

2022 CCSSA Congress Abstracts

A retrospective review of complications in a South African neurocritical care unit over one year

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Background. The establishment of a dedicated neurocritical care unit (NCCU) is well known to offer benefits to patients. These units are optimised to care for patients with various brain and spine pathologies. Complications peculiar to such units in low- and middle-income countries (LMICs) are relatively undocumented.

Objectives. To determine the complications in a NCCU at Groote Schuur Hospital (GSH) over one year and their association with length of stay (LOS) and mortality.

Methods. A retrospective review of complications of patients admitted to the NCCU at GSH from 1 January 2020 to 31 December 2020 as per NCCU patient data registry (HREC ethics approval: R012/2015).

Results. A total of 850 patients were admitted to the NCCU, with a median age of 43 years (high care) and 41 years (ICU), predominantly male (64%). The overall complication incidence rate was 38.2%. The statistically significant complications (p -value <0.05) were metabolic abnormalities (and their subcategories) as well as infection (subcategories ventilator-associated pneumonia (VAP), surgical site infection (SSI), central line-associated bloodstream infection (CLABSI) and deep-vein thrombosis (DVT). The most common complication was metabolic abnormalities at 28.2%, specifically sodium aberrations. LOS has been shown to have a statistically significant association with frequency of complications. Mortality, on the other hand, does not have a statistically significant association.

Conclusion. Complications in a dedicated NCCU in South Africa are mostly metabolic abnormalities and infections. The complications are associated with LOS and not with mortality.

Patient safety practices among professional nurses in a private health setting in Gauteng Province, South Africa

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Background. The rendering of safe and efficient quality patient care is very significant in nursing. Accordingly, nurses should be pivotal in planning and developments of all healthcare providers' patient safety systems and processes.

Objective. This study assessed nurses' practices related to patient safety within a private healthcare setting.

Methods. A convergent mixed method was used, the sample comprising professional nurses working in two private hospitals in Gauteng Province and utilising a two-stage sampling procedure

(starting with purposive sampling followed by simple random sampling). Data were collected using structured questionnaires for quantitative databases and open guides for qualitative databases. Data analysis utilised STATA 16, SPSS and ATLAS.ti. Ethical clearance was obtained from the ethics committee of UNISA and the private hospitals involved.

Results. A total of 63% of professional nurses demonstrated poor understanding of the concept of patient safety; professional nurses lacked training and awareness of patient safety as a public health crisis; the various units in the participating hospitals did not have quality alerts in place in respect of the areas of concern regarding patient safety issues; 74.06% of the professional nurses did not adhere to patient safety policies owing to excessive workload, burnout, stress, miscommunication and staff shortages; ~63% of professional nurses experienced guilt or vulnerability when required to write an incident report; and 63.21% of the professional nurses prioritised the patients' disease condition in the plan of care over the patients' safety.

Conclusion. Patient safety issues can improve by addressing the identified areas of concern.

Guidelines to improve patient safety practices among professional nurses in a private health setting

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Background. Most hospitals have standard operating procedures (SOPs) in place to enhance good patient quality outcomes; however, there are no patient safety guidelines in place to promote patient safety practices including adherence to these SOPs, and hence the need to develop such guidelines.

Objective. These guidelines are intended to enhance quality patient safety outcomes through the utilisation of evidence-based guidelines to improve nurses' adherence to patient safety protocols.

Methods. Guidelines were developed based on research findings from a mixed-method study. Participant responses and results from the data analysis with emphasis on the responses to 'what could be done to improve patient safety' and also 'what should be included in the development of the guidelines for patient safety practices'. In order to assess whether the developed guidelines are useful for nursing practice, a Delphi technique was used to obtain expert advice and input.

Results. The following areas were outlined as areas which can help to improve patient safety, and hence were included in the guidelines: stress management, staff shortages, corrective action, communication channels, quality alert, surveillance, knowledge acquisition, policy availability, environmental checks, functional equipment, personal protective equipment, patient empowerment, family involvement, screening, compassion, nursing process, nursing care rounds, punctuality and hand hygiene.

Conclusion. Formulated and well-structured guidelines can help to improve nurses' adherence to patient safety protocols.

Physicians' experiences of withdrawal of life-sustaining treatment in the adult intensive care unit: A qualitative study

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Background. Despite the advances in intensive care, one out of five patients die after being admitted to the intensive care unit (ICU). Most of these deaths occur after a decision to limit life-sustaining treatment. Physicians are placed in a precarious situation where they hold the overall responsibility for patients' treatment, including withdrawing treatment.

Objective. To explore the experiences of physicians participating in the withdrawal of life-sustaining treatment in the intensive care unit.

