and joint modeling.

Results

Between April 2023 and June 2024, 156 patients were included. Of those 130 (83%) were successfully liberated from IMV. The mortality rate at 90 days after ICU discharge was 44 (28%). The median weaning duration was 9 [IQR 8, 15] days. The cumulative incidence of dyspnea was 3 [2, 6] days per patient and the prevalence of dyspnea was 58% (Figure 1). The median dyspnea intensity score was 6 [4, 7] among patients with dyspnea. A history of dyspnea during weaning was associated with a 48% lower probability of successful weaning (hazard ratio 0.516, p<0.001). The questionnaires to evaluate the association between dyspnea and post-ICU symptoms were answered by 53/108 (49%) of patients. 18 patients (34%) had probable PTSD, 24 (45%) had anxiety and 23 (43%) depression. The cumulative dyspnea incidence was significantly associated with PTSD symptoms (Table 1).

Conclusions

Tracheostomized critically ill patients frequently suffered from severe dyspnea during weaning. Dyspnea was associated with a longer weaning duration, unsuccessful weaning from IMV and PTSD symptoms after ICU discharge.

References

1: Demoule et al., Dyspnoea in acutely ill mechanically ventilated adult patients: an ERS/ESICM statement. Intensive Care Med. 2024 Feb;50(2):159-180.

Remark

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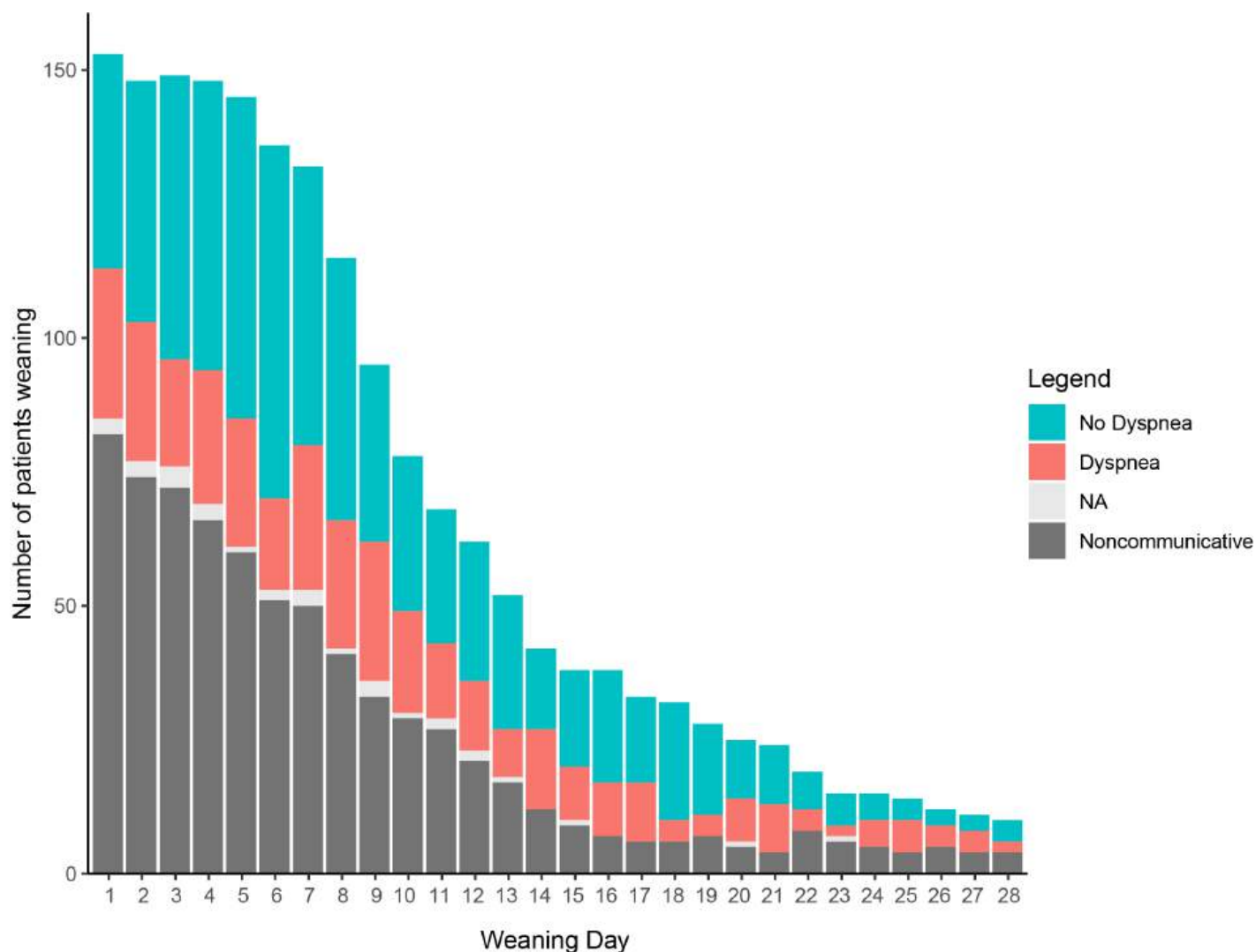16. Intensive Care, *Radboud University Medical Centre,* Nijmegen, *the Netherlands*

Figure 1: Figure 1

Table 1. Results from post-ICU questionnaires on psychologic symptoms and HR-QoL

	Outcomes in responding patients (n=53)	Association between dyspnea and outcome	
		OR (95% CI)	P-value
HR-QoL (EQ-5D utility score)	0.70 [0.60, 0.81]	0.98 (0.96; 1.00)	0.07
Perceived health state (EQ-5D VAS)	60 [40, 71]	0.61 (0.09; 4.26)	0.61
PTSD symptoms (IES-R total score)	16 [6, 26]	9.7 (1.79; 52.4)	0.01
Probable PTSD (IES-R score ≥ 22)	18 (34)	1.20 (0.95; 1.56)	0.14
Anxiety symptoms (HADS anxiety score)	6 [3, 11]	1.80 (0.98; 3.30)	0.06
Anxiety disorder (HADS anxiety score ≥8)	24 (45)	1.25 (0.99; 1.63)	0.08
Depression symptoms (HADS depression score)	6 [2, 11]	1.84 (0.98; 3.44)	0.06
Depressive disorder (HADS depression score ≥8)	23 (43)	1.21 (0.96;1.56)	0.13

Post-ICU outcomes at 90 days after ICU discharge in patients who survived and responded to the questionnaires. Associations between dyspnea and questionnaire scores are analyzed with linear regression, and with logistic regression for binomial score outcomes. Regressions are controlled for the number of communicative weaning days. Abbreviations: OR: Odds ratio, CI: confidence interval, HR-QoL: health-related quality of life, EQ-5D: European Quality of Life five dimensions, VAS: visual analog scale, PTSD: post-traumatic stress disorder, IES-R: Impact of Event Scale-Revised, HADS: hospital anxiety and depression scale.

Figure 2: Table 1

EP08

Retention of Patient Reported Outcome Measures and physical tests during 180 days follow-up of a Randomized Controlled Trial in acutely admitted critically ill patients

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Abstract teaser

Functionele testen worden toenemend relevant als uitkomstmaat in IC-onderzoek, maar brengen uitdagingen met zich mee. In een RCT gericht op PROMs onderzochten wij de retentie van PROMs en fysieke tests na IC-opname. Na 30, 90 en 180 dagen bleef de retentie onder de 50%. Timing van follow-up, onvermogen of onwil en het gebruik van meerdere vragenlijsten blijken mogelijke biasbronnen.

Background

The use of functional endpoints is increasingly advocated in ICU research. We recently performed an RCT assessing the effect of protein provision on functional outcomes in acutely admitted ICU patients. The primary endpoint was Health Related Quality of Life, quantified with EuroQol-5D-5L utility. This RCT is hitherto the largest ICU trial primarily focusing on functional endpoints. The aim of this post-hoc analysis was to establish the retention rates of Patient-Reported Outcome Measures (PROMS) and physical tests, at 30, 90 and 180 days of follow-up. Additionally, we assessed if baseline characteristics, clinical variables, and PROM scores influence retention of PROMs, specifically in relation to participation in physical testing during follow-up.

Methods

The trial enrolled 935 patients. For this post-hoc analysis, we selected all patients alive at each follow-up moment. We calculated retention of PROMS (EQ-5D-5L, SF-36, HADS, IES-r) and physical tests (handgrip strength, MRC-sum, 6-minute walking test) by counting the number of patients contributing to a particular outcome as percentage of total enrolled patients and as percentage of surviving patients. In addition, we compared baseline characteristics, ICU length of stay and PROMs at all timepoints between patients that were physically tested and those that were unwilling or unable to be physically tested, using chi-square and unpaired t-tests.

Results

There were 597 (64%), 508 (54%) and 483 (52%) patients known to be alive after 30, 90 and 180 days. PROMS were available in <50% of all cases in almost all instances (Table 1). Retention of secondary PROMS was substantially worse than for the primary outcome. The number of patients undergoing physical tests declined over time, although the relative and absolute number of patients able to perform a 6-minute walk test increased over time (Table 2).

The retention of physical tests was consistently lower in patients with a neurological admission diagnosis (p<0.01). Importantly, at all timepoints, the EQ-5D-5L utility was significantly higher in patients that were physically tested versus those that were unwilling or unable (Table 2). Such differences were not found for other PROMS (SF-36, HADS, IES-R).

Conclusions

Follow-up of functional outcomes in patients enrolled in the acute phase of critical illness is challenging, due to low retention rates. Our experience has important implications for future research focusing on functional recovery after ICU admission as it shows that timing of follow-up, inability or unwillingness to participate in physical testing and the use of multiple questionnaires are potential sources of bias.

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Bels et al. Lancet 2024

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Table 1. Retention of Patient Reported Outcome Measures (PROMS) and physical tests at 30, 90 and 180 days after randomization.

	Day 30			Day 90			Day 180		
Survival Status									
Alive	597 (64%)			508 (54%)			483 (52%)		
Dead	279 (30%)			339 (36%)			354 (38%)		
Unknown	59 (6%)			88 (9%)			98 (10%)		
	N	% of total	% of alive	N	% of total	% of alive	N	% of total	% of alive
PROMS									
EQ-5D-5L (primary)	526	56%	88%	443	47%	74%	433	46%	90%
SF-36	245	26%	41%	324	34%	54%	339	36%	70%
HADS	268	29%	45%	338	36%	57%	350	37%	72%
IES-R	255	27%	43%	328	35%	55%	343	37%	71%
Physical tests									
MRC-sum	308	33%	52%	295	32%	49%	261	28%	54%
HGS	280	30%	47%	288	31%	48%	261	28%	54%
6MWT	130	14%	22%	207	22%	35%	213	23%	44%

EQ-5D-5L=EuroQoL-5-Dimension-5-Level Questionnaire (survivors only); SF-36=Short-Form-36 Questionnaire; HADS=Hospital Anxiety and Depression Scale; IES-R=Impact of Event Scale-Revised; MRC-sum=Medical Research Council-sum score; HGS=Handgrip Strength (percentage of predicted); 6MWT=6-minute walk test (percentage of

nd 180 days after randomization.

Table 2. Baseline characteristics, ICU length of stay and functional outcomes in alive patients that were or were not physically assessed at 30, 90 or 180 days after randomization						
	Day 30		Day 90		Day 180	
	Physcially assessed	Not Physcially assessed	Physcially assessed	Not Physcially assessed	Physcially assessed	Not Physcially assessed
	321 (54%)	276 (46%)	300 (59%)	208 (41%)	272 (56%)	211 (44%)
Baseline characteristics and clinical outcome						
Respiratory	94 (61%)	60 (39%)	104 (68%)	50 (32%) b	99 (64%)	55 (36%) *
Cardiovascular	82 (67%)	40 (33%) *	82 (67%)	40 (33%)	77 (63%)	45 (37%)
Neurological	41 (43%)	55 (57%) *	44 (46%)	52 (54%) *	37 (39%)	59 (61%) †
APACHE II score	15 (6)	15 (6)	16 (6)	14 (6) ‡	15 (6)	15 (6)
Baseline EQ-5D-5L-HUS	0.81 (0.23)	0.80 (0.22)	0.80 (0.21)	0.81 (0.24)	0.82 (0.21)	0.81 (0.24)
Length of ICU stay (days)	18 (13)	28 (24) ‡	22 (18)	22 (21)	20 (17)	22 (20)
Functional Outcomes						
EQ-5D-5L HUS	0.50 (0.28)	0.43 (0.29) §	0.65 (0.28)	0.58 (0.31) §	0.71 (0.24)	0.63 (0.34) §
SF-36	43 (19)	43 (17)	52 (21)	51 (23)	60 (22)	58 (24)
HADS	17 (4)	17 (3)	17 (4)	17 (4)	17 (3)	18 (4)
IES-R	19 (16)	19 (13)	17 (16)	18 (17)	17 (6)	17 (6)
MRC-sum	49 (12)	-	54 (8)	-	57 (6)	-
HGS	68 (31)	-	79 (31)	-	91 (31)	-
6-MWT	61 (24)	-	71 (27)	-	77 (25)	-

EQ-5D-5L HUS=EQ-5D-5L Utility; SF-36=Short-Form-36 Questionnaire; HADS=Hospital Anxiety and Depression Scale; IES-R=Impact of Event Scale-Revised; MRC-sum=Medical Research Council-sum score; HGS=Handgrip Strength (percentage of predicted); 6MWT=6-minute walking test (percentage of predicted); data presented as absolute numbers (%) or mean (SD).

* p<0.01, X2 test; † P<0.001, X2 test,

‡ p<0.001, unpaired t-test; § P<0.01, unpaired t-test

Figure 2: Baseline characteristics, ICU length of stay and functional outcomes in alive patients that were or were not physically assessed at 30, 90 or 180 days after randomization

EP09
E-bike related mortality and severity of injuries in patients admitted to the ICU: A pilot study.

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Abstract teaser

Gezien de toegenomen populariteit van elektrische fietsen groeit ook de bezorgdheid over de ernst van de verwondingen, derhalve vergelijkt deze studie elektrische en klassieke fietsongevallen die intensive care opname vereisten. E-bike gebruikers hadden ernstigere verwondingen met een ISS ≥ 16 en een hoger risico op 28-dagen mortaliteit. Dit benadrukt de noodzaak voor evaluatie van strengere e-bike reguleringen en preventieve maatregelen.

Background

Electric bicycles (e-bikes) are more popular than ever, as a result more e-bike related trauma patients are admitted to the ICU and concerns about the severity of their injuries arise. The aim of the present study was to compare the characteristics and outcome of cycling-related trauma requiring intensive care unit (ICU) admission, focusing on differences between e-bike and classic cycling incidents.

Methods

This retrospective observational pilot study was conducted in our regional level III trauma center, evaluating data from bicycle-related trauma patients admitted to the ICU from January 2022 to December 2023. The primary outcomes were mortality in 28 days and injury severity score (ISS) ≥ 16.
Differences in demographics, injury patterns and severity scores were compared with Mann-Whitney U test for continuous variables and chi-square test for categorical variables. Differences in clinical outcome measures were assessed by log-rank test in Kaplan-Meier analyses and significant differences were tested in a multivariable Cox regression model adjusted for confounding variables.

Results

A total of 143/562 bicycle-related trauma patients were admitted to the ICU, including 67 (47%) e-bike and 76 (53%) classic bike-related incidents. Demographics and clinical characteristics of these patients are shown in table 1. E-bike users were significantly older, more often female, wore fewer helmets, had more frequent an Injury Severity Score (ISS) of 16 or more and had higher Acute Physiological and Chronic Health Evaluation (APACHE) IV scores. Indicating a trend towards more severe injuries in the e-bike cohort. E-bike users exhibited a lower incidence in thoracic injuries. Contrary to our expectations, there was no difference in frequency of Traumatic Brain Injury (TBI) and length of stay in the ICU or hospital between both groups. E-bike users had increased risk of 28-day mortality in Kaplan-Meier analysis, log- rank p 0.003 (figure 1). This increased risk of e-bike users remained significant, when tested in a multivariable Cox regression model adjusted for age, sex, ISS ≥ 16 and APACHE IV (HR 2.66, IQR 1.02-6.96, p 0.047).

Conclusions

In conclusion, e-bike trauma patients had more severe injuries and higher 28-day mortality compared to classic bicycle incidents as they had more frequent an ISS ≥ 16. These findings suggest a need to review our e-bike regulation and preventive measures.

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Figure 1. Kaplan Meier survival curve of 28-day mortality of e-bike versus classical bicycle trauma patients.
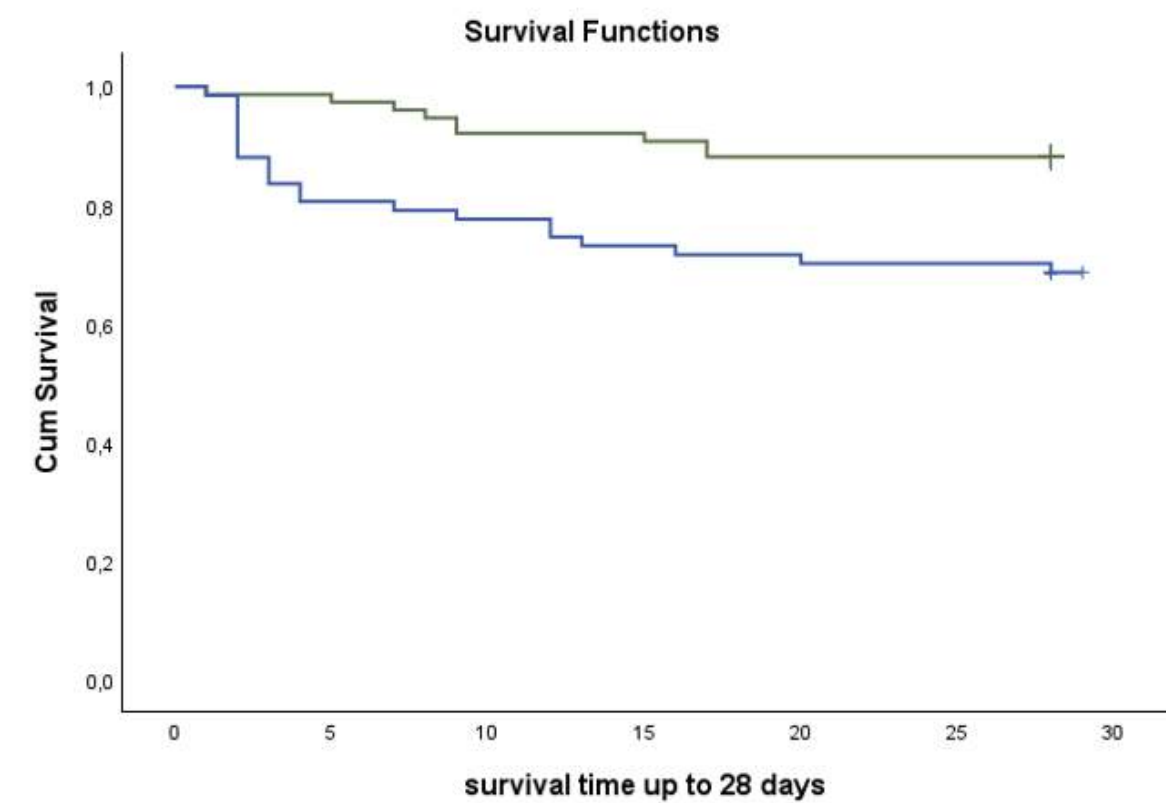
Legends: Green line - classic bicycle, blue line = e-bike, log-rank *p* 0.003.

Number at risk

Classic bicycle	76	61	67
E-bike	67	52	46

Figure 1: Figure 1: Kaplan Meier survival curve of 28-day mortality of e-bike versus classical bicycle trauma patients.

Table 1: *Characteristics of bicycle trauma patients admitted to the ICU.*

Characteristics	e-bike	classic bike	*p*-value
	n = 67	**n = 76**	
Age, years; median (IQR)	63 (54-75)	49 (28-70)	<0.001
Gender, female; n (%)	29 (43%)	21 (28%)	0.050
Helmet; n (%)	4 (6%)	21 (28%)	<0.001
Alcohol intoxication; n(%)	9 (13%)	16 (21%)	0.231
Anticoagulation; n (%)	7 (10%)	2 (3%)	0.055
High energy speed trauma; n(%)	24 (36%)	38 (50%)	0.088
ISS; median (IQR)	25 (17-29)	20 (14-29)	0.069
ISS ≥ 16; n (%)	57 (85%)	55 (72%)	0.025
APACHE IV score; median (IQR)	51 (36-75)	37 (27-56)	0.004
TBI; n (%)	52 (78%)	50 (66%)	0.119
subtype TBI; n (%)			0.563
- epidural hematoma	5 (10%)	8 (16%)	
- subdural hematoma	21 (40%)	21 (42%)	
- traumatic SAH	11 (21%)	8 (16%)	
- intracranial hemorrhage	4 (8%)	1 (2%)	
- brain contusions	11 (21%)	12 (24%)	
ICP device; n (%)	12 (23%)	8 (16%)	0.317
Surgical intervention; n (%)	10 (19%)	11 (22%)	0.806
CPC; median (IQR)	3 (2-5)	2 (1-3)	0.014
CPC good performance; n (%)	22 (42%)	33 (66%)	0.016
Facial injury; n (%)	28 (42%)	35 (46%)	0.608
Spinal cord injury; n (%)	8 (12%)	4 (5%)	0.151
Thoracic injury; n (%)	20 (30%)	35 (46%)	0.047
Abdominal injury; n (%)	4 (6%)	6 (8%)	0.652
Pelvic trauma; n (%)	8 (12%)	8 (11%)	0.789
Extremity injury; n (%)	13 (19%)	14 (18%)	0.881
Multitrauma; n (%)	28 (42%)	40 (53%)	0.195
ICU LOS (days); median (IQR)[b]	3 (2-5)	2 (1-6)	0.672
Hospital LOS (days); median (IQR)[b]	8 (4-15)	8 (5-12)	0.568
28-day mortality; n (%)[b]	21 (31%)	9 (12%)	0.003

[a]All continuous data are presented as median (interquartile range) and categorical data as number (percentage). Differences in continuous variables were compared by Mann-Whitney *U* test and differences in categorical variables by chi-square test.
[b]Differences in outcome measures were assessed by log-rank test.