Method. An exploratory qualitative design was used. Nine physicians were purposively sampled from one adult ICU in an academic hospital. Interviews were transcribed verbatim and analysed using thematic analysis. An ethical clearance certificate (M210229) was obtained from the University of the Witwatersrand.

Results. Five main themes emerged after data analysis that described physicians' experiences, namely 'making the decision to withdraw treatment', 'shared feelings', 'navigating the challenges', 'supporting patient and family throughout the process' and 'learning from experience'. Physicians describe the decision to withdraw treatment as a process, often made on a case-by-case basis and taken over a period of time. Despite the challenges, it is their duty to support the patient and family throughout the process.

Conclusion. The withdrawal of treatment is an integral part of ICU practice. It is an area that most physicians are uncomfortable with, as they are not trained to deal with these issues, especially newly qualified, less experienced physicians. However, it is a skill that comes from experience. There is a need to support physicians through continuous end-of-life training and education.

Upper-limb muscle strength and exercise endurance as predictors of successful extubation in mechanically ventilated patients: A predictive correlational study

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Background. Failed extubation increases the length of stay in intensive care unit (ICU) and reduces the patient's functional ability. Avoiding failed extubation is of utmost importance; therefore predictors for successful extubation are paramount.

Objective. To determine if upper-limb muscle strength and exercise endurance can be used by physiotherapists as predictors for successful extubation in mechanically ventilated patients. The statistical objective of this study was to develop a prediction equation based on upper-limb muscle strength and exercise endurance for outcome of extubation.

Methods. A total of 57 patients were eligible for evaluation in the surgical and medical ICUs of an academic hospital in South Africa. Peripheral and respiratory muscle strength was evaluated using the Oxford grading scale, Medical Research Council score (MRC-score), handgrip dynamometer and maximum inspiratory pressure (MIP). Exercise endurance was tested while patients were riding the MOTomed letto2 cycle ergometer for six minutes with the upper limbs. Ethics approval ref. no. 394/2017 was provided.

Results. Exercise endurance (time the patient rode actively) ($p=0.005$), general body muscle strength (MRC score $p=0.007$) and number of days ventilated ($p=0.005$) were associated with successful extubation. The newly developed prediction equation comprised exercise endurance, and the number of days ventilated exhibits a sensitivity of 81.82% and a specificity of 77.14% to predict successful extubation. The equation indicated that if the number of days the patient is ventilated decreases, and the exercise endurance increases, the risk to fail extubation will decrease.

Conclusion. Exercise endurance incorporated in an algorithm shows excellent potential to predict successful extubation.

Improving continuous renal replacement therapy circuit lifespan at CHBAH ICU

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Background. Continuous renal replacement therapy (CRRT) is dependent on a properly functioning dialysis circuit. Circuit clotting results in interruptions in CRRT, increased blood loss, increased workload and increased cost. Optimising circuit duration is therefore central to safe and effective CRRT in the ICU.

Objective. To quantify circuit lifespan, assess the need for improvement, identify potential solutions, implement changes and assess the results of these changes.

Method. An audit was undertaken at CHBAH ICU. Ethical approval was obtained through the University of the Witwatersrand ethics committee. A retrospective review of the ICU databases was conducted to determine the circuit lifespan and potential causes of circuit malfunction. The circuit lifespan was found to be suboptimal, and potential problems in anticoagulation were identified. A quality improvement (QI) project was then launched after obtaining ethical approval from the ethics committee. Evidence based interventions reported to enhance circuit lifespan were implemented. Continuous data collection was employed to assess their success. Results indicated difficulties in implementing change. The QI project is ongoing.

Results. At audit, the median (IQR) circuit lifespan was suboptimal at 11 (6 - 20) hours ($p<0.05$). Longer-lasting filters were found to have received more heparin ($p<0.05$). The implemented QI interventions did not significantly improve median circuit lifespan. Non-adherence to the anticoagulation protocol was a contributing factor. QI interventions are under way to address this issue.

Conclusion. Improving circuit lifespan is central to optimising CRRT. It is an iterative process requiring ongoing audit and intervention.

Clinical features and outcomes of myasthenia gravis patients admitted to Charlotte Maxeke Johannesburg Academic Hospital ICU – 20-year retrospective study

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Background. There are limited data on the clinical characteristics and outcomes of patients with myasthenia gravis (MG) admitted to the intensive care unit (ICU).

Objectives. The aim was to study the clinical characteristics and outcomes of patients with MG admitted to the ICU in Johannesburg, South Africa, over 20 years.

Methods. A retrospective study was undertaken of patients with MG admitted to the multidisciplinary ICU of Charlotte Maxeke Johannesburg Academic Hospital over a 20-year period, from 1998 to 2017. From the case records, demographic data, clinical features, management and outcomes were assessed and reviewed.

Results. There were 34 patients with MG admitted to the ICU during this period, of whom 24 were female and 10 male. Their mean (SD) age was 37.4 (13.0) years, ranging from 16 - 66 years. Four patients were human immunodeficiency virus (HIV)-positive. The mean (SD) length of stay in ICU was 10.6 (20.1) days, ranging from 1 - 115 days. Two patients were diagnosed with MG in the ICU after failure to wean from the ventilator. Twenty-two patients were intubated and ventilated on admission. Morbidities included self-extubation, aspiration pneumonia and iatrogenic pneumothorax. History of thymectomy was present in 12 patients. The treatments received for MG included pyridostigmine (73.5%), corticosteroids (55.9%), azathioprine (35.3%), plasmapheresis (26.5%) and intravenous immunoglobulin (8.8%). Overall mortality was 5.9% in the ICU.

Conclusion. MG is a serious disorder with considerable morbidity and mortality. It is, however, a potentially manageable disease provided that appropriate ICU resources are available.

Comparison of the effects of electronic cigarette vapours and tobacco smoke extracts on human neutrophils *in vitro*

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Background. Electronic cigarettes (ECs) are delivery systems composed of nicotine and various chemicals. Although ECs are possibly safer than cigarettes, they contain toxicants which may interact with cells of the innate immune system, such as neutrophils (PMNL)

Objective. This study compared effects of aqueous EC aerosol extracts

plus/minus nicotine or those of cigarette smoke extract (CSE) on PMNL and platelet reactivity *in vitro*.

Methods. The generation of reactive oxygen species (ROS), degranulation (elastase release) and release of extracellular DNA (NETosis) was measured using chemiluminescence, and spectrophotometric and microscopic procedures, respectively, and expression of CD62P by activated platelets using a flow-cytometric procedure.

Results. Exposure of PMNL to EC aerosol extracts, with and without nicotine and CSE significantly inhibited ROS generation and elastase release by N-formyl-L-methionyl-L-leucyl-L-phenylalanine (fMLP, 1 µM)-activated PMNL. Pre-treatment of PMNL with CSE resulted in marked attenuation of phorbol 12-myristate 13-acetate (PMA, 6.25 nM)-mediated activation of release of extracellular DNA, but not by the EC extracts. Similarly, CSE, but not EC extracts, inhibited expression of CD62P by platelets activated with adenosine 5'-diphosphate (100 µM).

Conclusion. These observations suggest that EC aerosols may modulate immunoprotective activities of PMNL such as ROS production and elastase release, the effect of which was not enhanced by inclusion of nicotine. The inhibitory effects of CSE were significantly greater than those of EC extracts and included marked suppression of NET formation and platelet activation. If operative *in vivo*, these effects of EC extracts may compromise intrinsic pulmonary antimicrobial defence mechanisms, albeit less so than cigarette smoke.

Paediatric acute respiratory distress syndrome (pARDS) in South African paediatric intensive care units (PICU) – a multi-site point prevalence study

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Background. Paediatric acute respiratory distress syndrome (pARDS) has significant associated morbidity and mortality. The reported global incidence is 3 - 15% of paediatric intensive care unit (PICU) admissions.

Objective. To describe the prevalence and characteristics of pARDS in children admitted to SA PICUs, using Pediatric Acute Lung Injury Consensus Conference (PALICC) criteria.

Methods. A cross-sectional point-prevalence study of all children admitted to eight PICUs, with ethical approval for all sites. Data were collected on the 15th day of each month, for six months, using a centralised REDCap database.

Results. A total of 310 patients were included: 166 (53.5%) male; median (IQR) age 9.8 (3.1 - 32.9) months; 195 (62.9%) invasively mechanically ventilated. Seventy-one (22.9%) patients were classified as 'at risk' of pARDS; 95 patients (30.6%; 95% CI 2.47% - 37.5%) fulfilled pARDS criteria: mild (53, 58.2%), moderate (23, 25.3%) and severe (16, 17.6%). Median (IQR) admission PIM3 risk of mortality in patients with and without pARDS was 5.6 (3.4 - 12.1)% v. 3.9 (1.0 - 8.2)% ($p=0.002$). Diagnostic categories differed between pARDS and non-pARDS groups ($p=0.002$), with no difference in age, sex or comorbidities ($p>0.1$). On multivariable logistic regression, admission risk of mortality (aOR 1.43; 95% CI 1.15 - 1.77; $p=0.001$); having a respiratory disease (aOR 2.61; 95% CI 1.04 - 6.53; $p=0.04$) and being admitted to Greys Hospital PICU (aOR 13.4; 95% CI 1.3 - 139.0; $p=0.03$) were independently associated with PARDS.