Legends: ISS: injury severity score, APACHE IV: acute physiology and chronic health evaluation IV, TBI: traumatic brain injury, ICP: intracranial pressure, SAH: subarachnoid hemorrhage, CPC: cerebral performance scale, ICU LOS: intensive care length of stay.

Figure 2: Table 1: Characteristics of bicycle trauma patients admitted to the ICU.

EP10

Effects of closed-loop ventilation versus conventional ventilation on alarms and interventions at the ventilator

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Abstract teaser

Ventilatiemodi zoals INTELLiVENT-ASV passen ventilatorinstellingen automatisch aan, maar het effect op werkdruk, alarmbeheer en acceptatie door zorgverleners is onbekend. In deze studie onderzochten we alarmen, ventilatie-interventies en acceptatie bij postoperatieve hartchirurgie patiënten. INTELLiVENT-ASV verminderde ventilatie-interventies en verhoogde bruikbaarheid en acceptatie, ondanks meer alarmbeheerinterventies, wat de potentie toont om verpleegkundige werkdruk te verbeteren.

Background

Mechanical ventilation is an essential intervention in the intensive care unit (ICU). Closed-loop ventilation modes, like INTELLiVENT®-Adaptive Support Ventilation (ASV), offer important advantages by automatically adapting ventilator settings based on real-time monitoring. Previous studies demonstrated its safety and improved lung protectiveness in various patient groups, however knowledge gaps remain regarding clinicians' workload and acceptance (1).
This study aimed to compare workload related to alarms and interventions at the ventilator with INTELLiVENT-ASV versus conventional ventilation in patients receiving postoperative ventilation after cardiac surgery. We also determined the acceptance of the closed-loop mode by ICU caregivers.

Methods

We conducted preplanned analysis of POSITiVE (2), a randomized clinical trial comparing INTELLiVENT-ASV with conventional ventilation in patients after cardiac surgery. The primary outcome was a combination of the number of alarms and manual interventions at the ventilator. Manual interventions included those related to changing ventilation and alarm settings. The primary outcome was calculated over the first three hours of ventilation or until extubation. Caregivers' acceptance was determined using a questionnaire based on the Technology Acceptance Model 2 and a user acceptance score ranging from 1 to 10.

Results

POSITiVE included 210 patients (104 automated and 106 conventional). The automated mode generated a comparable number of alarms at similar frequencies as the conventional group (2.00 [1.33-3.57] vs 2.24 [1.33-4.01] alarms per hour; P=0.65), less ventilation control interventions per hour (0.33 [0.33-1.00] vs 1.00 [0.33-2.00]; P<0.001), but significantly more alarm management interventions per hour (12.50 [9.13–24.00] vs 2.11 [1.33–3.65]; P<0.001), compared to the conventional group. Respectively, 99 (≥1 for 95% of patients) and 103 (≥1 for 97% of patients) surveys were completed for the automated and conventional group. Perceived ease of use did not differ between the two modes. The automated mode had higher perceived usefulness (2.61 [2.25-2.84] vs 2.11 [1.82-2.35]; P<0.001) and higher user acceptance (7.98 [7.75-8.20] vs 7.01 [6.67-7.35]; P<0.001) compared to the conventional group.

Conclusions

Automated ventilation for post-cardiac surgical patients reduces interventions related to ventilation management and shows higher clinicians' acceptance, indicating its potential to optimize patient care and reduce bedside nurses' workload. However, while alarm frequencies were similar, interventions related to alarm management increased.

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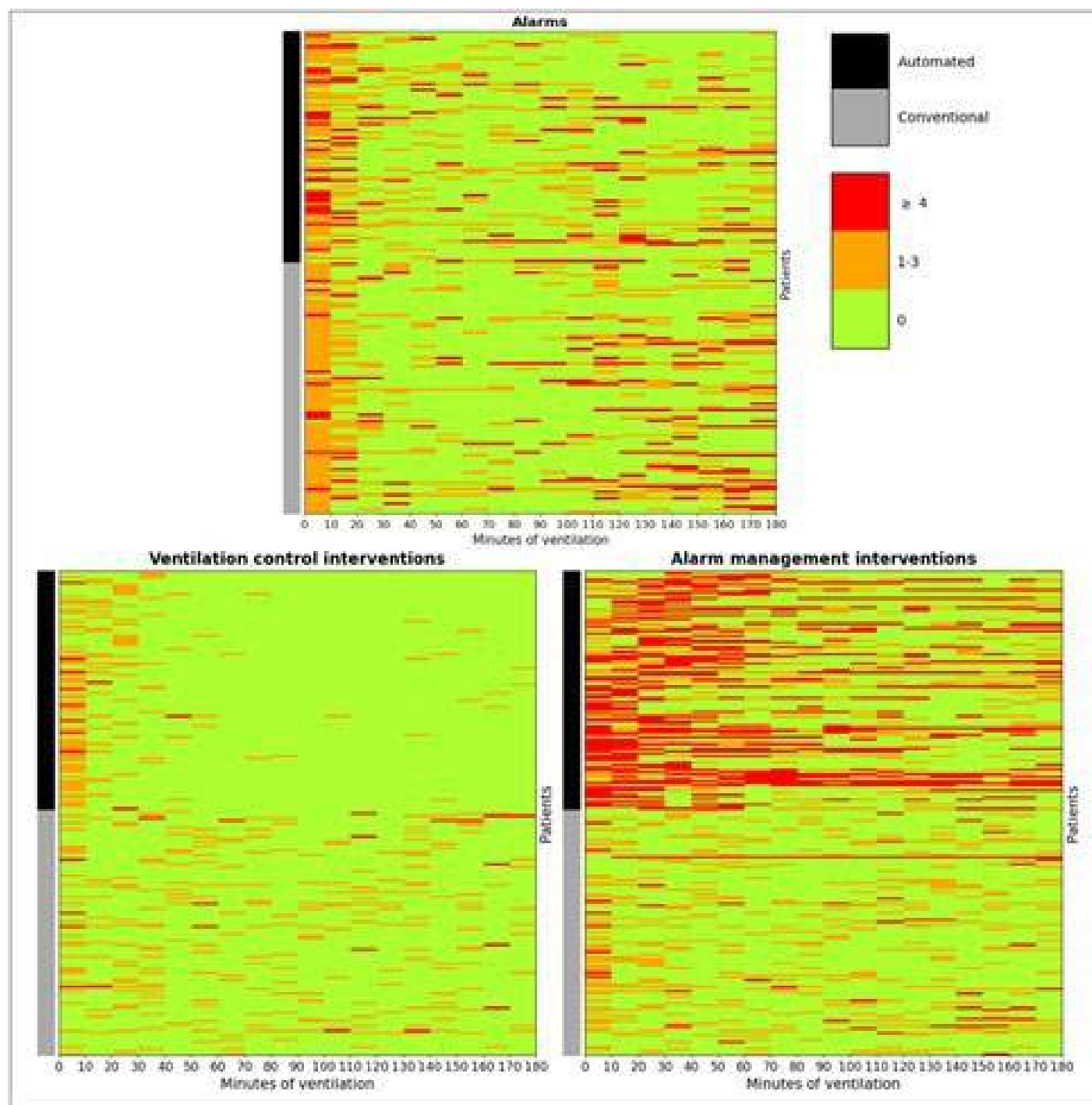
Figure 1: Heatmap of the number of alarms, ventilation control interventions and alarm management intervention.

EP11

Absence of return of spontaneous circulation prior to emergency department admission predicts mortality in ≥80 years OHCA patients: a multicenter retrospective analysis.

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Abstract teaser

De overleving bij 80-plussers na een OHCA is slecht. Deze retrospectieve multicenterstudie van 177 patiënten toonde dat overleving (32%, 42 van 133) uitsluitend voorkwam bij patiënt met ROSC bij aankomst op de SEH vs geen ROSC (0 van 44). De resultaten benadrukken het potentiële belang van "ROSC op SEH" als verwijscriterium en als multidisciplinaire besliscriterium voor deze kwetsbare groep.

Background

Survival following out-of-hospital cardiac arrest (OHCA) in patients aged ≥80 years remains exceedingly poor, with a rising incidence anticipated due to Europe's aging population. This study investigates survival and neurological outcomes based on the presence of return of spontaneous circulation (ROSC) at emergency department (ED) arrival, aiming to guide decisions on the appropriateness of further medical intervention, such as an intensive care admission.

Methods

A retrospective cohort analysis was conducted on 177 patients aged ≥80 years presenting with OHCA to Catharina Hospital (2015–2024) and Anna Hospital (2018–2024). Data on demographics, resuscitation parameters, survival rates, and neurological outcomes, measured using the Cerebral Performance Category (CPC) scale, were analyzed using Chi-square and Mann-Whitney U tests.

Results

Survival was exclusively observed in patients achieving ROSC at ED arrival. None of the 44 patients without ROSC at ED admission survived. Median resuscitation time was longer in non-ROSC patients (48 minutes; IQR: 25) compared to ROSC patients (15 minutes; IQR: 17). Shockable rhythms were more prevalent among ROSC patients (50.4% vs. 31.8%). In the ROSC cohort, survival rates were 32% at discharge, 26% at six months with 80% (27 of 34) achieving a CPC score of ≤2, and 25% at 12 months. Of those discharged, 47.6% returned home without additional care.

Conclusions

This multicenter Dutch study emphasizes the absence of ROSC at ED arrival as a predictor of zero survival in OHCA patients aged 80 or older. These poor outcomes align with existing literature and suggest that continued treatment in non-ROSC cases may not be justified. Revising hospital referral criteria and ED care protocols for this population could optimize medical resource utilization and minimize futile interventions, while ensuring a focus on patient-centered care.

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EP12

Clinical proof-of-concept for arterial waveform analysis to reveal underlying causes for hemodynamic instability in critically ill patients

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Abstract teaser

Automated peripheral arterial waveform analysis shows promise in differentiating the causes of hemodynamic instability. This clinical proof-of-concept study identifies distinct waveform changes following preload and afterload modulation in critically ill patients, while contractility changes require further exploration. These findings pave the way for individualized hemodynamic management using arterial waveform trends as a continuous decision support tool.

Background

Hemodynamic instability is frequently observed in patients admitted to the intensive care unit following cardiac surgery. However, differentiating in the underlying cardiovascular pathophysiology to provide effective targeted treatment remains a significant challenge. A recent in-silico simulation study suggested that automated peripheral arterial waveform analysis could aid in distinguishing various causes of hemodynamic instability, serving as a continuous decision support tool [1]. This retrospective, observational single centre study aims to validate these in-silico findings using a clinical dataset of peripheral arterial waveforms from hemodynamically unstable (post-)cardiac surgery patients. We hypothesize that we can validate these findings on clinical data by determining the distinctive morphological changes in the arterial waveform features after preload, afterload, and contractility modulation.

Methods

Representing changes in preload, afterload, and contractility, a total of 92 fluid boluses from 55 patients, 97 norepinephrine increases from 73 patients, and 28 dobutamine increases from 15 patients were included, respectively. Arterial waveform morphology was characterized using 28 different features and statistically compared before and after the interventions.

Results

Changes in preload were distinctively and significantly indicated by diastolic blood pressure, (relative) dicrotic notch pressure, and the diastolic runoff slope. Changes in afterload were characterized by nine features, including pulse pressure, downstroke pressure, relative total beat area, relative systolic area, (maximum) systolic upstroke, and systolic downstroke time. No significant waveform alterations were observed in response to changes in contractility, likely due to the small sample size of dobutamine interventions (n=28).

Conclusions

This clinical proof-of-concept study demonstrates that distinct morphological changes are present in arterial waveforms of hemodynamically instable critical care patients after cardiac surgery when altering preload via fluid administration and afterload via norepinephrine. These insights could foster more individualized hemodynamic management based on physiological conditions, guided by trends in arterial waveform morphology.

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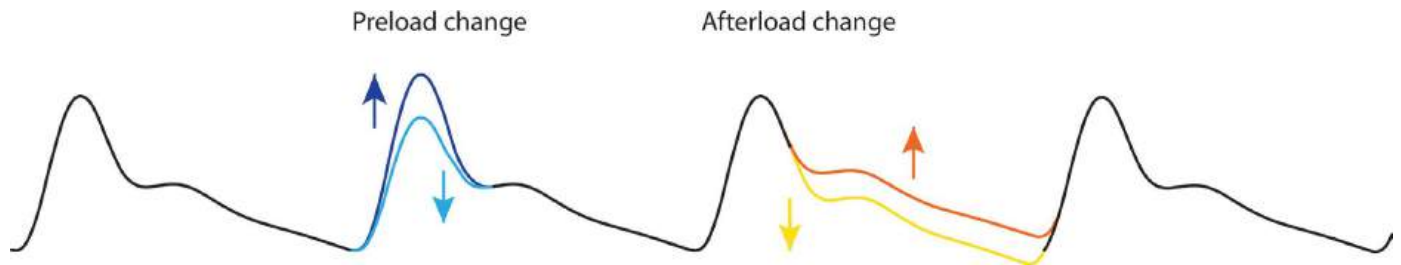

Figure 1: Schematic representation of the preload and afterload changes in the arterial blood pressure waveform morphology

EP13

Effect of Noninvasive Respiratory Strategies on Intubation in Hospitalized Patients with Respiratory Failure: A Target Trial Emulation

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Abstract teaser

Kunnen non-invasieve beademingsstrategieën het risico op intubatie verminderen? Met Target Trial Emulation vergeleken we High-flow Nasal Oxygen (HFNO), Non-Invasive Ventilation (NIV) en conventionele zuustof (COT) op het risico op intubatie. NIV en HFNO verlagen het risico op intubatie ten opzichte van COT. Er lijkt een voorkeur voor HFNO boven NIV bij immuun gecompromitteerde en COVID-19 patiënten.

Background

Invasive mechanical ventilation (IMV) is often required for patients with hypoxemic respiratory failure. Although lifesaving, IMV can have severe and costly consequences for patients, loved-ones, and society (1). This study evaluates the effectiveness of high-flow nasal oxygen (HFNO) and non-invasive ventilation (NIV) in reducing invasive mechanical ventilation and explores their effects across subgroups.

Methods

We conducted a target trial emulation with a clone-censor-weight design using retrospective data from the National COVID Cohort Collaborative (N3C) (2), which contains hospitalized patients from 84 centres across the United States. Adult patients with a PaO2/FiO2 ratio ≤200 mmHg were included. Exclusion criteria were hypercapnia, a history of COPD or chronic heart failure, a do-not-resuscitate order, or an urgent need for intubation. We conducted a per-protocol analysis comparing three treatment strategies: HFNO, NIV, and conventional oxygen therapy (COT), incorporating a 6-hour grace period. Outcomes were the 28-day risk and restricted mean time lost (RMTL) of intubation and mortality. Competing risks were accounted for.

Results

Of 24,326 eligible patients, 1,622 followed the HFNO strategy, 2,827 the NIV strategy, and 18,396 the COT strategy. By day 28, the HFNO group had a 18% lower risk (95% CI: 15, 21; P<0.001) and the NIV group had a 16% lower risk of intubation (95% CI: 13, 19; P<0.001) compared to the COT group. Patients in the HFNO and NIV groups remained intubation-free for an average of 4 additional days compared to the COT group, without an increase in mortality. HFNO showed benefits over NIV in immunocompromised patients and patients with COVID-19. No differences in intubation risk between HFNO and NIV were observed across subgroups based on BMI, respiratory rates, or P/F ratios.

Conclusions

Compared to COT, NIV and HFNO strategies are associated with a reduced intubation risk and longer intubation-free periods in patients with hypoxemic respiratory failure, without affecting mortality. The effectiveness of HFNO versus NIV varies by patient characteristics, for which we identified relevant subgroups for further testing in randomized controlled trials.

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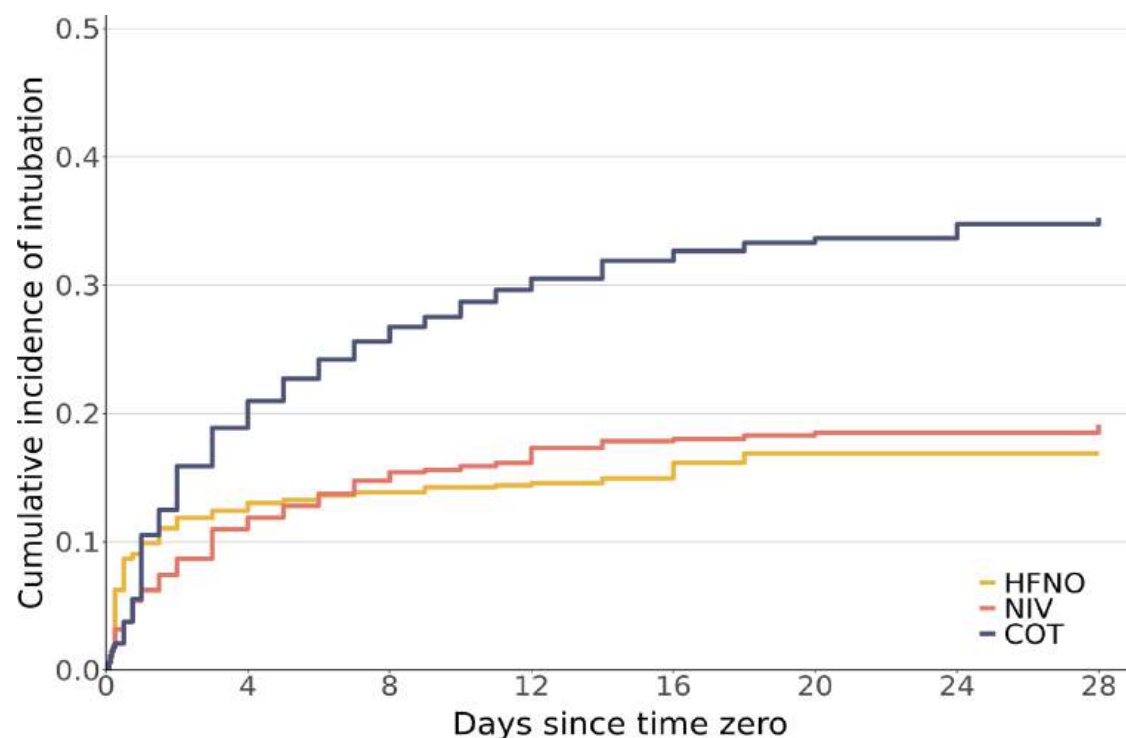
Figure 1: Cumulative incidence of intubation comparing a HFNO, NIV, and COT strategy for patients with hypoxemic respiratory failure

Analysis	Arm comparison	RMTL difference over 28 days	
		days (95% CI)	p-value
Main analysis	COT vs. HFNO	3.8 (3.1 – 4.4)	<0.001
	COT vs. NIV	3.5 (2.9 – 4.1)	<0.001
	NIV vs. HFNO	0.3 (-0.5 – 1.0)	0.47
12-hour grace period	COT vs. HFNO	3.6 (3.0 – 4.1)	<0.001
	COT vs. NIV	2.9 (2.4 – 3.4)	<0.001
	NIV vs. HFNO	0.7 (0.0 – 1.2)	0.04
COVID-19 diagnosis	COT vs. HFNO	4.4 (2.8 – 5.9)	<0.001
	COT vs. NIV	2.7 (0.8 – 4.5)	0.005
	NIV vs. HFNO	1.8 (0.2 – 3.2)	0.02
Immunocompromised	COT vs. HFNO	4.6 (3.1 – 6.2)	<0.001
	COT vs. NIV	1.7 (-0.4 – 3.9)	0.11
	NIV vs. HFNO	2.8 (0.2 – 3.9)	0.008
Not immunocompromised	COT vs. HFNO	3.6 (2.8 – 4.3)	<0.001
	COT vs. NIV	3.7 (3.1 – 4.2)	<0.001
	NIV vs. HFNO	0.0 (-0.9 – 0.7)	0.91

Figure 2: RMTL difference for outcome intubation between each pair of non-invasive respiratory strategies, analysed for different sensitivity and subgroup analyses. A lower RMTL indicates more intubation-free days during the 28 days of follow-up.

EP14
Early vs. Delayed Switching from Controlled to Assisted Ventilation: A Target Trial Emulation

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Abstract teaser

Wat is het effect van vroeg versus verlaat switchen van gecontroleerde naar geassisteerde beademing op successvolle extubatie? Met Target Trial Emulation vergeleken we vroege (binnen 1 dag na P/F>150) en verlate (1 of meer dagen na P/F>150) switch. Vroeg switchen is geassocieerd met minder intubatiedagen en ICU-opnamedagen vergeleken met vertraagd switchen, wat voordelig is voor patiënten, beddencapaciteit en ziekenhuiskosten.

Background

In critically ill patients receiving invasive mechanical ventilation, switching from controlled to assisted ventilation is a crucial milestone towards ventilator liberation. The optimal timing for switching to assisted ventilation has not been studied. Our objective was to determine whether a strategy of early as compared to delayed switching affects the duration of invasive mechanical ventilation, ICU length of stay, and mortality.

Methods

We conducted a target trial emulation using the prospective, global WEAN SAFE dataset (1). Patients were eligible for switching if still on controlled mechanical ventilation, not receiving neuromuscular blockers, and PaO2/FiO2 ratio >150 mmHg. We compared an "early switching" strategy (switch within one day after reaching switching eligibility criteria) to a "delayed switching" strategy (switch one or more days after reaching the switching eligibility criteria). Primary outcome was the 28-day cumulative incidence of successful extubation. Secondary outcomes included 28-day and 90-day ICU discharge and ICU mortality.

Results

1489 patients met the switching eligibility criteria. The early switch group had, on average, 4 additional days of being successfully extubated over the 28-day period (95% CI: 3, 6; P<0.001) compared to the delayed group, with a higher difference in cumulative incidence of successful extubation at day 28 (7%; 95% CI: 0, 13; P=0.04).
Early switching was associated with an 11% higher cumulative incidence of ICU discharge at day 28 (95% CI: 7, 18; P<0.001) and an average of 7 additional days discharged from the ICU over the 90-day period (95% CI: 4, 12; P<0.001) compared to delayed switching. ICU mortality rates did not differ between the strategies.

Conclusions

Early switching from controlled to assisted ventilation is associated with shorter duration of invasive mechanical ventilation and ICU stay compared to delayed switching.

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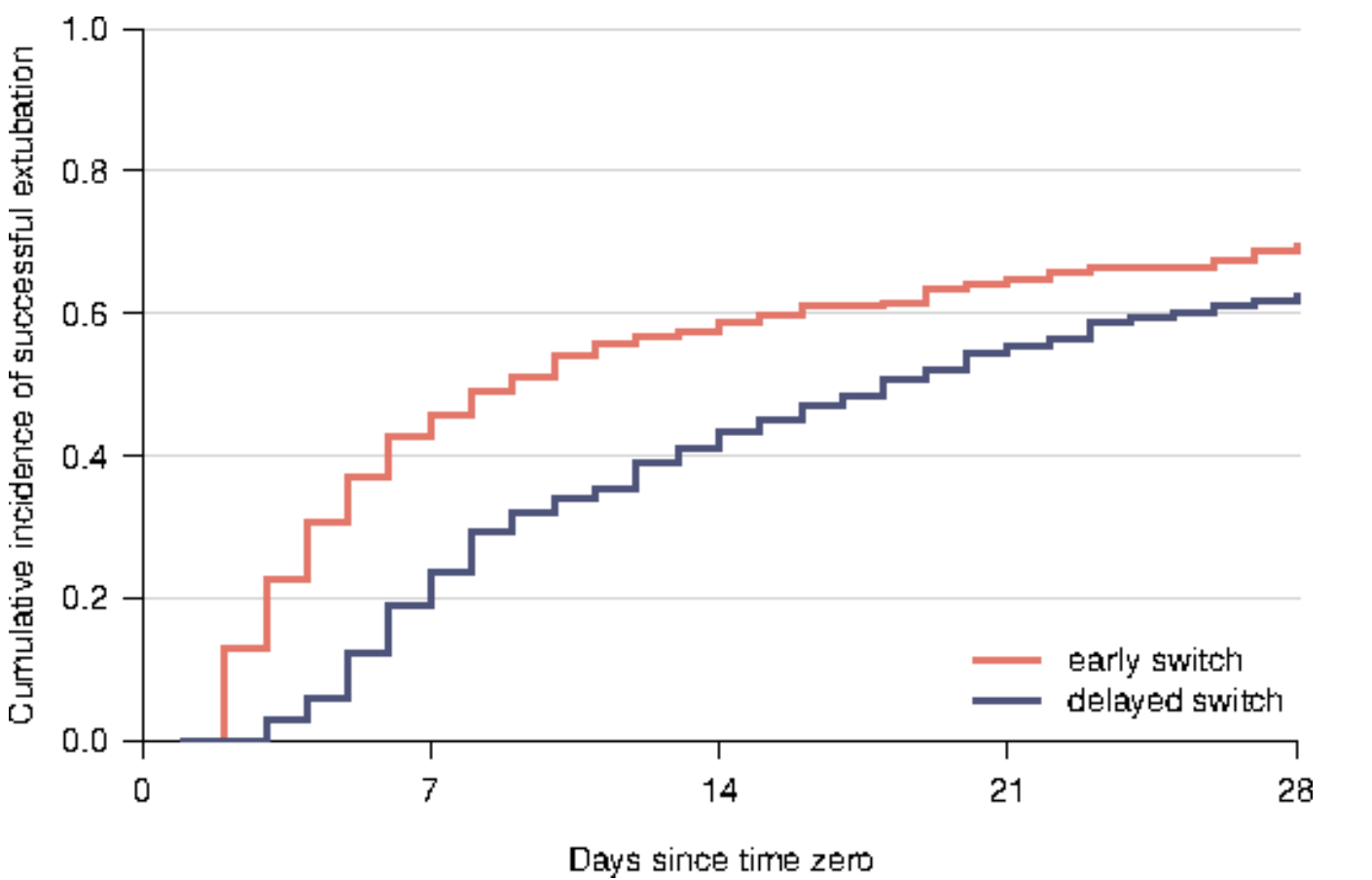
Figure 1: Cumulative incidence of successful extubation for early versus delayed switching from controlled to assisted ventilation

	Cumulative incidence, % (95% CI)		Risk difference, % (95% CI); p-value	RMTL, days (95% CI)		RMTL difference, days (95% CI); p-value
	Early switch	Delayed switch		Early switch	Delayed switch	
Successful extubation						
day 28	70 (64 – 74)	63 (58 – 67)	7 (0 – 13); 0.04	15 (14 – 16)	11 (10 – 11)	4 (3 – 6); <0.001
ICU discharge						
day 28	74 (69 – 77)	63 (57 – 67)	11 (7 – 18); <0.001	14 (12 – 14)	9 (8 – 10)	4 (3 – 6); <0.001
day 90	82 (77 – 86)	79 (75 – 83)	2 (-2 – 9); 0.45	63 (59 – 66)	56 (52 – 57)	7 (4 – 12); <0.001
ICU mortality						
day 28	14 (10 – 19)	16 (14 – 20)	-2 (-7 – 2); 0.45	3 (2 – 4)	3 (2 – 3)	0 (-1 – 1); 0.67
day 90	17 (13 – 21)	19 (16 – 23)	-2 (-8 – 3); 0.41	13 (9 – 16)	14 (12 – 17)	-1 (-5 – 3); 0.64

Figure 2: Cumulative incidence and RMTL for early versus delayed switching from controlled to assisted ventilation

EP15

Does PCT improve diagnosis of early infection in clinically suspected cardiac surgery patients? A two-center, prospective diagnostic study.

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Abstract teaser

Diagnosing early infection after cardiac surgery is challenging due to the extensive inflammatory response (1-5). We studied procalcitonin to diagnose infection in patients suspected of infection within the first three postoperative days.

Background

We studied the diagnostic performance of procalcitonin (PCT) in patients clinically suspected of infection after cardiac surgery. We hypothesized that PCT rules out infection. Secondarily, we analyzed diagnostic performance of C-reactive protein (CRP), interleukin-6 (IL-6), and leukocytes.

Methods

A prospective, cross-sectional study in elective cardiac surgery patients. Patients were clinically suspected of infection if their body temperature was <36.0 or >38.0 °C, blood cultures were drawn or antibiotic treatment was initiated, in the first three postoperative days (POD). Infection diagnosis was adjudicated by chart review, according to center for disease control criteria. Daily blood samples were collected up to POD 3. The sample collected on the day of clinical suspicion was used for analysis. Cut- off values and corresponding diagnostic performance measures were deemed clinically relevant if a negative likelihood ratio (-LR) ≤0.2 was achieved or a positive likelihood ratio (+LR) ≥5 to respectively rule-out or rule-in infection.

Results

In 15/310 (5%) suspected patients infection diagnosis was confirmed. PCT concentrations were similar in infected and non-infected patients (0.39 µg/L, IQR 0.19-0.72 vs. 0.30 µg/L, 0.17-0.63, p=0.58). The area under the curve (AUC) was 0.54 (95% CI 0.39-0.69). The minimal –LR and the maximal +LR were 0.39 and 1.57 at a cut-off of 0.15 and 0.83 µg/L respectively. IL-6 concentrations were higher in infected patients (196 pg/ml (IQR 126-259) vs. 106 pg/ml (69-188), p=0.03). The AUC was 0.67 (95% CI 0.53-0.80). The minimal –LR and the optimal +LR were 0.23 and 6.56 at a cut-off of 73 and 815 pg/ml respectively. The corresponding negative- and positive predictive value were 99% and 25%. CRP and leukocytes did not differentiate infected from non-infected patients.

Conclusions

PCT has no added value diagnosing early infection in clinically suspected cardiac surgery patients. IL-6 could be useful, mainly to rule-out infection.

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Remark

Figure 1 - legend: Violin plots of biomarker concentrations in patients with or without early infection after cardiac surgery. The violin plots reflect the density of concentrations for each biomarker. The black lines within the violin plots show the median. The p- value for the Wilcoxon Rank Sum test is displayed. PCT = procalcitonin, IL-6 = interleukin-6, CRP = C-reactive protein.
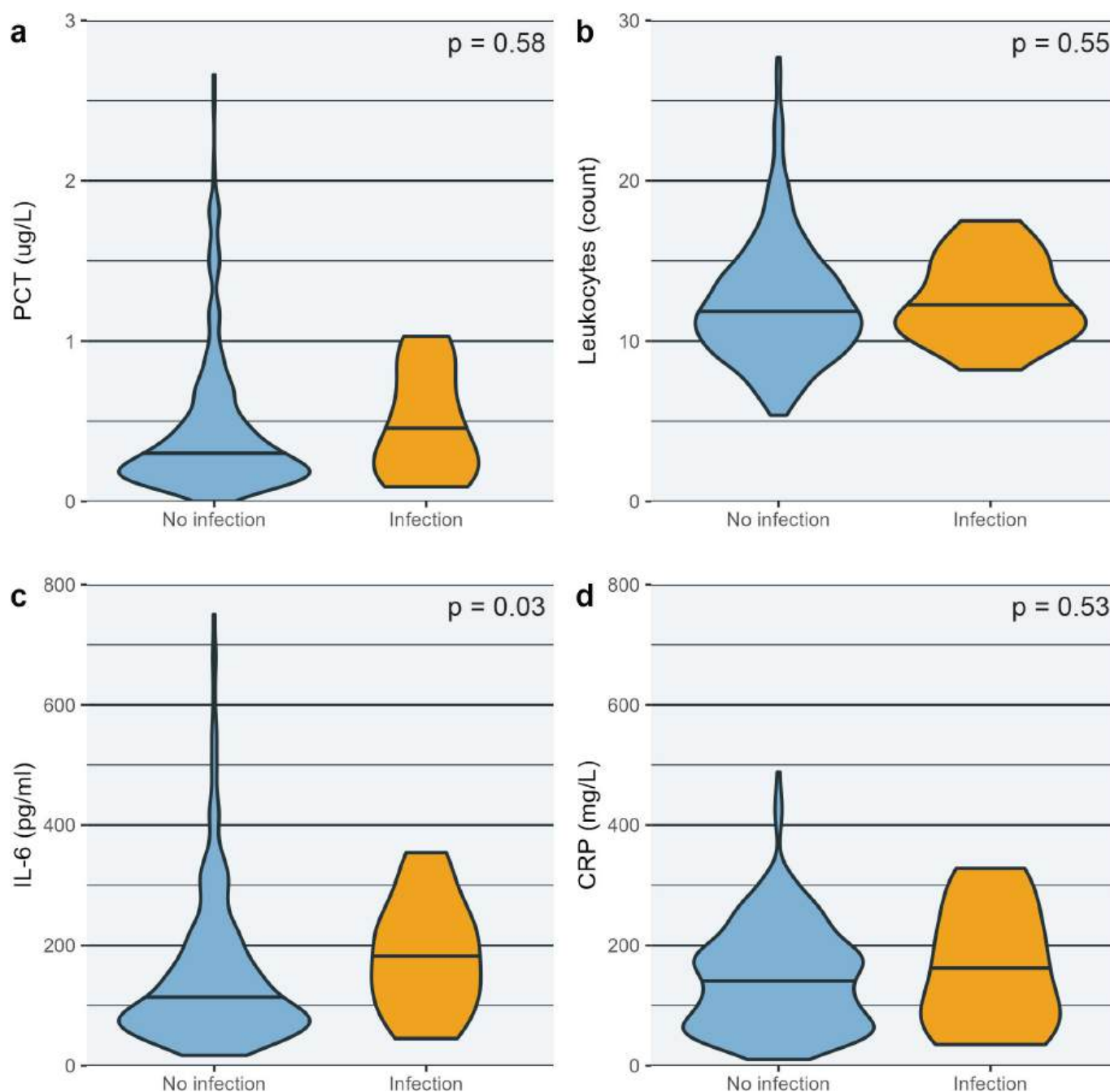

Figure 1: Figure 1 – PCT, leukocytes, IL-6 and CRP in cardiac surgery patients suspected for early infection

EP16

Development and internal validation of a prediction model for failure of High-Flow Nasal Oxygen at initiation in patients with COVID-19

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Abstract teaser

Achtergrond/vraagstelling: Het voorspellen van High-flow Nasal Oxygen (HFNO) falen kan klinische beslissingen verbeteren bij hypoxemisch respiratoir falen door virale infecties (COVID-19).
Hoe/wat onderzocht: Ontwikkeling van een voorspellingsmodel op basis van variabelen gemeten vlak vóór start van HFNO.
Uitkomst en relevantie: Ontwikkeling van een consistent model, ook na interne validatie. Vertaling naar de klinische praktijk vereist aanvullend onderzoek.

Background

High-Flow Nasal Oxygen (HFNO) is commonly used to treat acute hypoxemic respiratory failure (AHRF) caused by viral pneumonias, such as those resulting from COVID-19, and can reduce the need for invasive mechanical ventilation (1,2). Predicting HFNO failure can aid clinical decision-making and facilitating efficient and appropriate use of resource-intensive treatment options. This study aimed to develop a prediction model for patients with AHRF due to COVID-19, using clinically relevant predictors and focusing on data available just prior to HFNO initiation.

Methods

This multicenter, prospective, observational study from 10 centers was conducted in the Netherlands between December 2020 and July 2021. Consecutive adult patients who tested positive for SARS-CoV-2 and initiated HFNO for hypoxemia were included. HFNO treatment could be initiated in the ward or ICU. Patients with treatment limitations were excluded. The primary outcome was HFNO failure, defined as the event of endotracheal intubation. Missing data were imputed 50 times using multiple imputation and model results were pooled after estimation. A multivariable logistic regression analysis was performed for model estimation, using pre-selected variables based on input from clinical experts and literature. Apparent discrimination and calibration were assessed. Internal validation was performed using bootstrapping to assess model stability and correct for optimism. A p-value of <0.05 was considered statistically significant.

Results

From the 608 patients included in the analysis, 277 patients (46%) reached the primary endpoint of endotracheal intubation. The final model included the following predictors: age, urea, platelet count, and respiratory rate, SpO2, and FiO2 prior to HFNO initiation (Table 1). The model demonstrated an acceptable C-statistic of 0.767 (95% CI [0.727-0.803]). Calibration metrics were excellent, with an estimated intercept of -0.005 and a slope of 1.001 (Figure 1). The model's performance remained stable after internal validation.

Conclusions

This novel developed model for predicting HFNO failure in hospitalized hypoxemic patients with COVID-19 performed well. Its performance remained consistent after internal validation. Translation into clinical practice and to non-COVID-19 induced AHRF will require additional research.

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Table 1. Potential predictors for HFNO failure

Variable	Candidate predictors model			Final model		
	Estimate	OR [95% CI]	P-value	Estimate	OR [95% CI]	P-value
Intercept	5.32			8.48		
Age (years)	0.02	1.02 (1.003-1.04)	0.02	0.02	1.02 (1.00-1.03)	0.05
Sex	0.13	1.14 (0.71-1.85)	0.59			
Number of comorbidities[a]						
0 vs. 1	-0.06	0.95 (0.61-1.48)	0.81			
0 vs. ≥2	-0.10	0.90 (0.52-1.57)	0.71			
Urea (mmol/L)	0.05	1.05 (1.001-1.09)	0.04	0.04	1.04 (1.00-1.08)	0.05
Haemoglobin (mmol/L)	0.03	1.03 (0.85-1.25)	0.76			
Platelet count (x10^9/L)	-0.01	0.95 (0.93-0.97)	<0.001	-0.01	0.94 (0.92-0.97)	<0.001
Leukocyte count (x10^9/L)	-0.01	0.91 (0.76-1.08)	0.28			
C-reactive protein (mg/mL)	0.00	1.00 (0.98-1.02)	0.95			
Lymphocyte count (x10^9/L)	-0.03	0.75 (0.26-2.23)	0.62			
Respiratory rate before HFNO initiation (per minute)	0.05	1.05 (1.02-1.08)	<0.001	0.05	1.05 (1.02-1.08)	<0.001
SpO$_2$ before HFNO initiation (in%)	-0.12	0.89 (0.84-0.94)	<0.001	-0.12	0.89 (0.84-0.94)	<0.001
FiO$_2$ before HFNO initiation[b]						
Category 2 vs. 1	1.18	3.25 (1.81-5.83)	<0.001	1.10	3.00 (1.71-5.29)	<0.001
Category 3 vs. 1	1.62	5.05 (3.23-7.89)	<0.001	1.60	4.95 (3.19-7.70)	<0.001
BMI (kg/m^2)[c]						
	0.09	1.09 (0.99-1.20)	0.08			
	-0.08	0.93 (0.82-1.05)	0.23			
Final equation for the probability of HFNO failure	1 / (1 + exp (−(8.48 + 0.02 x age + 0.04 x urea − 0.01 x platelet count + 0.05 x respiratory rate before HFNO initiation − 0.12 x SpO$_2$ before HFNO initiation + 1.10 x if FiO$_2$ category 2 + 1.60 x if FiO$_2$ category 3))).					

[a] Number of comorbidities according to the Charlson Comorbidities: 0, 1 or ≥2
[b] FiO$_2$: estimated fraction of inspired oxygen, divided into three categories: group 1) nasal oxygen 1-6 L/min or air-entrainment mask 10 L/min, group 2) air-entrainment mask 15 L/min or non-rebreathing mask 10 L/min and group 3) non-rebreathing mask 15 L/min
[c] Body Mass Index: using splines and 3 knots
Abbreviations: OR: Odds Ratio, CI: Confidence Interval, HFNO: High-Flow Nasal Oxygen, SpO$_2$: oxygen saturation, FiO2: Fraction of Inspired Oxygen

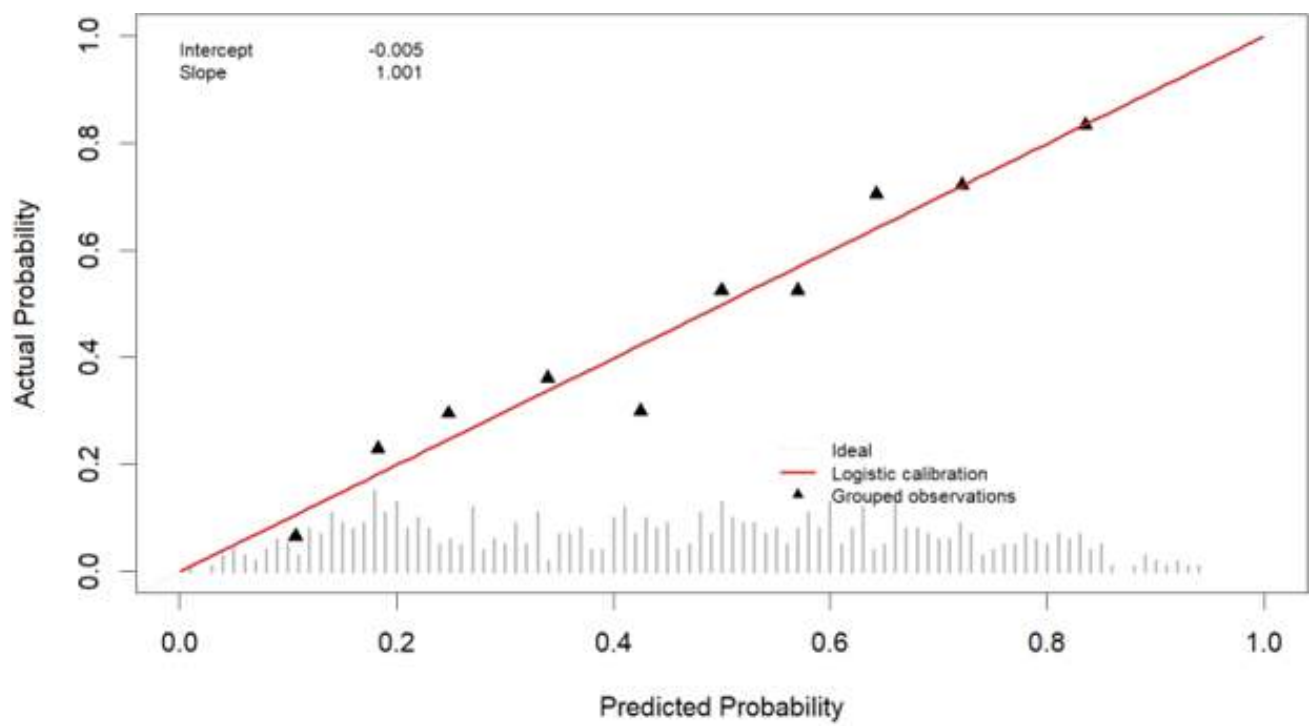*Figure 1: Table 1 - Potential predictors for HFNO failure.*

Figure 1. Apparent calibration plot of main model.