Conclusion. The 30.6% prevalence of pARDS in South Africa is substantially higher than reports from other socio-geographical regions, highlighting the need for further research in this setting.

Machine learning models for the identification of critically ill children in South Africa

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Background. Development of artificial neural network models for paediatric critical illness in South Africa.

Objectives. Failures in identification, resuscitation and appropriate referral have been identified as 19 significant contributors to avoidable severity of illness and mortality in South African children. Machine learning models were developed to predict a composite outcome of death before discharge from hospital or admission to the PICU.

Design. Prospective, analytical cohort study.

Setting. A single-centre tertiary hospital in South Africa providing acute paediatric services.

Patients. Children under the age of 13 years presenting to the Paediatric Referral Area. Outcomes: Composite outcome of death before discharge or admission to the PICU.

Results. A total of 765 patients were included, with 116 instances of the study outcome. Models were developed on three sets of features: two derived from sequential floating feature selection and one from the Akaike information criterion to yield nine models. Models demonstrated good discrimination on cross-validation, with mean ROC AUCs greater than 0.8 and mean PRC AUCs greater than 0.53. ANN1, developed on an inclusive feature-set demonstrated the best discrimination, with a ROC AUC of 0.84 and a PRC AUC of 0.64. Model calibration was variable, with most models demonstrating weak calibration. Decision curve analysis demonstrated that all models were superior to baseline strategies, with ANN1 demonstrating the highest net benefit.

Conclusions. Models demonstrated satisfactory performance, with

the best performing model being an ANN model. Given the good performance of simpler models, these models should also be considered, given their advantage in ease of implementation.

Sonographic measures of the diaphragm at unit admission are linked with ventilation outcome

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Background. The time that patients spend on a ventilator is an important outcome of ICU. Increased time on ventilator (ToV) has been linked to increased mortality. Identifying patients at risk of prolonged intubation at unit admission could allow for focused treatment interventions to prevent ventilator-induced diaphragm dysfunction and reducing ToV. We investigated whether sonographic measures of the diaphragm within the first three days of unit admission are associated with ventilation time.

Objective. To determine which sonographic measurements are associated with length of mechanical ventilation.

Methods. The study was approved by the Health Research Ethics Committee of Stellenbosch University. Diaphragm sonography measurements were taken within 24 hours of intubation with ultrasound at the zone of apposition using a 5 - 12 MHz ultrasound transducer. Three tidal breaths were visualised, and thickness was measured at end-inspiration and end-expiration. Diaphragm thickening fraction (DTF) was calculated as the percent change between thickness at end-inspiration and end-expiration. Linear regressions were performed on ultrasound measurements, clinical data and ToV.

Results. Forty-nine mechanically ventilated participants were assessed within 24 hours of intubation. The median time on ventilator was 56.5 hours. There was a moderate correlation between inspiratory Tdi ($r=0.366$) and expiratory Tdi ($r=0.439$) with ToV. Inspiratory Tdi explained 21.3% of the ToV. DTF on unit admission was not associated with ToV ($p=0.10$).

Conclusion. Sonographic measures at unit admission are linked to ventilation outcome. Initial inspiratory and expiratory Tdi are associated with ToV. The clinical utility of these findings needs further investigation.

Intensive care nurses' knowledge of pressure injury prevention

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Background. Pressure injuries (PI) continue to be a major public health concern despite current scientific and technological advancement in PI prevention. PI development risk is greater for patients in ICU owing to severe illness, presence of comorbidities, restricted movement, and bed-rest complications, thus delaying recovery and increasing mortality. Even though the prevention of PIs is a multidisciplinary responsibility, nurses play an important preventative role.

Objective. To describe ICU nurses' knowledge of pressure injury prevention. Ethical clearance was obtained from the university's Human

Resource Ethics Committee (reference M200364). Data were collected in four ICUs.

Methods. A quantitative, descriptive and cross-sectional design was used. The sample comprised 101 respondents. The PUKAT 2.0 questionnaire was used to collect data. Data were analysed using descriptive and inferential statistical tests.

Results. A score of 15/25 (60%) indicates an adequate knowledge of pressure injuries. Only six respondents scored 60% and above. These findings suggest that ICU nurses cannot contribute effectively to the prevention of PIs. The lowest scores were in prevention of PIs, classification and observation (25%). The highest scores (100%) were found in risk assessment and nutrition. The fact that ICU nurses lack knowledge of prevention measures, classification and observation of stages may indicate that they may not be able to use risk-assessment tools effectively in clinical practice.

Conclusion. Improving training and providing ICU nurses with adequate information about current strategies and evidence-based practices to prevent PIs could strengthen their contribution to patient safety.

Flexible bronchoscopy in critically ill patients with Covid-19 pneumonia at Chris Hani Baragwanath Hospital, South Africa: A prospective observational trial

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Background. Ventilatory difficulty owing to mucous plug-related airway obstruction and the utility of flexible bronchoscopy has been reported.

Objective. To determine the effect of bronchoscopic mucous plug aspiration on ventilatory requirements.

Method. A prospective observational study at Chris Hani Baragwanath Academic Hospital Covid ICU (2021 - 2022). Ethical approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (HREC).

Results. We enrolled 17 patients with a median age of 46 years (IQR 36 - 55), 41% were female, and 56% were diabetic, hypertensive or both. Median SOFA score and PF ratio were 9.5 (IQR 8 - 12) and 105.8 (IQR 89.9 - 173.2), respectively. Median duration from admission to bronchoscopy was 14 days (IQR 10 - 16). Oxygenation index (OI) was not significantly different between T0 (pre-bronchoscopy) and 24 hours later (T24). Set peak pressure (PS) decreased from a median of 26 cmH₂O (IQR 14 - 26, n=14) (T0) to 20 cmH₂O (IQR 14 - 20, n=13) (T24), $p=0.04$. Median tidal volume increased significantly from 450 mL (IQR 347.5 - 620, n=16) to 532 mL (IQR 418 - 630.5, n=16) at 6 hours post bronchoscopy, $p=0.03$. There were no significant changes in PaCO₂ and lung ultrasound findings during this 24-hour period. No patients experienced a decrease in MAP below 65 mmHg or oxygen saturation below 90%. Using standard PPE, none of the study doctors was infected during the bronchoscopy procedures. Median LOS was 19 days (IQR 17 - 28) and the ICU mortality rate was 76% (13/17).

Conclusion. Bronchoscopy was not associated with short-term oxygen desaturation or haemodynamic instability. It was associated with improved tidal volumes and lower pressure requirements.

Calcium channel blocker (CCB) toxicity in critically ill patients: An observational study

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Background. Calcium channel blockers (CCBs) account for 35% of cardiovascular drug overdoses in the USA, the management is variable and the burden in our setting is undefined.

Objective. To determine the prevalence of CCB overdose at Chris Hani Baragwanath Academic Hospital adult intensive care unit (ICU), management strategies and patient outcomes.

Method. We performed a retrospective observational study (2020 - 2021). Ethical approval was obtained from the University of the Witwatersrand's Human Research Ethics Committee (HREC).

Results. We admitted 1 317 patients to the ICU during the study period. The prevalence of toxin ingestion admissions was 14%. The 95% confidence interval (CI) was 13 - 15%. CCB overdose accounted for 5% (CI 3 - 7%) of toxin ingestion admissions. After correction of volume status, the frequencies of interventions utilised were vasopressors (78%), HIE therapy (67%), calcium (44%), methylene blue (11%) and hemoperfusion (44%). Maximum vasopressor dose was achieved in the first 8 hours while lactate levels peaked 8 hours after admission. The median durations of ventilation, vasopressor use and length of ICU stay were 6 days (CI 0 - 7), 5 days (CI 4 - 6) and 9 days (CI 6 - 11), respectively. Patients receiving haemoperfusion had a trend to lower duration of ventilation (2 fewer days), vasopressor days (1.5 fewer days) and ICU LOS (1.5 fewer days). ICU mortality was 33% for the group and 25% for those undergoing haemoperfusion.

Conclusion. CCB overdose is a significant healthcare burden with a high mortality. Novel strategies such as hemoperfusion may be considered when disease is refractory to standard therapy.

Pulmonary ultrasound in Covid-19 and non-Covid-19 pneumonia in South Africa

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Background. Pulmonary ultrasound (US) techniques have historically been applied to acute lung diseases, particularly in critical care, to describe lung lesions.

Objective. To explore the role of lung US for hospitalised community-acquired pneumonia (CAP) during the Covid-19 pandemic.

Method. Prospective observational study at Chris Hani Baragwanath Academic Hospital Covid ICU (2020 - 2022). Ethical approval was obtained from the University of the Witwatersrand's Human Research Ethics Committee (HREC).