Figure 2: Figure 1 - Apparent calibration plot of main model.

EP17

A transcriptomic endotype based on the innate immune response is associated with hyperinflammation and poor outcome in the acute phase of sepsis

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Abstract teaser

Immunologische heterogeniteit belemmert effectieve behandeling van sepsis. Een geïndividualiseerde aanpak is daarom vereist. In een gecontroleerd ontstekingsmodel identificeerden we drie immunologische endotypes: Innate-hyper, Innate-inter en Innate- hypo. Toepassing van deze endotypes bij sepsispatiënten wijst uit dat het Innate-hyper endotype is geassocieerd met hyperinflammatie en de hoogste 30-dagen mortaliteit (42%, waarvan 23% overleed in de eerste vijf dagen na IC opname).

Background

Effective clinical management of sepsis is hampered by extensive immunological heterogeneity, necessitating an individualized treatment approach. To facilitate this we identified robust innate immunity endotypes among sepsis patients and explored their immunological correlates, prognostic value and potential drug candidates.

Methods

Endotypes were derived by integrating gene expression profiles and plasma cytokine response data obtained in 110 young healthy female (n=57) and male (n=53) volunteers who underwent experimental endotoxemia (i.v. administration of 1 ng/kg bacterial lipopolysaccharide [LPS]) twice with an interval of one week. Derived endotypes were subsequently applied to 522 sepsis patients enrolled in the MARS cohort [1].

Results

The first LPS challenge resulted in profoundly increased circulating cytokine concentrations and a distinct shift in monocyte gene expression profiles. The response upon the second LPS challenge was severely blunted (p < 0.0001 for all cytokines), exemplifying endotoxin tolerance. Three distinct transcriptomic innate immunity endotypes were derived: Innate-hyper, Innate-inter, and Innate-hypo, with the former exhibiting both the most profound response upon the first LPS challenge and the most pronounced tolerance (Figure 1A, B). In the sepsis cohort, 88 (17%), 265 (51%) and 169 (32%) patients were classified as having the Innate-hypo, Innate-inter and Innate-hyper endotype, respectively. The Innate-hyper endotype was characterized by the highest plasma concentrations of inflammatory, endothelial and coagulation markers (Figure 2A). Furthermore, patients with this endotype exhibited the highest mortality (HR 2.04 (1.36 – 3.10) and 2.80 (1.74 – 4.50) compared with the Innate-inter and Innate-hypo endotypes, respectively, p<0.001), especially in the first five days of ICU admission, and tended to develop ICU-acquired infections more frequently (Figure 2B, C). Prognostic separation using the innate immunity endotype classification was more pronounced than with the original Mars1-4 endotype classification (28-fold lower log-rank p-value). An in-silico signature-based drug prediction analysis revealed that hydrocortisone has the largest predicted capacity to reverse the Innate-hyper transcriptomic signature.

Conclusions

Transcriptomic innate immunity endotypes derived using a pseudo-supervised approach on data obtained in a standardized controlled model of inflammation are consistently associated with the inflammatory status and outcome of sepsis patients, and demonstrate better prognostic separation compared to other unsupervised transcriptomic endotypes. These endotypes hold promise for breaking the "one-size-fits-all" approach that has been unsuccessfully applied for decades in sepsis management.

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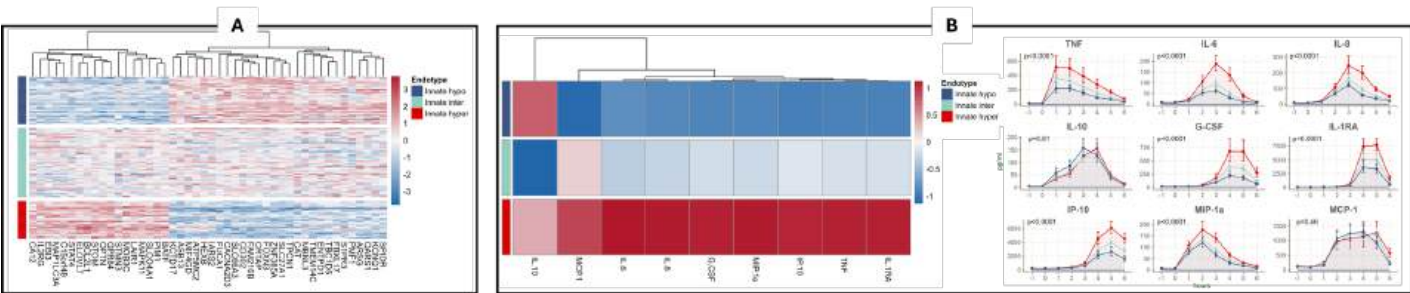
Figure 1: Gene expression and cytokine response of the three identified innate endotypes profiles following administration of LPS in healthy volunteers
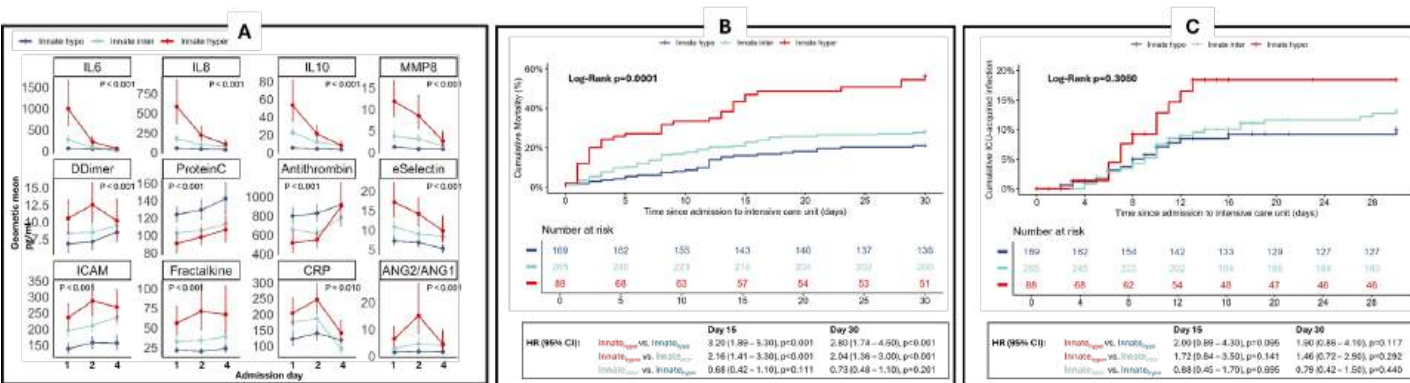

Figure 2: Host response biomarkers during the first four days of ICU admission, 30-day mortality, and 30-day ICU acquired infections of 522 sepsis patients stratified by innate immunity endotypes

EP18
Angiotensin II in septic shock, non-responders fail to RAAS?

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Abstract teaser

Behandeling met angiotensine II bij septische shock met hoog renine is geassocieerd met verbeterde overleving, effecten op het Renine-Angiotensine-Aldosteron-Systeem zijn onbekend.
In patiënten behandeld met Angiotensine II werden op 3 tijdstippen de RAAS cascade gemeten.
De hoogte van renine was niet geassocieerd met bloeddrukstijging na start Angiotensine II, er blijkt een afwezigheid van angiotensine receptor activatie te zijn in non-responders.

Background

Septic shock is caused by a dysregulated host-response to infection resulting in life-threatening organ dysfunction. Vasodilation is the primary component of circulatory failure and is treated with catecholamines or vasopressin. The ATHOS-3 trial showed that 69% of patients in vasodilatory shock responded with an increase in mean arterial pressure (MAP) to treatment with angiotensin II [1]. A post-hoc analysis showed an association with a high baseline renin and a reduction in mortality [2]. We assessed the Renin-Angiotensin-Aldosteron-System (RAAS) in patients treated with angiotensin II to elucidate the underlying physiological mechanism.

Methods

Patients with septic shock and a noradrenaline dose >0,2 µg/kg/min were included and treated with angiotensin II for at least 24 hours. Blood samples were drawn before start, after 3 and 24 hours. Renin, angiotensin I, angiotensin II, angiotensin 1-7 and angiotensin 1-5 were measured. Baseline angiotensin I / II and angiotensin II / 1-7 ratios were calculated and used as a proxy for ACE and ACE-2 activity, respectively. A target MAP of ≥65mmHg was maintained and patients were deemed a responder to angiotensin II if a reduction in noradrenalin dose of >25% was achieved.

Results

Ten patients were included, six patients responded to angiotensin II with a median reduction of noradrenaline dose of 72%. Baseline characteristics are displayed in table 1. Non-responders showed higher baseline SOFA score, noradrenalin dosage and had more often severe acute kidney injury. Measurements of the RAAS cascade are shown in figure 1. Baseline renin was higher in non-responders (445,5 versus 282 µU/ml) while patients responding to angiotensin II showed a decline of plasma renin concentration over time. Baseline angiotensin I/II ratio was similar between responders and non-responders (2,1 versus 2,3) suggesting similar ACE activity. Angiotensin II dose was higher in non-responders at 3 hours (37,4 versus 23,8 ng/kg/min) and 24 hours (40 versus 18 ng/kg/min), accordingly the angiotensin II plasma concentration was also higher at 3 hours (1021,4 versus 612 µU/ml) but not at 24 hours (291,2 versus 281 µU/ml). Angiotensin 1-7 was higher at 3 (46,5 versus 9,9 µU/ml) and 24 (4 versus 36,8 µU/ml) hours in non-responders.

Conclusions

In conclusion, in non-responders there seemed an inability to activate the angiotensin-2-receptor or its downstream pathway, illustrated by successfully achieving a high plasma concentration of angiotensin II with an absence of a negative feedback mechanism. High baseline renin was not associated with a response to angiotensin II.

References

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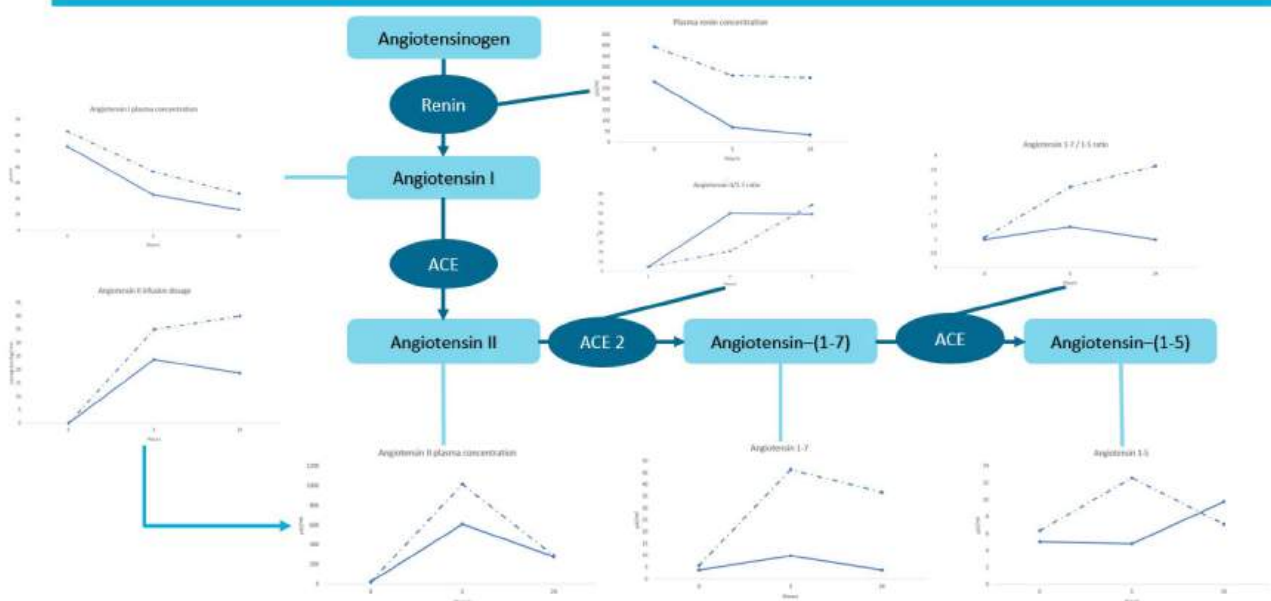
Figure 1: Figure 1

	Responders (N=6)	Non-responders (N=4)
Age	65 (50 - 74)	65 (55 − 70)
Sex M/F	5/1	3/1
BMI	28,6 (23,1 − 29,4)	27,0 (22,8 − 33,3)
SOFA	8,5 (6,5 − 9,8)	13 (10,8 − 15,3)
Fluids administered 24hrs before start ATII (ml/kg)	51,8 (38,2 − 61,7)	91,5 (66,5 − 96,8)
Baseline Norepinephrine dose (mcg/kg/min)	0,23 (0,20 − 0,26)	0,51 (0,41 − 0,64)
Vasopressin	2	3
Inotropics		
Milrinone	1	2
Dobutamine	1	0
ACE-i	1	0
ARDS	1	0
Albumin	20,5 (13 - 25,8)	17 (13,5 − 19,8)
Diuresis before start ATII (ml/hr)	0,68 (0,42 − 0,85)	0,03 (0,03 − 0,03)
Plasma creatinin	113 (96 − 250)	248 (205 − 315)
AKI		
No AKI	1	0
KDIGO 1	2	0
KDIGO 2	2	1
KDIGO 3	1	3
RRT	1	4
Diuresis 3h after start ATII (ml/kg/u)	0,47 (0,38 − 0,54)	0,01 (0 − 0,01)
Mortality during ICU stay	2	3
MV (hours)	123 (80 − 511)	133 (79 − 431)
Vasopressor (hours)	124 (88 − 219)	133 (79 − 309)

Figure 2: Table 1

Redefinition of myocardial infarction after cardiac surgery: clinical feasibility of the European Association for Cardio-thoracic surgery algorithm for the diagnosis of perioperative myocardial injury and infarction

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Abstract teaser

Hoe diagnosticeer je een myocardinfarct na hartchirurgie het beste? Dit onderzoek past het nieuwe algoritme van de European Association for Cardio-thoracic Surgery toe op een prospectief Nederlands cohort en vergelijkt de resultaten met de huidige definitie. Er werden minder patiënten met perioperatieve hartschade en myocardinfarcten gedetecteerd, met mogelijke gevolgen voor toekomstige studie-uitkomsten en kwaliteitsregistraties.

Background

Diagnosing myocardial infarction (MI) after cardiac surgery is a challenge, as the key diagnostics, cardiac biomarker release and electrocardiogram (ECG) changes, are inherently abnormal due to surgical trauma and myocardial ischemia. This study investigated the impact of the new European Association for Cardio-thoracic surgery (EACTS) algorithm for diagnosis of perioperative myocardial injury (PMI) and infarction (MI) after cardiac surgery.

Methods

This is a prospective multicenter cohort study in adult patients undergoing cardiac surgery. High sensitivity troponin T was systematically measured before induction of anesthesia, at the end of surgery and on the first, second and third postoperative morning. Postoperative ECGs to detect new myocardial ischemia were made at ICU arrival, every morning during ICU stay, at hospital discharge and on indication. Other diagnostics of new myocardial ischemia were performed on indication. The incidences of PMI and MI were compared between the EACTS algorithm and the fourth Universal Definition of Myocardial Infarction (4UD). One-year mortality relative risks were calculated for patients with perioperative biomarker elevation, PMI and MI versus those without myocardial injury.

Results

1.155 patients were included for analysis. Median age was 66 [IQR 60-71] and 79.9% was male. Median EuroSCORE II was 6.2% [IQR 4.0%–10.4%]. Surgery types were coronary artery bypass grafting (CABG) (53.0%), CABG with aortic valve replacement (10.2%), single valve procedures (24.4%) and other procedures (12.4%). The EACTS algorithm classified 2.5% (n=29) of patients as MI (versus 2.7%, n=31 in 4UD) and 29.7% (n=342) of patients as PMI (versus 84.4%, n=975 in 4UD). Further, 432 (37.4%) patients with PMI diagnosis in 4UD were reclassified to the newly defined 'perioperative biomarker elevation' group (Figure 1 and 2). The incidence of no myocardial injury was 12.9% (n=149) in 4UD and 30.3% (n=350) for EACTS.

One-year mortality incidence for EACTS were 0.8% for patients without myocardial injury, 1.9% for patients with perioperative biomarker elevation, 4.0% for patients with PMI and 12.0% for patients with MI. For 4UD incidences were 0.9% for patients without myocardial injury, 2.3% for PMI and 15.4% for MI. Crude relative risks for one-year mortality for EACTS was 2.6 (95% CI 0.6-10.9) for perioperative biomarker elevation, 5.3 (95% CI 1.3-20.9) for PMI and 16.0 (95% CI 3.3-76.2) for MI, and 2.6 (95% CI 0.5-15.3) for PMI and 17.2 (95% CI 2.7-111.5) for MI for 4UD.

Conclusions

Application of the new EACTS algorithm led to a slightly decreased MI incidence and significant reduction of PMI diagnoses.
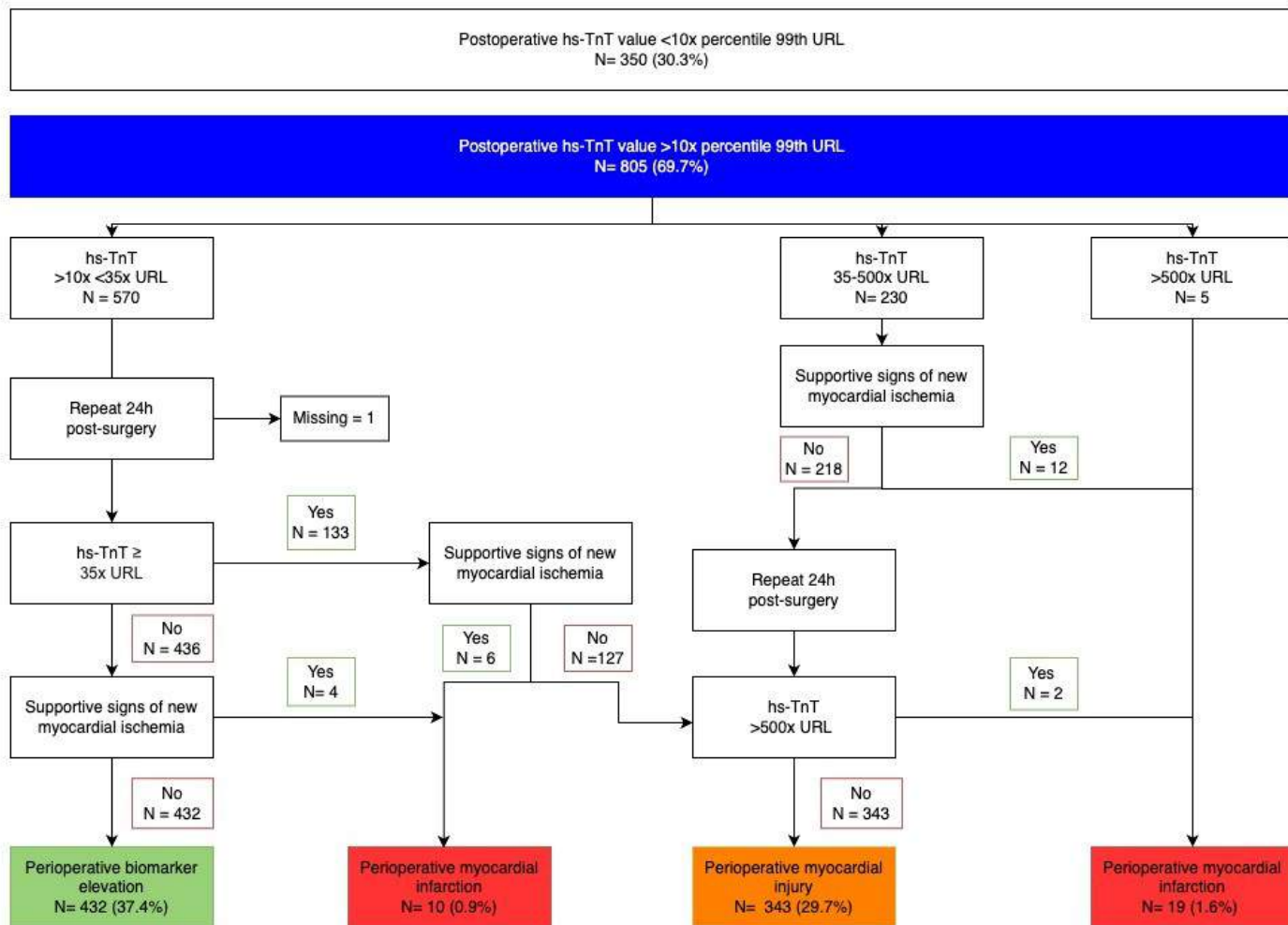
Figure 1: Figure 1: Diagnosis of myocardial injury and infarction in patients after cardiac surgery using the EACTS algorithm.
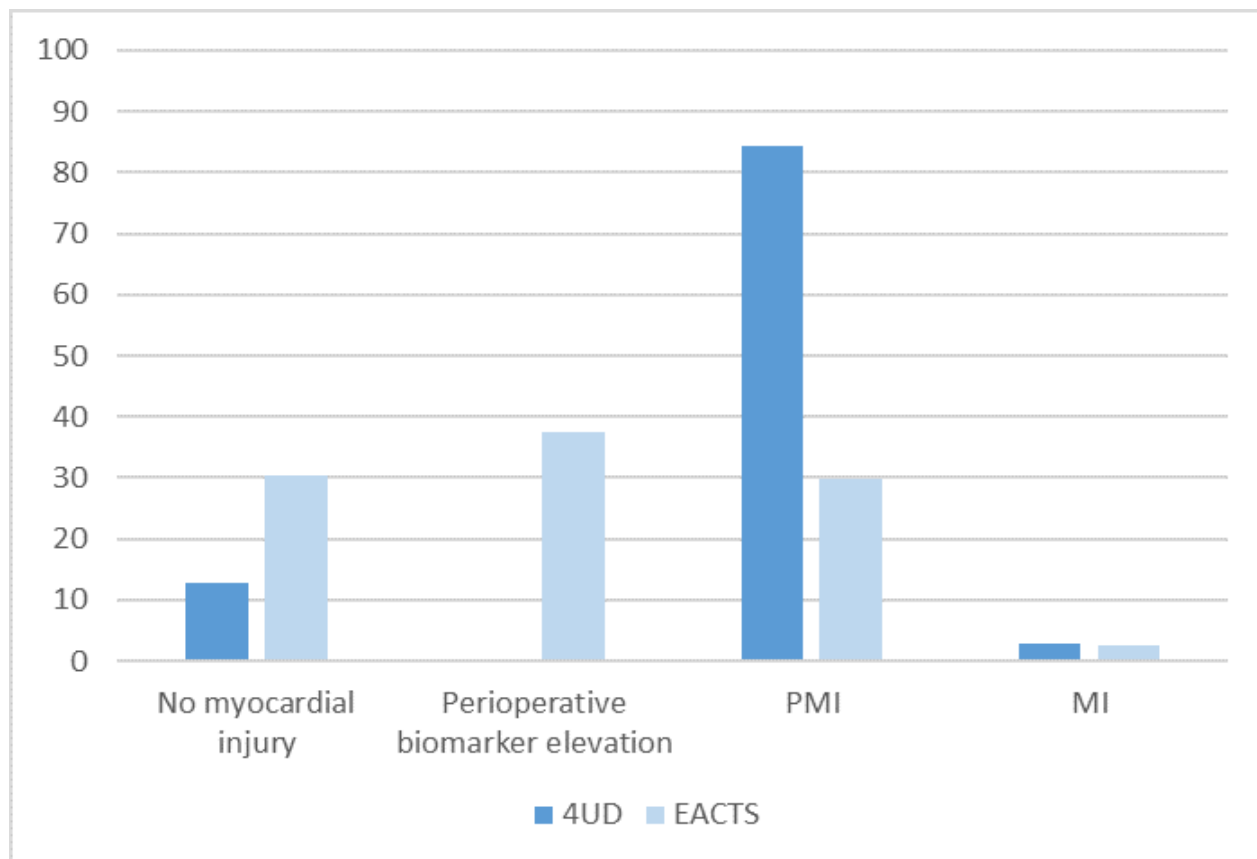

Figure 2: Figure 2: Incidences (%) of no myocardial injury, perioperative biomarker elevation, PMI and MI after cardiac surgery

EP20
Quantifying Non-Actionable Alarms in the ICU: A Retrospective Study of Critical ECG Alerts

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Abstract teaser

Alarmen in de intensive care (IC) zijn stressfactoren voor zowel zorgverleners als patiënten. Deze retrospectieve studie onderzocht de prevalentie en van kritieke ECG-alarmen bij 127 IC-patiënten. Van de 7362 kritische rode alarmen kwam 1 op 7 (n=1080) door ECG-alarmen (31% VF/asystolie), waarvan 85,9% vals-positief waren. Deze bevindingen benadrukken de noodzaak voor gerichtere alarmmanagementstrategieën zonder de patiëntveiligheid in gevaar te brengen.

Background

Alarms in intensive care units (ICUs) are major stressors for both clinicians and patients, contributing to physical complaints such as sleep disturbances and post-intensive care syndrome. Alarm fatigue, caused by frequent alarms, can desensitize clinicians to critical alerts and compromise patient safety. Reducing false-positive alarms is crucial to mitigating these issues, requiring an understanding of alarm prevalence and false-positive rates. This study aimed to evaluate the prevalence and proportion of false-positive ECG-related critical alarms in ICU patients.

Methods

This retrospective, single-center study analyzed high-resolution ECG data (500Hz) from 127 ICU patients via Data Warehouse Connect (Philips). A random sample of critical ECG alarms (incl. VF/VT, asystole, and severe brady-/tachycardia) underwent a thorough manual review using detailed analysis of vitals and electronic patient records. False positives were non-actionable alarms without documented clinical complications or related interventions.

Results

A total of 7362 critical alarms, including 1080 critical ECG alarms, were analyzed. Of these, 13.2% (143 alarms from 20 patients) were manually reviewed. The cohort (mean age 69.1±9.2 years, 75.6% male) comprised 95% ICU admissions after elective surgeries, 0.8% non-surgical admissions, with a median ICU stay of 0.9 days (IQR 0.7–1.9). The prevalence of all critical alarms and critical ECG alarms was 0.7 and 0.2/hour/patient. Manual review showed 85.9% of the critical ECG alarms were false positives, 31.0% involving ventricular fibrillation/asystole.

Conclusions

The high prevalence of alarms, coupled with a significant proportion of false-positive ECG alarms, underscores the burden of non- actionable alarms in ICUs. These findings highlight the need for targeted alarm management strategies, such as multiparametric algorithms, to reduce alarm fatigue and enhance clinical efficiency without compromising patient safety.

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EP21

A mixed-methods national analysis of organ donation evaluation forms: what can be improved in approaching donor families under the opt-out consent system?

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Abstract teaser

In 2020 voerde Nederland een opt-out-systeem voor orgaandonatie in, samen met de Kwaliteitsstandaard Donatie die richtlijnen biedt voor het benaderen van donorfamilies. Deze studie onderzoekt via evaluatieformulieren en interviews in hoeverre orgaandonatiegesprekken voldoen aan de theoretische eisen van de Kwaliteitsstandaard Donatie. De analyse laat zien dat orgaandonatiegesprekken niet volledig voldoen aan de gestelde eisen, waardoor nabestaanden geregistreerde toestemmingen overrulen.

Background

In 2020, the Netherlands implemented an opt-out consent system alongside the Quality Standard Donation (QSD). The QSD provides guidance for approaching donor families regarding organ donation, including the newly introduced 'No objection' registration and guides the organ donation conversations(1). To evaluate the applicability and feasibility of the QSD, the Dutch Transplant Foundation (NTS) developed an evaluation form for each organ donor conversation. This study analyses whether donation conversations align with the theoretical guidance outlined in the QSD.

Methods

A mixed-methods design was used, combining quantitative and qualitative analyses. Quantitative data were derived from the national NTS database of evaluation forms, while qualitative data came from transcripts of semi-structured individual interviews with intensivists (n=10). Descriptive statistics were applied to quantitative data, while thematic analysis, using Atlas.Ti version 24 and an abductive approach, was employed for qualitative data. The COREQ guidelines were used to scaffold reporting of the analysis of the interviews.

Results

Of 1178 evaluation forms, 145 were consent registrations ('Yes' or 'No objection') where families made it plausible that the registration did not reflect the donor's wishes (Table 1). In three cases, donation proceeded. Both evaluation forms and interviews revealed notable differences in donation conversations for physicians and relatives, in case of registrations based on 'Yes' versus 'No objection' registration.

Families often claimed that the potential donor would not have wanted to be a donor, perceiving 'No objection' registrations as unreflective of the donor's true wishes. However, in about half of these cases, families presented arguments based on their own views and preferences rather than the donor's intentions. Additionally, 20% of the interviewees were unfamiliar with the QSD.

Regarding education on the new Donation Act, 84.4% of the intensivists who completed the evaluation forms had completed the e-learning on the new act, and 50.4% had attended the practical communication training.

Conclusions

In conclusion, organ donation conversations often fail to meet the QSD guidance, which prioritizes adherence to the patient's wishes. This was due to limited awareness of the QSD and the absence of formal criteria for 'making plausible by family' herein. Consequently, relatives frequently overrule registered consents, voicing personal opinions and preferences over the potential donor's wishes. To address this, we recommend updating the QSD with clear, formal requirements and mandating communication training tailored to these challenges. This approach aims to enhance clarity, consistency, and effectiveness in clinical practice.

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Remark

Ik heb hetzelfde abstract een paar minuten geleden per ongeluk al ingediend, doordat ik op enter drukte in het "auteurs" vak van de referentie. Hierbij ontbraken nog een aantal dingen, vandaar een nieuwe inzending.

Table 1. Number of 'Yes' and 'No objection' registrations and family approach outcomes

Registration Type	'Yes'	'No objection'
Total	432	264
Family made plausible	36	109
Exclusions*	5	0
Donation proceeded	1	2
No organ donation	30	107
No organ donation (%)	7.0%	40.6%

*Exclusions due to lack of documented narratives.

Figure 1: Table .1 Number of 'Yes' and 'No' registrations and family approach outcome

EP22
The effect of PEEP in ventilator weaning failure: role for longitudinal diaphragm atrophy?

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Abstract teaser

Diafragmadysfunctie verslechtert de uitkomst van beademde patiënten waarbij PEEP mogelijk een rol speelt, omdat de spier zich aanpast (longitudinale atrofie). Wij hebben onderzocht of een afname in PEEP een effect heeft op efficiëntie van het diafragma. We vonden geen eenduidig effect van PEEP op diafragma-efficiëntie, waarbij de efficiëntie in de helft van de patiënten steeg en in de helft afnam.

Background

Diaphragm dysfunction worsens outcomes in acutely mechanically ventilated patients(1). In addition to disuse atrophy, adaptation of the diaphragm to PEEP may contribute to diaphragm dysfunction. This process is called longitudinal atrophy, and originates from absorption of sarcomeres in response to caudal displacement of the diaphragm with increased end-expiratory lung volume due to PEEP. Previously, we demonstrated that PEEP decreases the efficiency of the diaphragm, which is defined respiratory effort divided by respiratory drive(2). This decrease is proposed to modulate the process of longitudinal atrophy. In this study, we investigated the effect of PEEP reduction on diaphragm efficiency in mechanically ventilated patients. We hypothesized that neuromuscular efficiency decreases after reduction of PEEP during a spontaneous breathing trial.

Methods

We performed a secondary analysis of 27 patients from a randomized controlled trial (NCT01721434) investigating the effect of levosimendan on diaphragm efficiency. Respiratory drive (diaphragm electrical activity,ΔEdi) and effort (transdiaphragmatic pressure,ΔPdi) were measured using a nasogastric catheter. Diaphragm efficiency was defined as ΔPdi/ΔEdi. Measurements were performed during a period of CPAP with clinical PEEP followed directly by a 5-minute SBT (PEEP=0 cmH2O).

Results

Respiratory drive and effort both increased after decreasing PEEP from high level (median 6 (5-8) cmH2O) to zero PEEP (Figure 1). ΔEdi increased from median 15.0 (5.2–21.7) μV to 17.9 (8.3–27.3) μV (P=0.009) and ΔPdi from 11.3 (9.3–14.3) to 13.5 (12.0–17.1) cmH2O (P=0.0002). Diaphragm efficiency was not different between high and zero PEEP on group-level (Figure 1). However, the response of individual patients in terms of drive, effort and diaphragm efficiency was heterogenous. The difference in diaphragm efficiency did not correlate with clinical parameters, such as duration of ventilation or PEEP level on study day.

Conclusions

In conclusion, there is no clear indication of longitudinal atrophy in this cohort, but it is possible that longitudinal atrophy played a role in the group with diaphragm efficiency decrease. This warrants a prospective follow-up study. Furthermore, we do show that respiratory drive and effort are affected by PEEP.

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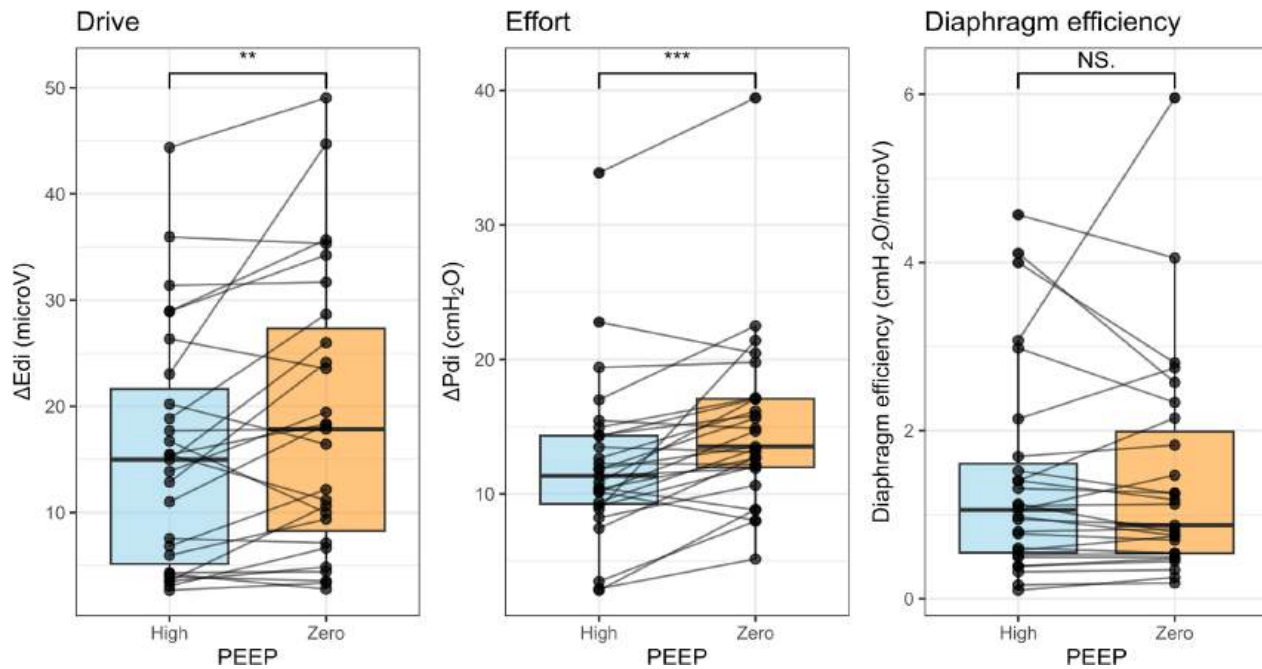
*Figure 1: Figure 1: Change in ΔEdi (left panel), ΔPdi (middle panel) and diaphragm efficiency (right panel) from PEEP at clinical setting (High PEEP) to zero PEEP. ** and *** indicate significant differences based on a paired Student's t-test (P < 0.01 and P < 0.001, respectively), while NS indicates Non-Significant.*

EP23
Een iets te bruine wielrenner?

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Teaser Case report

Een diepe refractaire shock bij een 66-jarige patiënt blijft een onduidelijke origine houden. Het Shigella antigeen wordt aangetoond; maar is Shigellose voldoende verklaring voor deze mate van shock?
De puzzelstukjes vallen op hun plaats door een combinatie van opvallende hyperpigmentatie, persisterende hyponatriëmie en hyperkaliëmie.

Case report

A 66-year old patient was presented in our emergency room with diarrhea, fever and collapses. Medical history showed a transient ischemic attack and deep vein thrombosis, but no other chronic diseases. Remarkable was the chronic decline of his physical condition over the past two years. The patient has had an excellent physical condition, competing in cycling competitions and ice-skating marathons. Several medical specialists had been consulted however without a definite diagnosis. Patient had mostly feared for 'long covid'.
Hypotension persisted during assessment at the emergency room, despite resuscitation with fluids and antibiotics. Admission to the Intensive Care Unit (ICU) was needed to start vasopressors. The shock appeared refractory to high doses of norepinephrine and epinephrine, therefore hydrocortisone was started as well.

Initial laboratory findings showed high lactate levels (6.1mmol/l) and elevated inflammatory parameters; e.g. CRP (100 mg/l). A CT-scan of thorax and abdomen solely showed a bit edematous colon ascendens. Microbiological assessment was performed on blood, urine and feces.

After 4 days the Shigella PCR turned out positive and the antibiotic regime was adjusted. Other cultures remained negative. A septic shock due to Shigellose became the diagnosis in absence of a different explanation.

Eight days after admission to the ICU, the vasopressor necessity and profound weakness remained despite otherwise adequate recovery. A notable hyponatremia and hyperkalemia persisted regardless of attempts of correction. However the clue to the underlying diagnosis turned out to be the skin color of the patient.

When admitted to the ICU, patient appeared suntanned. It was until his descent was questioned during the daily rounds that suspicion was raised. He was fully Caucasian and later his partner explained the skin had darkened without extravagant sunlight-exposure. With the retrospective notion that the hypotension had re-occurred after discontinuing the hydrocortisone a primary Addisons disease was suspected.
These clinical signs added with a positive synacthen-test confirmed the diagnosis of primary adrenal insufficiency. Hydrocortisone restart resulted in an exceptionally quick recovery of his clinical condition, blood pressure and weakness.

Primary adrenal insufficiency is a rare disease, caused by a destruction of the cortex of the adrenal glands resulting in hypocortisolism and hypoaldosteronism.[1,2] Autoimmune adrenalitis is the most common cause.[1,2]
Retrospectively research of the CT scan of the abdomen showed that both adrenal glands could not be identified. Additional laboratory results showed positive adrenal autoantibodies.
Patient swiftly regained this outstanding physical condition illustrated by his astonishing improvement of his Strava® results.

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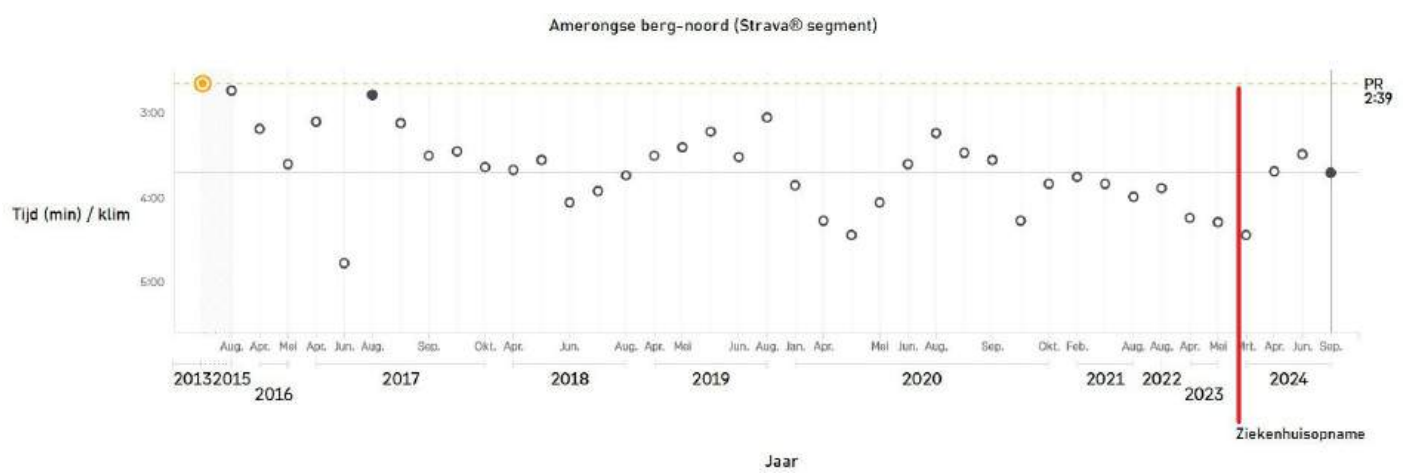*Figure 1: gebruind of hyperpigmentatie?*

Figure 2: Strava resultate

EP24
An unexpected paraneoplastic syndrome

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Teaser Case report

Een 78-jarige man, aanvankelijk gediagnosticeerd met pneumonie, vertoonde tekenen van het syndroom van Cushing. Aanvullend onderzoek toonde gemetastaseerde ziekte aan met haarden in de longen, lever en nieren, wat zou kunnen passen bij een ACTH-producerende tumor. Deze casus benadrukt hoe belangrijk het is om bij ouderen met onverklaarbare klachten verder te kijken dan de eerste diagnose.