Results. We enrolled 72 patients, 48 with Covid-19 CAP and 24 non-Covid-19 CAP. Of the Covid group, 60% (29/48), and 58% (14/24) of the non-Covid-19 group, had an admission P/F ratio <150, $p=0.87$. Covid pneumonia patients had predominant B-line pattern on the right side. Non-Covid pneumonia patients had a predominant pattern of consolidation

(C pattern) in the RUZ and RMZ. Lung ultrasound signs on the left side also reflected a predominant B-line pattern among Covid pneumonia patients, while among non-Covid pneumonia patients there was no dominant pattern. We found significant inverse correlations between P/F ratio and both a B-line pattern with confluence (BC), $r=-0.31$ and B-lines without confluence (B-lines >3), $r=-0.28$. A higher SAPS II score (positive predictor), higher RUZ US score (negative predictor) and absence of B lines in RUZ (negative predictor) were independent predictors of hospital mortality using multiple logistic regression model.

Conclusion. A simple six-point lung US examination was able to provide a characteristic profile to aid in the differentiation of Covid-19 pneumonia. This profile was associated with a lower P/F ratio and a higher hospital mortality.

From newly qualified to competent: How to bridge the gap?

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Background. Having practice-ready professional nurses in the ICU is no longer an expectation but is essential, owing to a shortage of professional nurses, fiscal constraints, increasing patient acuity, and a projected acute increase in nurse shortages. Newly qualified professional nurses are expected to arrive and 'hit the floor running' but are confronted with expectations and situations beyond undergraduate preparation for practice. The question remains: How do we empower novice professional nurses to be practice ready?

Objective. To provide recommendations to prepare student nurses with the necessary skills, knowledge, values and ethical standards to become practice-ready professional nurses.

Method. This study utilised a sequential explanatory mixed method. Census and purposive sampling methods were utilised.

Results. The integrated results identified four factors that affected the nursing student's perceived readiness for practice in the ICU: (i) support for new professional nurses; (ii) their need for professional socialisation and belonging; (iii) orientation and skill development; and (iv) rotation and exposure in the clinical learning environment as a student.

Conclusion. Multifaceted innovative introduction programmes may assist in 'closing the gap' and assisting the newly qualified professional nurse to become competent.

A survey to determine patient safety culture in the intensive care units of a selected private hospital

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Background. Patient safety culture comprises the shared values, beliefs, competencies and behaviours of an individual and a group of staff working together in an organisation to promote patient safety. Patient safety culture determines the ability of an organisation to reduce the safety risk of patients. Assessment of safety culture is important for improving patient safety in a healthcare organisation which is measured by global surveys.

Objective. To determine the existing patient safety culture in the ICUs of a selected private hospital.

Methods. In this study, the researcher used descriptive non-experimental quantitative research to determine the existing patient safety culture in the ICUs of the selected private hospital. The study was approved by the Research Ethics Committee of the Faculty of Health Sciences, University of Pretoria. The researcher obtained permission from the selected private hospital in Gauteng. The respondents were purposively selected registered nurses including ICU-trained, non-ICU-trained and enrolled nurses working in the ICUs.

Results. Teamwork within the unit, organisational learning and continuous improvement, feedback and communication concerning errors were essential in creating a patient safety culture. Moreover, improving staffing, non-punitive response to errors, supervisor/manager communication openness, management support for patient safety, handoffs and transition (handover), teamwork across units, and hours per week worked in the ICU require urgent attention.

Conclusion. The results should contribute to improving patient safety.

Healthcare professionals' perception of knowledge and implementation of patient safety incident reporting and learning guidelines in specialised care units, KwaZulu-Natal

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Background. Despite the implementation of intervention strategies, patient safety incidents (PSI) in specialised care units remain high and are of serious concern, worldwide.

Objectives. To determine healthcare professionals' perception of knowledge and implementation of patient safety incident reporting and learning guidelines in specialised care units of three major selected public hospitals in KwaZulu-Natal, South Africa.

Methods. A descriptive, cross-sectional survey design was used. A purposive sample of 237 subjects from three major selected public hospitals in two districts of KwaZulu-Natal was targeted. Ethical clearance was obtained from the University of KwaZulu-Natal Human Science Research Ethics committee (HSSREC/00001651/2020). Ethical clearance was also obtained from the Department of Health, prior data collection (NHRD Ref: Kz_202010_0240). An online structured questionnaire was used to collect data. A descriptive statistical analysis was conducted initially prior to the inferential statistics.

Results. A total of 181 questionnaires were returned, yielding a response rate of 76%. Notably, 83% of respondents had high levels of perceived knowledge on the PSI Reporting and Learning guidelines. However, 97.6% had low perceptions of the implementation of PSI reporting and learning guidelines. The respondents' age ($p=0.05$), current unit ($p=0.015$) and shift of the day ($p=0.000$) were significantly associated with perception of implementation of the PSI Learning and Reporting guidelines.

Conclusion. The respondents demonstrated a good perception of knowledge of PSI Reporting and Learning guidelines; however, perception of the implementation of the PSI Reporting and Learning guidelines was poor. Effective awareness during in-service training and continuous professional development for healthcare professionals is recommended.

The management of inpatient hyperglycaemia by intensivists in South African hospitals

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Background. Hyperglycaemia is highly prevalent in intensive care unit (ICU) patients and is associated with poor outcomes. Despite international guidelines on managing hyperglycaemia in critically ill patients, data are limited about the management of these patients in South Africa.

Objective. To investigate intensivist practices in the management of inpatient hyperglycaemia in South African ICUs.

Methods. An observational cross-sectional study surveyed 63 intensivists in the state and private sector followed by a validation audit of 111 ICU patients at three major Johannesburg academic hospitals.

Results. An equal number of respondents practised in the state or privately (42.9%) while 14.2% practised in both sectors. Hyperglycaemia was defined as >10 mmol/L (interquartile range (IQR) 8 - 11) and hypoglycaemia <4 mmol/L (IQR 3.5 - 4). Oral hypoglycaemic agents were used by 34.9% of survey respondents (metformin 28.6% and sulfonylureas 17.5%) but just 14.4% in the audit (metformin 14.4% and sulfonylureas 0.9%). Regarding insulin, in the survey 30.2% continued, 39.6% stopped, 15.9% reduced and 14.3% increased prehospital doses. Insulin infusion was the preferred regimen (34.9%), then sliding-scale insulin (SSI) (30.1%) and combined basal insulin and SSI (27%). Of audited patients, 59.5% ($p<0.001$) were managed with SSI alone and 14.4% by infusion ($p=0.002$). Although 87.3% reported daily review of therapy, this was noted in just 3.6% of the audit ($p<0.001$).

Conclusion. Reported and observed practices by intensivists diverge from current guidelines. Currently, some critically ill patients receive therapy that has potential for harm. These results suggest a lack of knowledge and inertia in the management of hyperglycaemia in the ICU.

Oxygen-efficient respiratory aid (OxEra device: A safety study)

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Background. The oxygen-efficient respiratory aid (OxEra) device delivers adjustable positive expiratory pressure (PEP) and is efficient in oxygen use.

Objectives. To ensure no asphyxiation (change from baseline end tidal carbon dioxide (ETCO₂) exceeding 6.3 mmHg and above the 45 mmHg threshold).

Methods. A safety study of the OxEra device was done on 30 healthy participants. Each participant had basic vitals, ETCO₂, and oxygen saturation (SpO₂%) recorded at baseline for 2 h. In the first 20 minutes, the PEP was increased by 5 cmH₂O until 20 cmH₂O, then continued for the rest of the time on a PEP of 5 cmH₂O. At each interval, vital signs, subjective comfort, pain and visual scores were measured.

Results. There was no significant change in ETCO₂ from baseline to 2 h. The median increase in ETCO₂ was 2 mmHg. The VAS and comfort score had a significant increase over the 2 h from baseline of 0 - 2 at maximum; however, the PAS scores showed no significant increase.

Conclusion. Overall, the OxEra device achieved the safety endpoints set out, with no sign of asphyxiation and appropriate physiological responses to changes in PEP. The comfort of the mask worsened over the 2 h; however, the scores were minimally worse on PEP application but improved with withdrawal of PEP. No adverse events were recorded.

The clinical utility of the best care always bundle (BCAB) for the prevention of ventilator-associated pneumonia (VAP) in patients with severe traumatic brain injury (STBI)

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Background. STBI is a risk factor for VAP. In STBI, VAP is associated with worse neurological outcomes.

Objective. To quantify the impact of BCAB on the VAP rate in STBI patients.

Methods. A retrospective review of STBI patients 12 months before (cohort 1) and after (cohort 2) implementation of the VAP-BCAB. Primary outcome was the VAP incidence after implementation of BCAB. Secondary outcomes included duration of mechanical ventilation (MV), neuro-critical care unit (NCCU) and hospital LOS, mortality, tracheostomy rate, re-intubation rate, and antibiotic use. Adherence to the VAP-BCAB and correlation with the VAP rate were also analysed.