Case report

Presentation

A 78-year-old male presented to the emergency department with worsening dyspnea, facial and peripheral edema, and extreme fatigue after returning from Cambodia four days earlier. He was prescribed diuretics by his general practitioner for the edema and took anticoagulants and statins due to a previous myocardial infarction.

Clinical findings

A chest X-ray showed consolidation in the left lower lung lobe. The patient had scabs and wounds on his feet and had gotten a tattoo while in Cambodia. Laboratory results indicated an elevated CRP (274), hyperglycemia (blood glucose 31 mmol/L), and a serum osmolality of 340 mmol/kg, suggesting a hyperosmolar hyperglycemic state(HHS). No ketones were detected in the blood or urine, ruling out diabetic ketoacidosis.

Diagnosis & Treatment

The patient was admitted to the ICU with suspected pneumonia and HHS. Sputum cultures confirmed infection with Influenza A, Streptococcus pneumoniae, and MRSA. Given the severity of the patient's condition, intubation was required.
A CT-scan was performed to assess the extent of the infection and investigate possible abscesses. The scan revealed a mass in the left lung hilum with lymphadenopathy, a mass in the kidney, and liver nodules with peritoneal deposits, suggesting metastatic cancer. At this stage there was a high suspicion of Cushing's syndrome as signs of hypercortisolism were noted. A characteristic 'full moon' face, a new-onset type 2 diabetes, a complicated infection, high blood pressure and muscle weakness. Elevated evening cortisol levels after starting corticosteroid treatment, in conjunction with the imaging findings consistent with liver metastases and a primary tumor of either the lung or kidney, raised suspicion for an ectopic ACTH-producing tumor such as a small cell lung carcinoma.[1]
After the scan was made, a palliative care path was initiated due to the poor prognosis of the metastasized cancer. It was decided in agreement with the family that the patient was brought home to initiate palliative sedation.

Discussion and conclusion

The patient's initial pneumonia diagnosis was followed by seemingly random symptoms, later identified as consistent with Cushing's syndrome. This underscores the importance of a comprehensive diagnostic approach as a straightforward diagnosis, such as pneumonia, can reveal an underlying serious condition. This case underlines the importance of being alert when patients present with unexplained systemic symptoms, especially in the elderly.

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EP25
Two severe unintended MDMA intoxications leading to sudden death in one of them

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Teaser Case report

Twee mannen (48 en 63 jaar) worden opgenomen op de IC na een onbedoelde auto-intoxicatie met een onbekend middel. Klinisch had één van hen een sympaticomimetisch toxidroom met tachycardie, hypertensie, diaforese, mydriase en hyperthermie. De tweede patiënt had secundair aan de intoxicatie een OHCA waarop het beeld van cardiogene shock het toxidroom vertroebelde.

Case report

Two men were presented to the emergency department of our hospital after the ingestion of an unknown liquid substance. Both of them ingested one sip and stopped drinking because of the bad taste. Witnesses reported that several minutes later the patients experienced extreme abdominal pain and quickly after that both of them collapsed. One of them (63 years old) was brought to the hospital with decreased consciousness, tachycardia, hypertension, mydriasis, diaphoresis and hyperthermia fitting to a sympathomimetic toxidrome. A GCS of 3 with severe hypercapnia necessitated intubation and mechanical ventilation. Hypertension was treated with labetalol. He also had a severe combined acidosis with a pH 6.87, pCO2 96 mmHg and lactate 8.2 mmol/L. Osmol gap was not elevated. Witnesses reported him to lie shaking on the floor with high muscle tone, possibly due to a seizure, which could explain the high lactate level. The patient received supported care at the ICU and did not develop rhabdomyolysis or multi organ failure. He was discharged to the ward within 24 hours and recovered well.

The second patient (48 years old) had a circulatory arrest and BLS was started. Witnesses reported him to lie shaking on the floor with an increased muscle tone as well. At the arrival of first responders – which was delayed for 20 minutes due to logistical problems - first rhythm was asystole. After 7 blocks of CPR he gained ROSC. There was a severe combined acidosis with a pH 6.95 pCO2 52 mmHg and lactate of 27.4 mmol/L. There was no clear toxidrome to be detected due to the cardiogenic shock. He was admitted to the ICU for TTM. After 24 hours the SSEP tested negative and the patient died after discontinuation of life support.

Toxicological screening showed MDMA in both patients. Quantitative analysis in the second case showed a postmortem plasma concentration of 4.7 mg/L MDMA, which is a potential lethal concentration1.

Discussion

These cases show the severity and heterogeneity of MDMA intoxication. MDMA intoxication can lead to sudden death, which is probably caused by dangerous arrhythmia due to its sympathomimetic effects. Interestingly, literature shows no clear correlation between MDMA blood levels and clinical symptoms, suggesting that there may also be an idiosyncratic component1. Treatment of MDMA intoxication is supportive and dependent on clinical symptoms.

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EP26
A fatal case of West Nile Virus encephalitis

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Teaser Case report

Wij presenteren een casus van een patiënt met West Nile virus encefalitis met fatale afloop, de eerste casus in Nederland in de afgelopen 5 jaar. Recent gebruik van rituximab heeft bijgedragen aan vertraging in het stellen van de diagnose en een fulminant ziektebeloop. Deze casus onderstreept het belang van een zorgvuldige reisanamnese en moleculaire diagnostiek bij immuungecompromitteerde patiënten.

Case report

Patient presentation
Early September 2024, a 65-year-old male presented at the Emergency Department (ED) of a regional hospital with fever, confusion and general weakness that developed over a couple of days. Medical history reported a B-cell lymphoma of the gastrointestinal tract for which he successfully received a rituximab containing treatment regimen until January 2024. Four weeks before presentation he visited Alicante, Spain. Upon his return he felt unwell and developed a fever 15 days later. Neurological examination on admission showed an altered mental status with a GCS score of E4M6V4, without neck stiffness.
CT and MRI scan of the brain were normal. CSF analysis showed a mild pleocytosis (6 x 10^6/L), slightly increased protein (650 mg/L) and normal glucose. Empirical treatment was initiated with ceftriaxone, amoxicillin and aciclovir.

Clinical course
Within two days the patient had a decline in consciousness level (GCS 3, intact brainstem reflexes). Blood and CSF bacterial cultures showed no growth and liquor PCR for common viral agents of meningo-encephalitis tested negative. West Nile Virus (WNV) serology was negative. Methylprednisolone and intravenous immunoglobulin were started for possible auto-immune encephalitis. A repeated MRI scan 7 days post-admission showed bilateral thalamic hyperintensities (see figure 1, differential diagnosis: auto-immune encephalitis or viral encephalitis).
He was transferred to the Amsterdam University Medical Center 10 days after admission. His neurologic status remained unchanged. Repeated electroencephalograms showed severe encephalopathy without reactivity to stimuli.
A repeat lumbar puncture was performed and on day 21 after initial admission the WNV PCR result returned positive, a result which was confirmed by PCR on urine WNV serology remained negative throughout.
Additional treatment with interferon alpha and remdesivir was considered [1,2,3], but no clinical benefit was expected due to the prolonged course of the disease and absence of viremia at time of diagnosis. 31 days post admission the patient's neurologic condition remained unchanged, after which it was decided to initiate palliative care.

Discussion
While most WNV infected patients remain asymptomatic, West Nile Virus neuroinvasive disease occurs in 1:150-200 infections and has a mortality of 10%. [4] Our patient most likely contracted the virus in Spain, based on travel history. He was immunocompromised due to recent use of rituximab, which might explain the prolonged incubation time, the fulminant course of the disease and the lack of WNV specific immune response, which have been described before in immunocompromised patients. [4]

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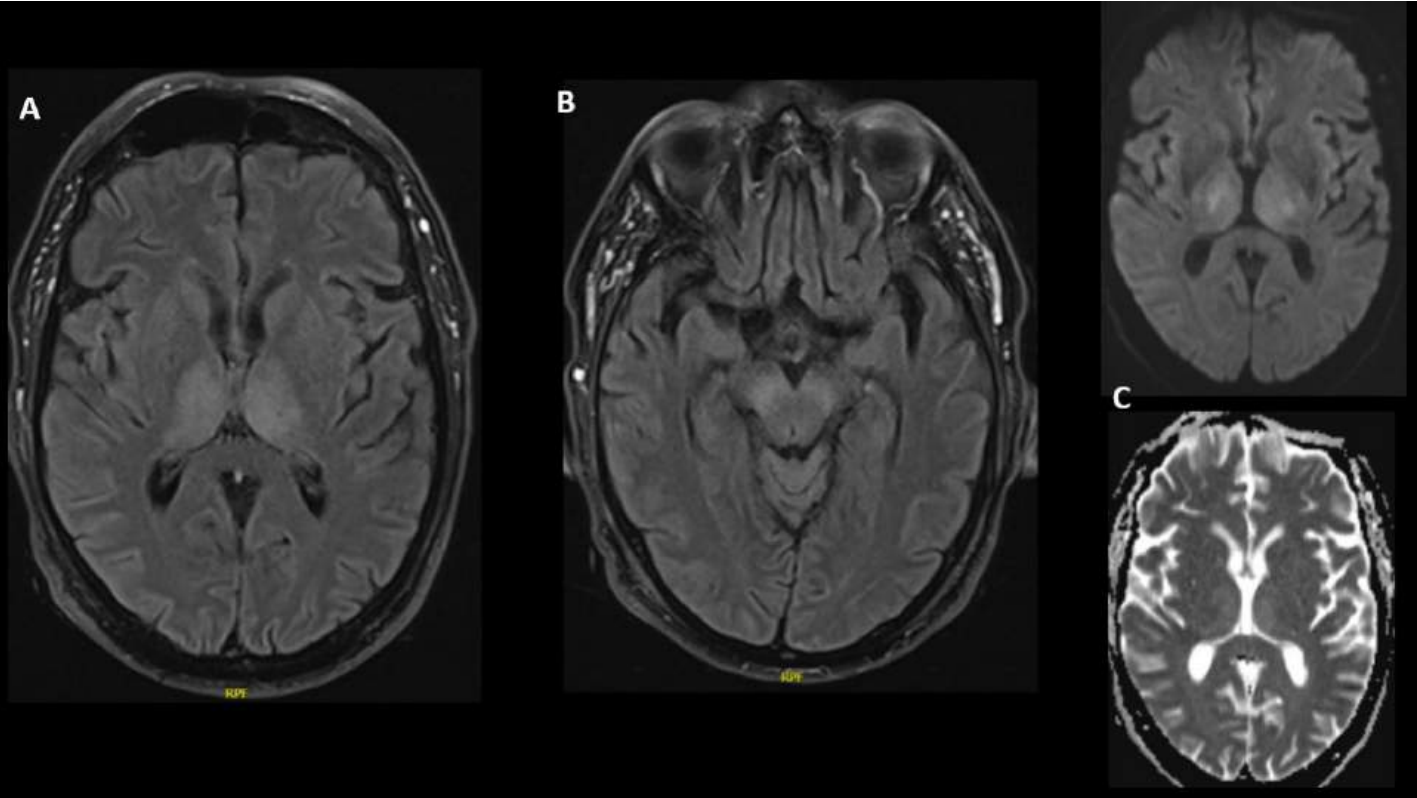- Lyle R. Petersen, Aaron C. Brault, Roger S. Nasci. (2013). West Nile Virus: Review of the Literature. *JAMA*.
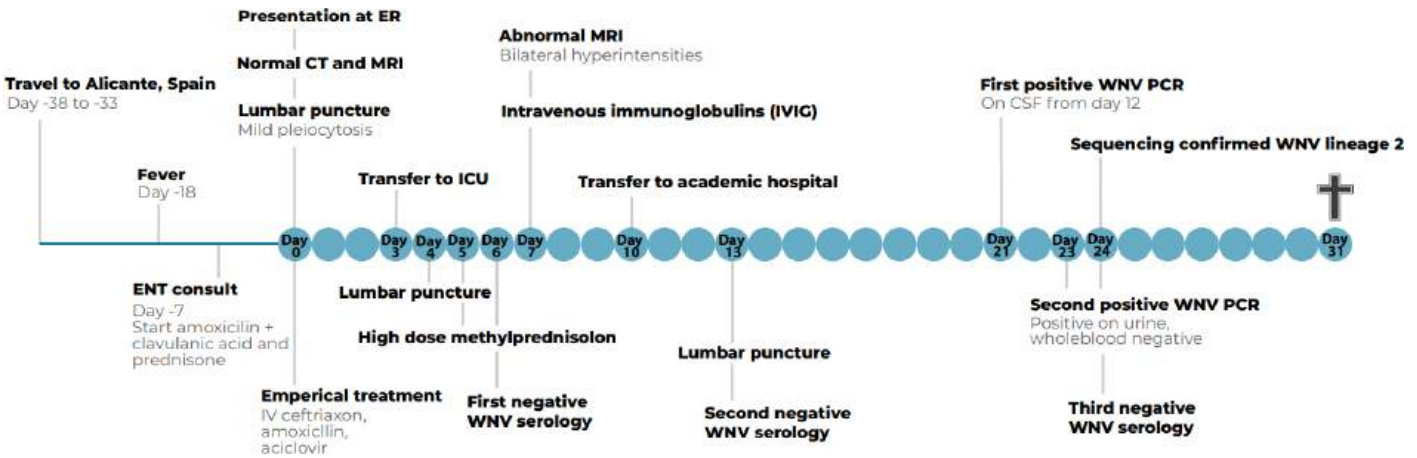
Figure 1: Figuur 1 MRI scan

Figure 2: Figuur 2 Tijdslijn casus

EP27
The 'legal' Breaking Bad reality

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Teaser Case report

Een 18-jarige patiënt presenteerde zich met respiratoire insufficiëntie, hypotensie en multiorgaanfalen na intoxicatie met designerbenzodiazepine bromazolam. Toxicologisch onderzoek detecteerde geen afwijkingen, waardoor de diagnose vertraagd werd gesteld. Designerbenzodiazepines zijn synthetische derivaten van klassieke benzodiazepines, met onvoorspelbare farmacologische effecten en beperkte detectie in standaard screenings. Dit geval benadrukt de noodzaak van alertheid en multidisciplinaire samenwerking in de spoedeisende- en intensive care-geneeskunde.

Case report

Introduction:
Designer benzodiazepines (DBDs) represent a rising public health threat due to their accessibility, unpredictable pharmacokinetics, and under-recognition in clinical practice. This case highlights the severe consequences of bromazolam intoxication in an 18- year-old male and underscores the urgency for heightened awareness among critical care professionals.
Case Presentation:
An 18-year-old male with no prior medical history was found unconscious at home. Empty blister packs of tramadol and midazolam were discovered nearby. When first assessed by the paramedics, the patient exhibited bradypnea (5 breaths/min), oxygen saturation (SpO2) of 50% (improving to 80% with 15 L/min oxygen), hypotension (60/30 mmHg), and sinus tachycardia (110 bpm). His Glasgow Coma Scale (GCS) score was 3.
In the emergency department (ED), the respiratory function was ensured and oxygenation normalized, but he remained hemodynamically unstable. Point-of-care ultrasound revealed severe left ventricular dysfunction, a dilated inferior vena cava, and no pericardial effusion. Blood tests showed metabolic acidosis (pH 7.13, PCO2 60 mmHg, lactate 5.4 mmol/L), and severe hyperkalemia. CT imaging revealed ischemic brain changes and aspiration pneumonia.
Toxicology screening detected benzodiazepines but was negative for opioids, leaving the cause of his condition unclear. Days later, family members discovered invoices for the designer benzodiazepine bromazolam in the patient's email, confirming the diagnosis.
Outcome:
The patient was stabilized in the ICU but sustained severe neurological deficits. He was later transferred to a rehabilitation facility, where his maximum achievable recovery was limited to eating independently with a spoon after months of rehabilitation.
Discussion:
DBDs, like bromazolam, are chemically modified versions of traditional benzodiazepines, designed to evade legal restrictions and being easily purchased online as research chemicals. They often remain undetected in standard toxicology tests. While mimicking classical benzodiazepine overdoses, DBDs present distinct risks due to their unpredictable and highly variable pharmacokinetics and pharmacodynamics. These include extended half-lives, inconsistent potency, and challenges in detection with standard toxicology assays.
In the Netherlands, the incidence of DBD intoxications increased sharply, from a single case in 2014 to 226 in 2022. (1) Diagnosis relies on a high index of suspicion, comprehensive history-taking, collaboration with hospital pharmacists, and advanced toxicological analysis.
Key Lessons for Critical Care:
1. Early Recognition: Maintain vigilance for severe or atypical presentations of benzodiazepine intoxication, especially in young patients.
2. Multidisciplinary Approach: Collaborate with pharmacists and toxicologists for accurate diagnosis and management.
3. Advocacy and Education: Push for stricter regulation of DBDs and greater awareness of their clinical implications.

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EP28
Angry Purkinje Syndrome after emergency CABG

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Teaser Case report

Wij presenteren een casus van een patiënt met op dag 4 post CABG een refractair polymorfe ventrikeltachycardie. Oorzaken als QT- verlengende medicatie, elektrolytenstoornissen en acute ischemie werden uitgesloten. Het 'angry purkinje syndrome' is een zeldzame oorzaak, welke goed reageert op kinidine.

Case report

A 58-year old man, known with COPD (GOLD 1), was admitted in our academic hospital six days after a NSTEMI. He developed ventricular fibrillation (VF) for what he was resuscitated and had an emergency CABG (LIMA-LAD, v-Ao-OM1). Postoperatively the patient had episodes of VF, attributed to reperfusion. Amiodarone was started and given recurrent VF it was decided to place the patient on VA-ECMO. Echocardiography revealed a tamponade for which a rethoracotomy was performed and an impella was inserted for additional unloading. A CAG was performed which showed well-functioning grafts, yet TEE continued to demonstrate poor left and right ventricle function.

On post-operative day (POD) 4 the patient developed refractory polymorphic ventricular tachycardia (VT) for which lidocaine was added to the amiodarone without success. There were no electrolyte disturbances and no signs of ischemia. He developed a continuous bigeminy with short-coupled VES often deteriorating to polymorphic VT. Lidocaine and amiodarone were stopped and low dose esmolol was started. The ventricular functions improved and the impella was removed on POD 9 and an attempt of weaning the ECMO was started. To support weaning, the negative inotropic esmolol was converted to oral quinidine, in the context of angry purkinje syndrome. Despite this the ventricular agitation continued, most likely due to gastric retentions. With no intravenous quinidine available, esmolol was briefly restarted. A duodenal tube was placed to administer quinidine. In addition, quinidine levels were taken to regulate dosage. Following these interventions, the patient's condition stabilized. Esmolol was discontinued, and ECMO was successfully removed. His intensive care unit course was complicated by acute kidney injury requiring temporary continuous venovenous hemofiltration, bronchospasm necessitating frequent nebulizations, and a Clostridium difficile infection treated with vancomycin.

Over the subsequent month, quinidine was gradually tapered and discontinued without recurrence of ventricular arrhythmias. Owing to his moderate left ventricular dysfunction, a single-chamber implantable cardioverter-defibrillator (ICD) was implanted. The patient was discharged to a rehabilitation clinic in stable condition.

Conclusion:
Angry Purkinje syndrome is a rare clinical entity characterized by polymorphic ventricular tachycardia triggered by Purkinje fiber-related ventricular ectopy, occurring in the absence of acute ischemia, QT-prolonging drugs, or significant electrolyte disturbances. Purkinje-related ventricular ectopy needs to be considered in the differential diagnosis when standard antiarrhythmic therapies fail. Quinidine may serve as an effective treatment option in managing this rare but critical condition.

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Figure 1: Polymorfe ventrikeltachycardie

EP29

Unveiling the unexpected: Yohimbine intoxication in a patient with mixed septic and cardiogenic shock

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Teaser Case report

Een 21-jarige man presenteerde zich met ernstige gecombineerde septische en cardiogene shock na een auto-intoxicatie, waarbij de standaard toxicologische screening het klinisch beeld onvoldoende verklaarde. Een uitgebreide toxicologische screening toonde een onverwacht verhoogde yohimbineconcentratie. Deze casus illustreert hoe een yohimbine-intoxicatie kan leiden tot ernstige cardiovasculaire complicaties en benadrukt het belang van uitgebreide toxicologische screening bij onverklaarbare shockbeelden na intoxicatie.

Case report

Unveiling the unexpected: Yohimbine intoxication in a patient with mixed septic and cardiogenic shock Tom

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Departments of intensive care medicine1 and clinical pharmacology2, Elisabeth-Tweesteden Ziekenhuis, Tilburg Introduction

This case describes a 21-year-old male with severe intoxication, presenting with mixed shock, respiratory failure, and rhabdomyolysis. The case highlights the challenges of diagnosing and managing complex toxicological presentations.

Patient Information

The patient, known for opiate abuse and previous suicide attempts, was found unresponsive and hypothermic in his garden house. Advanced Life Support with intubation was performed, naloxone was administered for suspected opiate intoxication.

Clinical Findings

The patient presented with profound hypotension and tachycardia, prompting resuscitation with fluids, vasopressors: high-dose norepinephrine (1mcg/kg/min), argipressin (0,03IE/min), hydrocortisone (200mg/day) and broad-spectrum antibiotics under suspicion of septic shock. X-ray of the lungs revealed a left-sided infiltrate. Initial echocardiography revealed a severely reduced ejection fraction, consistent with cardiogenic shock, milrinon (0,5mcg/kg/min) was started. Further laboratory results revealed severe rhabdomyolysis (CK >132000 U/L), acute kidney injury (creatinine 266 µmol/L), metabolic acidosis (pH 7.12, lactate 7.6 mmol/L), and hyperkaliemia (potassium 5.4 mmol/L).

Timeline

The patient appeared in shock and was transferred to the ICU. Toxicology screen was positive for benzodiazepines, but no opioids. Despite appropriate therapy, the patient's hemodynamic instability persisted, raising suspicion for a contributing toxicological etiology.

Diagnostic Assessment

In addition to elevated flurazepam levels, extensive toxicological screening revealed elevated plasma levels of yohimbine (0.98 mg/l), confirmed by high-performance liquid chromatography-mass spectrometry (HPLC-MS). Given the short half-time (0.5 to 2 hours) and the late sampling time, a near-lethal concentration after ingestion was likely.

Therapeutic Intervention

High-dose norepinephrine, argipressin, hydrocortisone, milrinone and antibiotics were required for shock management. Aggressive hydration was used for rhabdomyolysis.

Follow-Up and Outcomes

The patient was extubated after 3 days and confirmed a suicide attempt with yohimbine pills. His hemodynamics stabilized, kidney function improved, and rhabdomyolysis resolved.

Discussion

Due to insufficient explanatory clinical findings, further toxicological investigation was pursued, ultimately revealing an unexpected intoxication. Yohimbine is primarily used as treatment for erectile dysfunction and as a weight-loss supplement. The mechanism of toxicity involves inhibition of α2 receptors, leading to unregulated norepinephrine release, excessive vasoconstriction, and increased myocardial oxygen demand. Paradoxically, in this case, profound hypotension was observed, likely due to a combination of septic shock. Management of yohimbine intoxication is largely supportive, including aggressive hemodynamic support. This case highlights the importance of recognizing atypical toxicological presentations.

EP30
When life gives you lemons, please eat them! - A case of scurvy in modern-day ICU

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Teaser Case report

Een 22-jarige man presenteert zich in shock met een Hb van 1.6 mmol/l. Nadat een acute bloeding is uitgesloten en duidelijk wordt dat hij een zeer eenzijdig dieet volgt worden vitaminedeficiënties vermoed als oorzaak van de ernstige anemie. Een ernstige vitamine C en foliumzuurdeficiëntie worden uiteindelijk bewezen. Scheurbuik komt nog altijd voor onder de Nederlandse bevolking.

Case report

Background

Symptomatic vitamin C deficiency (VCD), better known as scurvy, is rarely diagnosed in modern-day ICU. However, a prevalence of 27.7% of VCD in critically ill patients with poor nutritional status in high income countries was reported, with scurvy being present in 48-62% of patients with VCD.[1]

Patient information and clinical findings

A 22-year old male, with a history of alcoholism and autism, presented at the emergency room with progressive fatigue, lethargy, dyspnoea and peripheral edema since 2 weeks. He was pale, had jaundiced sclera and mottled skin, was tachypnic (40/min), hypoxic (SpO2 88%) and hypotensive (80/40mmHg), without fever (T35.4). Lab results showed severe macrocytic anemia (Hb 1.6 mmol/l; table 1), metabolic, and coagulation disturbances. There were no clinical signs of bleeding.

Diagnostic assessment and treatment

The patient was resuscitated with blood products and admitted to the ICU. Due to his poor nutritional status vitamin deficiencies were suspected to cause the anemia, among several of the other presenting symptoms. High dose intravenous vitamin B1 (3d500mg), C (3d1000mg), K (1d10mg) and folate (1d5mg) supplementation was started immediately. Other causes of macrocytic/haemolytic anemia were ruled out. Severe vitamin C (<1 umol/l) and folate (<4.6 nmol/l) deficiency were confirmed, with normal vitamin B1 (102 nmol/l) and B12 (436 pmol/l). Additional clinical symptoms of scurvy, including a hyperkeratotic rash and poor wound healing were noticed during ICU stay. These rapidly improved after treatment, and Hb normalized (5.4 to 10.0mmol/l) without further need of transfusions. After thorough diagnostic assessment the patient was also diagnosed with decompensated alcoholic cardiomyopathy and alcoholic hepatitis.

Discussion

Folate deficiency is a well-known cause of megaloblastic anemia. VCD decreases the bioavailability of folate, depresses erythropoiesis and increases haemolysis. Clinical symptoms of VCD include anaemia, fatigue, muscle/joint pain, gingivitis, bruising, ecchymosis, impaired wound healing, edema, pulmonary hypertension, depression and delusions.[1,2] Vitamin C is not produced by the body and thus depends on intake, with psychiatric comorbidities and addiction problems being important risk factors for low intake.[1] Scurvy and folate deficiency may cause and contribute to critical illness, but can be easily treated, underlining the importance of considering vitamin deficiencies in high-risk patients.

References

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Hb	1.6 mmol/l
MCV	116 fl
Reticulocytes	196 10*9/l
Haptoglobin	0.2 g/l
Trombocytes	39 10*9/l
PT	44 s
APTT	74 s
LDH	337 U/l
ALAT	170 U/l
ASAT	228 U/l
Bilirubin	82 umol/l

Figure 1: Lab results on admission

EP31

Stanford Type A Aortic Dissection in a Pregnant Patient with Pre-eclampsia and HELLP Syndrome: Navigating Complex Choices To Delay Delivery or Perform Cesarean and Aortic Surgery

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[1] Maastricht University Medical Centre+, Maastricht, the Netherlands

Teaser Case report

Een 26-jarige zwangere vrouw met ernstige pre-eclampsie en een beginnend HELLP-syndroom ontwikkelde een type A-dissectie. Multidisciplinair overleg resulteerde in een plan voor spoedchirurgie met een sectio, hysterectomie en aansluitende aortachirurgie. Deze casus toont het belang van snelle diagnostiek en gecoördineerde zorg bij zeldzame en levensbedreigende obstetrische complicaties.

Case report

A 26-year-old woman (G2P0A1) at 23+0 weeks gestation was referred to our hospital with early pre-eclampsia, presenting with hypertension, headaches, oedema, and fetal growth restriction. Hypertension was managed with escalating doses of methyldopa and nifedipine. Corticosteroids were administered to enhance fetal lung maturity in anticipation of delivery after 24 weeks. At 24+2 weeks, the patient began developing HELLP syndrome, and later that evening, she complained of acute chest- and interscapular pain. After excluding myocardial infarction, CT-angiography for suspected pulmonary embolism revealed a Stanford type A aortic dissection extending from the aortic root to the renal arteries.

The patient was admitted to the ICU for blood pressure control, and a multidisciplinary consultation was held with obstetrics, cardiothoracic surgery, anaesthesia, and ICU. Two key dilemmas arose: to leave the fetus in situ, risking worsening pre-eclampsia and HELLP, or perform a cesarean to improve maternal prognosis; and whether a hysterectomy, which reduces bleeding risk during cardiopulmonary bypass (CPB) and heparinization, outweighed preserving future fertility. Although reports of successful aortic repair during pregnancy and after cesarean section (C-section) exist1,2, we agreed that hysterectomy posed a lower risk of peri- and postoperative bleeding

Within 1.5 hours of symptom onset, CPB cannulas were placed, and a C-section was performed, delivering a daughter cared for by the NICU team. Hysterectomy and a brief cooling-off period preceded CPB and subsequent uncomplicated aortic surgery comprising ascending aorta and hemiarch repair.

Peri- and postoperatively, the mother experienced severe hypertension managed with multimodal antihypertensive therapy. Respiratory insufficiency on ICU day-3 required reintubation and prone positioning due to pleural effusion, atelectasis, and Serratia marcescens urosepsis confirmed by blood and urine cultures. After antibiotic and diuretic treatment, the patient was extubated and steadily recovered, leaving the ICU on day-12 and the hospital on day-16. Despite maximal neonatal care, the daughter succumbed to an intraventricular haemorrhage. Pathological examination of aortic tissue showed medial degeneration, suggesting a connective tissue disorder, prompting referral to clinical genetics. The patient received follow-up care from obstetrics, a vascular internist for hypertension management, and cardiothoracic surgery, alongside psychological support and physical rehabilitation.

This case highlights the importance of multidisciplinary collaboration in managing rare, potentially fatal obstetric emergencies that demand rapid decision-making and balancing of maternal and fetal outcomes in high-risk scenarios.

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Remark

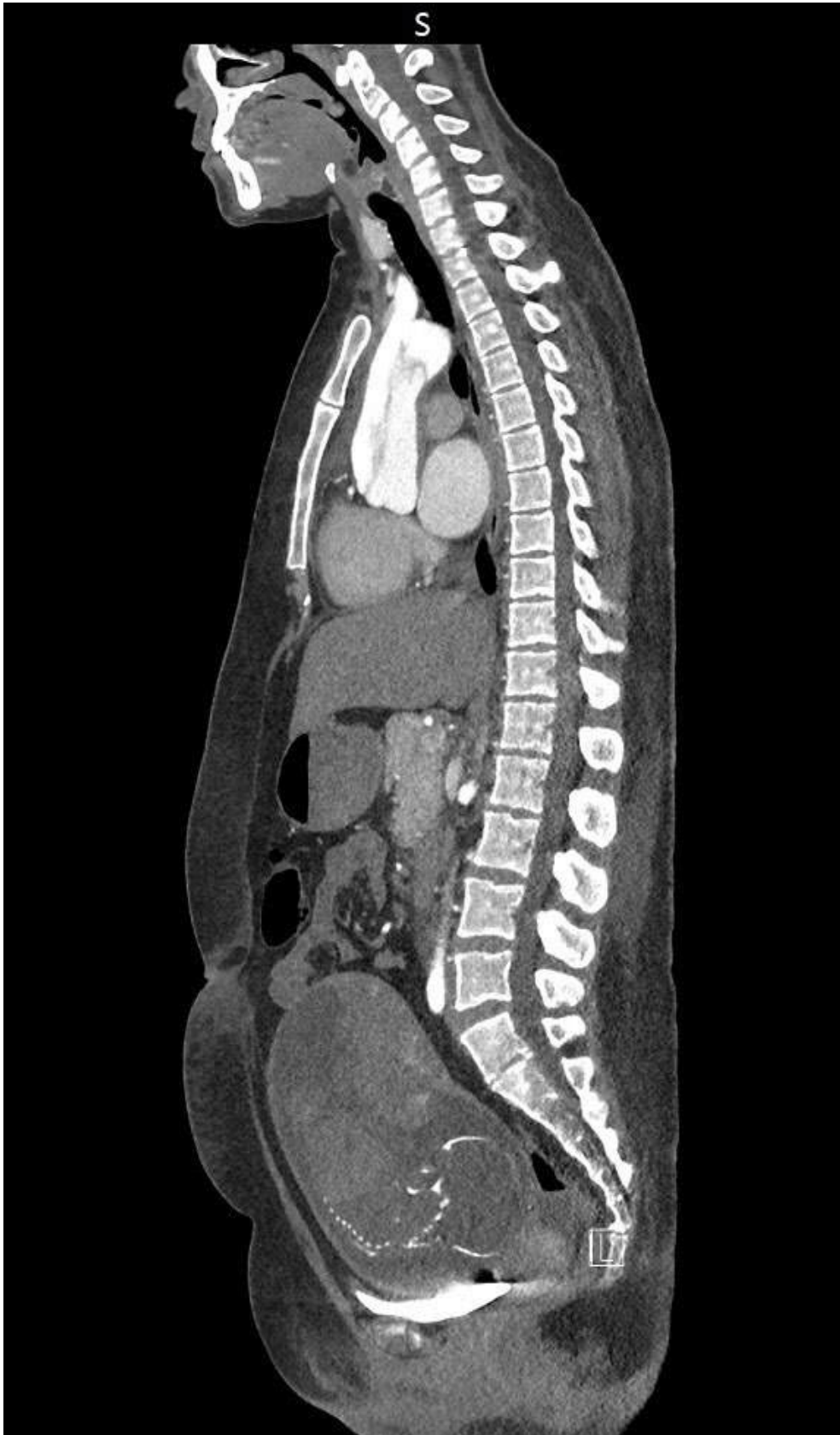De patiënte heeft schriftelijk toestemming gegeven voor het anoniem gebruik van haar casus.

Figure 1: CT-aorta

EP32

Cardiogenic shock due to delayed obstruction of the circumflex due to indirect CS-based MV annuloplasty (Carillon): a case-report

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Teaser Case report

De percutane opties voor mitraliskleppreparatie zijn volop in ontwikkeling; één daarvan is de Carillon procedure. Hierbij is acute potentiele obstructie van de circumflex (Cx) een bekende periprocedurele complicatie. Dit casereport beschrijft, zover bij ons bekend, voor het eerst een casus waarbij er sprake was van late obstructie van de Cx 19 dagen na de ingreep.

Case report

1. Introduction

Transcatheter edge to edge repair (TEER) options for functional mitral valve regurgitation (MR) are evolving. A possible option is indirect coronary sinus (CS) based mitral valve (MV) annuloplasty (Carillon). (1) The latter is percutaneously deployed in the coronary sinus to reduce the mitral annular dimension.

2. Case Presentation

The patient, a 79 year old woman, had a medical history of atrial fibrillation, an ischemic, dilated cardiomyopathy with reduced ejection fraction (25-30%), implantable cardioverter-defibrillator (ICD) and a severe mitral valve insufficiency (MI). It was decided to perform a CS-based MV annuloplasty (Carillon). The procedure was completed without periprocedural complications.

19 days after the Carillon procedure patient presented at the emergency department with hypotension (60/30 mmHg) and atrial fibrillation 74 bpm with delayed intraventricular conduction. Saturation was 95% with a non-rebreather mask. An electrocardiogram (ECG) showed a known left bundle branch block (LBBB) with ST depression in V1-V4 and ST elevation in I and aVL, different compared to the last ECG. (Figure 1). A focused transthoracic echocardiogram (TTE) revealed poor systolic left ventricular function, a velocity time integral (VTI) of 8, mitral valve insufficiency and non-significant pericardial effusion. The working diagnose was cardiogenic shock secondary to an acute posterior myocardial infarction. Patient experienced multiple episodes of output loss linked to ventricular tachycardia (VT) and ventricular fibrillation (VF) for which repeated defibrillation.

Coronary angiography was performed and revealed a significant stenosis of the LCx at the site of the Carillon device. (Figure 2). Dilatation was performed and a drug-eluting stent (DES) was placed.

The patient was transferred to the intensive care unit (ICU) for post-resuscitation care. Despite all the interventions, the patient continued to exhibit signs of cardiac decompensation with severe mitral valve insufficiency. The patient passed away 7 days after presentation to the emergency department.

3. Discussion

The LCx runs between the coronary sinus and mitral annulus in 64-80% of cases. (2) Due to this close anatomical relationship the LCx is susceptible to extrinsic compression. Compression of the LCx is a known periprocedural risk which needs to be addressed during the intervention. (3) In this case, occlusion of the Cx was also ruled out periprocedural. To the best of our knowledge, we report the first case of delayed (19 days after intervention) occlusion of the LCx due to indirect CS-based MV annuloplasty (Carillon). Possibly the late occlusion occurred due to remodeling and dilatation of the heart causing impingement.

References

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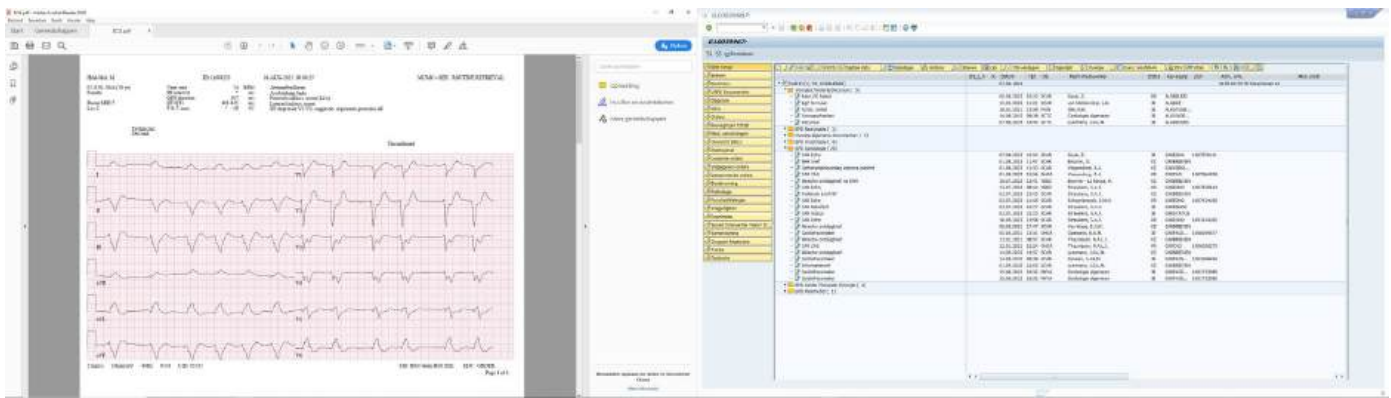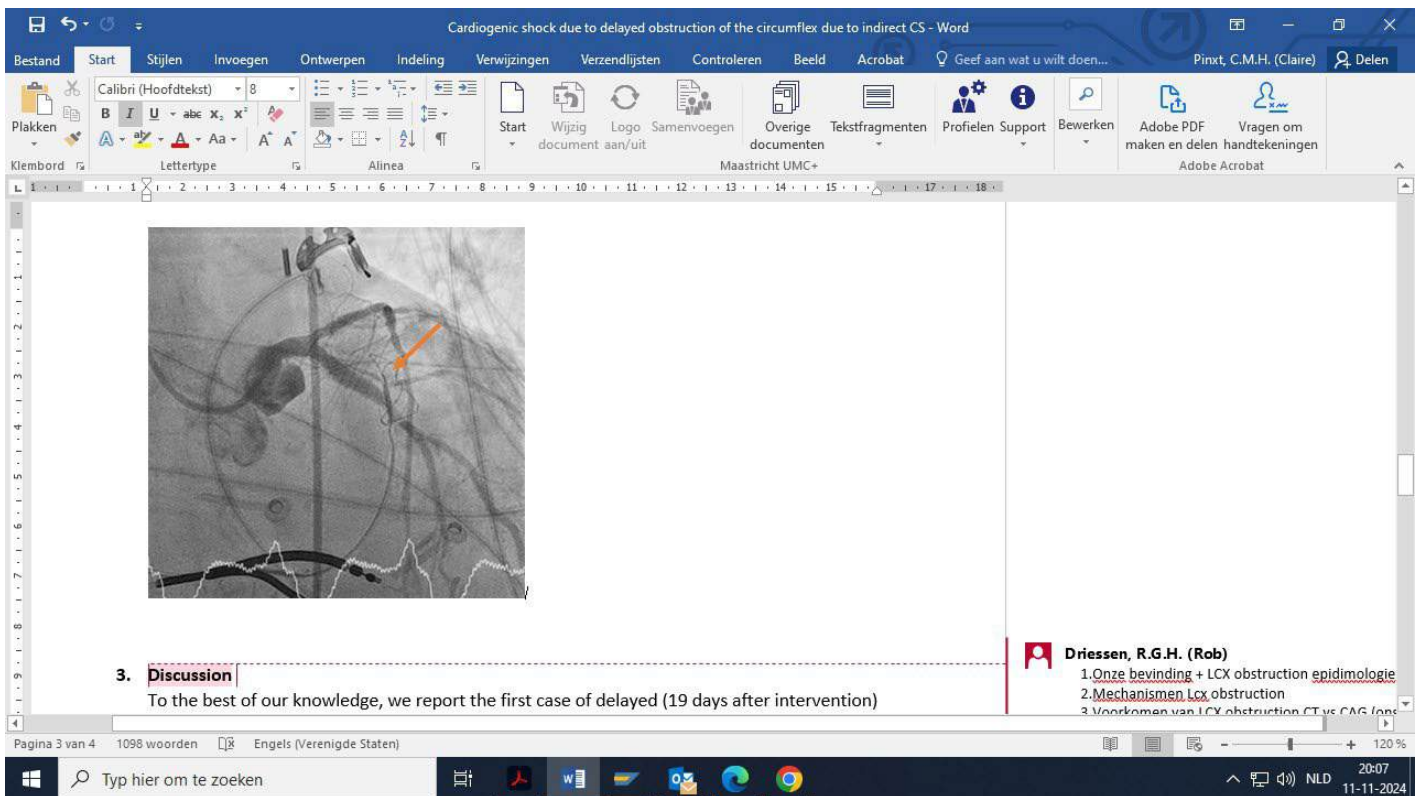
Figure 1: ECG at presentation

Figure 2: Coronary angiography; occlusion LCx

EP33
True Blue

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Teaser Case report

Een verschil in pulsoximetrie en arteriële zuurstofsaturatie kan wijzen op methemoglobinemie, hierbij is zuurstoftransport naar de weefsels minder efficiënt.

Vaak is er sprake van een intoxicatie met nitraat bevattende medicatie, voeding of drugs. Ook dient gedacht te worden aan het enzym tekort G6PD.

Overweeg behandeling met methyleenblauw, maar denk aan de contra-indicaties.

Case report

Introduction: Intensivists are frequently consulted in case of hypoxemia. We present a patient with low pulse oximetry while having a normal arterial oxygen saturation. This 'saturation gap' might implicate the existence of methemoglobulin. Our patient was having an unusual cause which resulted in diagnostic and therapeutic challenges.

Presentation: a 65-year-old female was admitted to our hospital complaining of obstipation and vomiting. Her medical history notes non-insulin dependent diabetes mellitus without complications.

Clinical findings: initial presentation in a respiratory and hemodynamic stable condition without fever. She has bowel distension without features of peritonitis. Laboratory investigation is without abnormalities. CT abdomen revealed colonic distension without obstruction.

Course: abdominal pain was under control with supplemental metamizole (NSAID). However, in the course more oxygen was needed. Pulse oximetry showed oxygen saturation of 72% while arterial oxygen saturation was 97% suggestive of a 'saturation gap'. Methemoglobulin appeared 15.2% (reference range <1.5%). We started high flow nasal oxygen therapy. She developed progressive abdominal distension, which eventually led to enteric translocation. She was treated with amoxicillin/clavulanic acid and metronidazole. Hemoglobin level declined from 8.0 mmol/L to 3.0 mmol/L due to a Coombs negative hemolysis. She refused red blood cell transfusion due to personal believes. Because a G6PD deficiency was suspected, treatment with methylene blue was contraindicated. She developed multiple organ failure. CT imaging showed intestinal ischemia. Despite surgical intervention, her condition deteriorated and she passed away. She appeared G6PD deficient.

Discussion: when detecting a gap between pulse oximetry and arterial oxygen saturation be aware of the presence of methemoglobulin. In this situation, oxygen cannot be released to tissue. It can be the result of an enzyme deficiency but more often is the result of intoxication with nitrate containing medication, food or drugs. Methemoglobulinemia is sporadically described after NSAID exposure. Treatment with methylene blue can be considered, but is contra-indicated in G6PD deficient patients. G6PD deficiency itself can cause hemolysis. Our patient also didn't allow red blood cell transfusion.

Conclusion: methemoglobulinemia after metamizol exposure in a G6PD deficient patient complicated by hemolytic anemia. Methylene blue is contra-indicated. Refusal of red blood cell transfusion.

Literature:

A patient with both methemoglobinemia and G6PD deficiency: A therapeutic conundrum. Reading NS et al. Am. J. Hematol. 2017 May; 92(5):474-477

Naproxen-induced methemoglobinemia in an alcohol-dependent patient
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EP34
Tips and Ticks

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Teaser Case report

1. Het Guillain Barre syndroom (GBS) wordt vaak voorafgegaan door een Campylobacter jejuni infectie en kan leiden tot respiratoire insufficiëntie, waarvoor behandeling middels intraveneus immuunglobuline (IVIG) en plasmaferese.
2. Wij presenteren een patiënt met een beloop passend bij GBS, niet reagerend op IVIG.
3. Borrelia burgdorferi IgM bleek positief, klinisch herstel onder Ceftriaxon.
4. Overweeg neuroborreliose bij therapieresistente GBS.

Case report

Introduction: Guillain-Barre Syndrome (GBS) is an immune mediated polyneuropathy characterized by ascending weakness and areflexia. It can progress to respiratory failure. The most common antecedent event is a Campylobacter jejuni infection. Presence of Brighton criteria for GBS, such as symmetrical muscle weakness with areflexia and an albumin-cytological dissociation in the cerebral spine fluid (CSF), can aid in making the diagnosis GBS. Effective treatments are intravenous immune globulin (IVIG) and plasma exchange. We present a patient supposed having GBS with rapid resolution after starting Ceftriaxone.
Presentation: A seventy-year-old man, otherwise fit and well, was presented with peripheral weakness and tingling. He had a trip abroad one week prior to onset of symptoms. There were no gastro-intestinal complaints and no tick- or mosquito bites noticed.
Clinical findings: on presentation a fine rash was visible on his lower extremities. But the patient had abnormal vibration and proprioception with areflexia and developed progressive muscle weakness. Elevated protein 591 mg/L (reference rate 150-450 mg/L) and normal white blood cell count was found in the CSF. EMG: absence of F waves and H reflexes. The diagnosis GBS was made. No infections associated with GBS were detected (like Campylobacter jejuni, CMV,EBV, dengue virus, zika virus).
Course: progression to respiratory failure, the trachea was intubated. IVIG was started with lack of clinical improvement. Borrelia burgdorferi immunoblot IgM appeared positive (IgG negative). The clinical picture could be compatible with neuroborreliose. His symptoms resolved after 5 days Ceftriaxone. A follow-up sample showed IgG seroconversion for Borrelia burgdorferi.
Discussion: GBS triggered by Borrelia burgdorferi is rare. Neuroborreliosis can mimic GBS and should be considered in any suspected case. In this case we propose simultaneous existence of GBS and Neuroborreliosis with impact on treatment.
Conclusion: Neuroborreliosis as GBS mimic, GBS triggered by Borrelia burgdorferi or both.
Take home message: Consider neuroborreliosis in suspected GBS cases with impact on treatment.

Literature:
Clinical association: Lyme disease and Guillain-Barre syndrome.
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Schrestha and Kadkhoda IDCases 27 (2022)
1

EP35
Antisynthetase syndrome imitating pneumonia

Wessel van der Veen[1], Sonja Biesenbeek[2], Kristine Koekkoek[1]

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Teaser Case report

Een 57-jarige ICT'er werd opgenomen op de Intensive Care en geïntubeerd vanwege een ernstige pneumonie. Er werd gestart met antibiotica en na één dag kon de patiënt worden gedetubeerd. Echter moest de patiënt binnen 24 uur opnieuw geïntubeerd worden vanwege respiratoire achteruitgang. Bij nader lichamelijk onderzoek vielen "mechanic hands" op, welke een symptoom waren van een zeldzaam syndroom.

Case report

Introduction

Antisynthetase syndrome is an autoimmune disorder involving joints, muscles and lungs, with a prevalence of 1,5:100.000. It typically affects females between 43-60 years[1]. The disease is associated with antibodies against aminoacyl-tRNA synthetases, most commonly anti-Jo1. Symptoms include myositis, interstitial lung disease (ILD), and arthritis. However, only 20% presents with this triad. In addition hyperkeratotic plaques located on the fingers, "mechanic hands", are present in 38%. Diagnosis is based on clinical evaluation, serology, and imaging. Early treatment with steroids and immunosuppressants like rituximab improves prognosis, which depends on severity and organ involvement. Anti-Jo1 positive patients have 5-year survival rates of 90%, significantly higher than non-anti-Jo1 patients[2].

Patient information and timeline

A 57-year-old male presented at the emergency department with a cough, nasal congestion and transient arthralgia for three weeks. A chest X-ray showed bilateral consolidations and initial evaluation was indicative of pneumonia (Table 1). The patient was treated with antibiotics and oxygen. Because of worsening hypoxia, he was transferred to the ICU and was intubated. His condition improved under antibiotic treatment, allowing extubation. However, after 24 hours he showed respiratory deterioration, requiring re-intubation.

On clinical reassessment, mechanic hands were noticed (Figure 1), which could not be explained by our patients' daily work as an IT-specialist. There were no signs of arthritis. A CT-scan was suggestive for organizing pneumonia. Bronchoalveolar lavage culture results were negative. Serology revealed positive ENA and anti-Jo1 auto-antibodies, indicating antisynthetase syndrome. However, creatine kinase (CK) was relatively low.

Before anti-Jo1 auto-antibodies tested positive, empirical treatment with dexamethasone was started, upon which the patient clinically improved. After conforming the diagnosis, steroids were switched to prednisolone and remission was induced with rituximab. Five days after starting steroids, the patient was discharged from the ICU. In the months following discharge, he was slowly returning to normal daily activities.

Discussion

This case stresses the importance of reconsidering the diagnosis when the clinical course is not as expected. Our differential diagnosis included various causes of ILD, vasculitis, atypical infectious pneumonia and lung carcinoma. The case underlines that antisynthetase syndrome can present without arthritis or high CK levels. Arthralgia, however, had been present in the weeks before presentation, emphasizing the importance of thorough history taking.

References

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Vital signs	
Oxygen saturation	96% on 15L O2 NRM
Heart frequency	77/min
Blood pressure	142/73 mmHg
Temperature	38.7 °C
Laboratory results	
C-reactive protein	321 mg/L
Creatine kinase	1212 U/L

Figure 1: Table 1. Vital signs and laboratory results on presentation

Figure 2: Figure 1. Mechanic hands

EP36
Hyperinsulinemic-Euglycemic Therapy in a verapamil intoxication

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Teaser Case report

Ernstige calcium antagonist intoxicaties kunnen een lethale afloop hebben. Wij beschrijven een casereport waarbij een ernstige verapamilintoxicatie succesvol werd behandeld middels ons HIET protocol met zeer hoge dosis insuline, een voorbeeld voor de praktijk.

Case report

Presentation

A 45 year old female with a history of AVNRT, alcohol abuse and depression with a previous suicide attempt was admitted to the ER with a severe verapamil intoxication. Two hours before presentation she took 50 pills of 120mg verapamil retard and 10 tablets of naltrexon 50mg.

Clinical findings

She presented with symptoms of tachypnea, a BP of 78/55 mmHg and a heart rate of 72. Initially she had a GCS of 15, but shortly after presentation she lost consciousness. At the ER she received 1 gr calcium and i.v. fluids but her blood pressure remained low. She was admitted to the ICU were she developed a AV-nodal rhythm, a QTc time of 591ms and seizures.

Treatment regime

After admittance she was sedated and intubated. At first she received noradrenalin, calcium and a vasopressor analogue for her hemodynamic instability and a laxative with active carbon for absorption reduction. We started with Hyperinsulinemic-Euglycemic Therapy (HIET). The patient's weight was 53kg and therefore we started an insulin infusion with 55 IU/hr with a bolus of 60 IU and a glucose 50% infusion at 100 ml/hour.

Patient outcome

After the start of HIET vasopressors could be minimised, and after 5 hours (patient had defecated at this time) the HIET dosage could be decreased with 5 to 10 IU/hour. 8,5 hours after the start of HIET it was stopped. During the HIET potassium suppletion was given up to 360mmol/day.

Discussion and conclusion

Verapamil causes cardiac toxicity by decreasing the myocardial uptake of free fatty acids, making it more carbohydrate dependent and inhibiting pancreatic insulin release. The mechanism by which insulin works is that it and increases the uptake of glucose and lactate into the myocardial cells and has a positive inotropic effect.[1]. Calcium suppletion is necessary to increase the extracellular concentration of calcium so that will promote calcium influx via unblocked L type calcium channels and by this overcome the antagonistic effects [2]. Local HIET-protocol starts with a 1IU/kg insulin bolus continued by 0,5IU/kg/hour combined with a 25g glucose bolus continued by a 0,5-1 /kg/ hour infusion. Dosage can be adjusted according to clinical effect.

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The effect of CytoSorb hemoperfusion on severe carbamazepine intoxication

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Teaser Case report

Een 56-jarige comateuze patiënt werd opgenomen met een ernstige carbamazepine intoxicatie (50.1 mg/L; >20 mg/L is toxisch). Na 3 dagen hemodialyse daalt de concentratie naar 30.0 mg/L. CytoSorb hemoperfusie werd toegevoegd waarbij na één uur de spiegel gedaald was naar 20.5 mg/L bij een klaring van 90 mL/min. Echter, dit nam af naar 32 mL/min in negen uur.

Case report

Carbamazepine is an anti-convulsive drug, which is protein-bound with a molecular weight of 236 Da (1). Metabolization of carbamazepine occurs in the liver to carbamazepine-10,11-epoxide, after which it is excreted mainly in the urine. Plasma carbamazepine levels >20 mg/L are considered toxic and can lead to seizures, altered mental state, respiratory depression and hemodynamic instability, among other effects (1). Hemodialysis is currently considered the primary treatment for severe intoxication. We present the case of a 56-year old male patient with a severe carbamazepine intoxication, treated with hemodialysis followed by CytoSorb hemoperfusion. The patient had a history of hypertension, drug abuse (cocaine), epilepsy without use of medication, and a previous carbamazepine intoxication. He was found unresponsive (Glasgow coma scale of three) and brought to the emergency department. Initially, he was respiratory and hemodynamic stable with a normal electrocardiogram. In addition, pupils were equal and light reactive, glucose levels were normal, and he was normothermic. Other differential diagnosis were excluded. After clinical deterioration due to respiratory insufficiency, the patient was intubated and admitted at the intensive care unit. The toxicology report showed a plasma carbamazepine level of 50.1 mg/L, for which intermitted hemodialysis (iHD) was started, amongst active charcoal and laxatives. However, these levels were still in the toxic range after two days (30.0 mg/L), despite several iHD sessions and continuous venovenous hemodiafiltration (CVVHDF) (Figure 1). Therefore, CytoSorb hemoperfusion with CVVHDF was initiated (2). Pre- and post-CytoSorb blood samples were obtained at the start of treatment and at 1, 2, 4, 6, 8 and 9 hours after initiation. The CytoSorb adsorber had an initial clearance of 90 mL/min, with plasma carbamazepine levels decreasing from 30.0 to 20.5 mg/L in the first hour (Figure 2A). Clearance decreased in nine hours by 64% to 32 mL/min, possibly due to saturation of the adsorber (Figure 2B). As plasma carbamazepine levels were still above the toxic range, another iHD session was performed for 13.5 hours, after which plasma carbamazepine levels returned to normal (<12.0 mg/L). The patient was extubated on day 4 and was discharged from the hospital ten days after admission. To our knowledge, this is the first case in which the CytoSorb adsorber was successfully used for a carbamazepine intoxication. CytoSorb hemoperfusion can be considered for rapid clearance of carbamazepine intoxication, however timely renewal is essential due to saturation of the adsorber.

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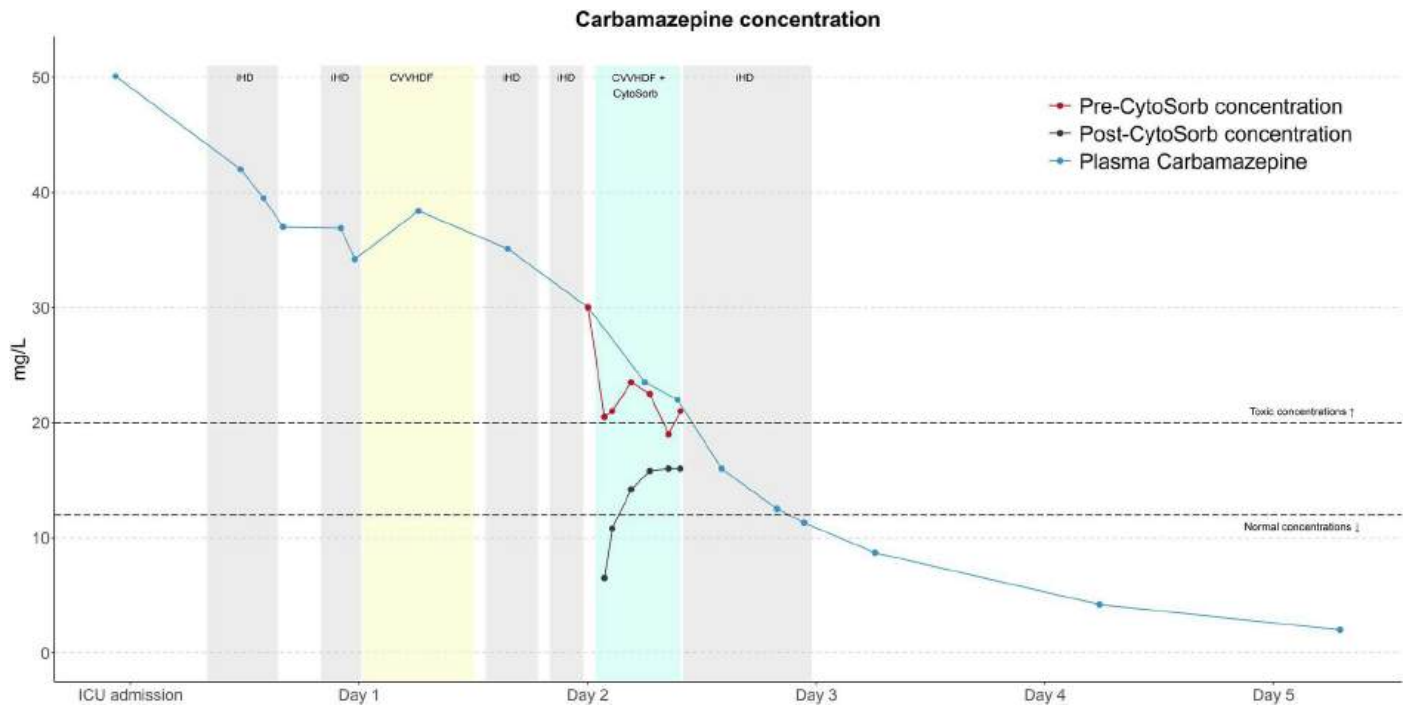
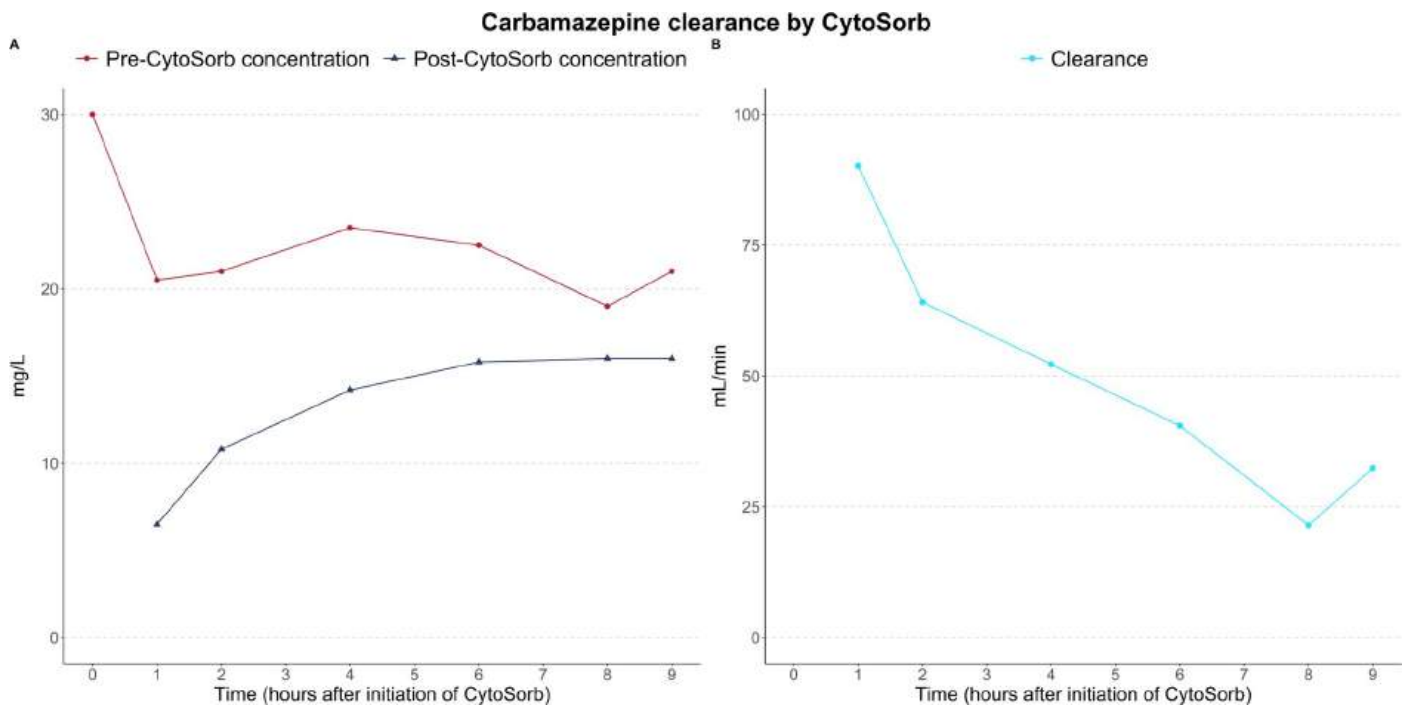*Figure 1: Figure 1: Overview of the plasma Carbamazepine concentrations over time.*

Figure 2: Figure 2: A) Plasma carbamazepine concentrations measured pre- and post-CytoSorb adsorber. B) Carbamazepine clearance of the CytoSorb adsorber.