Results. Of the patients in cohort 1, 24.68% had VAP and, in cohort 2, 18.56% ($p=0.163$). Duration of MV was 6.68 days (5.44 - 7.92), 7.25 days (6.13 - 8.36) in cohort 1 and 2, respectively ($p=0.520$). NCCU LoS was 10.65 days (8.94 - 12.36), and 10.35 days (8.85 - 11.84) in cohort 1 and 2, respectively ($p=0.797$). Hospital LoS was 21.54 days (16.15 - 26.94), and 17.96 days (15.29 - 20.63) in cohort 1 and 2, respectively ($p=0.246$). Thirty tracheostomies (37.5%) were recorded in cohort 1, 33 (31.73%) in cohort 2 ($p=0.219$). Thirteen re-intubations (20%) were recorded in cohort 1, 9 (10.23%) in cohort 2 ($p=0.055$). The VAP rate was lower (7%) in months with high adherence rates to the VAP-BCAB, compared with higher VAP-rates (28%) ($p=0.003$) in months with low adherence.

Conclusion. The clinical utility of the VAP-BCAB for the prevention of VAPs in STBI was clear, but only where adherence to the bundle was high.

SASPEN Abstracts

Assessment of the clinical usability of adult undernutrition diagnostic criteria in an academic hospital, Gauteng Province, South Africa

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Background. The Global Leadership Initiative on Malnutrition (GLIM) provides possible consensus for diagnosing adult undernutrition. There is uncertainty on the utilisation of these criteria in resource-limited hospitals.

Objective. To determine (i) the clinical usability of selected GLIM criteria in a resource-limited academic hospital in Gauteng Province; and (ii) the number of patients diagnosed as undernourished using provided equipment compared with available hospital resources.

Methods. A descriptive, observational, cross-sectional study was conducted in adult internal medicine and surgical wards in an academic hospital in Gauteng during April 2020. Ethical approval was obtained from the Faculty of Health Sciences Research Ethics Committee, University of Pretoria, and the academic hospital's Research Committee. Ninety-five patients were included using non-random convenient sampling. Patients were screened on admission using phenotypical criteria (nonvolitional weight loss, body mass index (BMI), reduced muscle mass (mid-upper arm circumference (MUAC) and handgrip strength (HGS)) and aetiological criteria (reduced food intake, inflammation prevalence (C-reactive protein (CRP) and medical diagnosis)).

Results. Fifty-four (56.84%) patients were identified as undernourished using provided equipment compared with seven (11.58%) utilising hospital resources. Weight loss could be determined in 45.26% of patients compared with 75.59% for BMI, 98.95% for MUAC and 94.74% for HGS, respectively. CRP could only be obtained from 43.16% patient files and medical diagnosis from 77.89% patient files. Ninety-two (96.84%) patients could report on food intake.

Conclusions. Undernutrition prevalence in adult hospitalised patients in South Africa is high. However, inadequate resources may result in under-reporting. MUAC and oral history intake seem to be the most clinical usable GLIM criteria in resource-limited hospitals.

Early economical benefits of peri-operative nasojejunal tube feeding in non-critical care adult surgical patients with gastric feed intolerance

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Background. Peri-operative short- or medium-term enteral nutrition (EN) via nasojejunal tube (NJT) is an option for anatomical gastric feed intolerance.

Objective. To determine duration of usage required to justify the high insertion costs of fluoroscopic-guided endoscopically placed NJTs.

Methods. Indication, successful insertion, and duration of NJT patency were determined. NJT insertion costs were compared with central venous catheter (CVC) insertion. EN costs over a hypothetical 28-day period factored in expected NJT replacements owing to blockage and were compared with parenteral nutrition (PN) via CVC, including routine CVC changes every 10 days. Public and private sectors were compared (University of Cape Town HREC 658/2020).

Results. One hundred and two NJTs were placed successfully (93.6%), with gastric outlet obstruction the most frequent indication (40.4%) with a median 10 days' (range 1 - 68 days, interquartile range (IQR) 6 - 16.75 days) usage. Irreversible blockage occurred in 33 tubes after a median 9 days (range 3 - 34 days; IQR 4.75 - 16 days). Calculated EN costs over 28 days, including NJT replacement every 9 days, reached US\$1 676.12 and PN costs with CVC replacement every 10 days, US\$3 461.35 ($p < 0.001$) in the public sector. In the private sector, PN costs at 28 days were significantly higher ($p < 0.001$) at US\$5 261.14 compared with EN US\$3 780.71. The cost benefit of EN via NJT over PN is seen after 3 days in public, and 4 days in the private sector.

Conclusion. Exponential cost saving occurs with EN via NJT, even when factoring in the likelihood of endoscopic NJT replacements.

The incidence of hypophosphataemia in at-risk upper gastrointestinal surgical patients treated according to refeeding guidelines

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Background. Refeeding syndrome (RFS) is a severe fluid and electrolyte shift occurring in malnourished patients on commencing oral, enteral or parenteral nutrition, with severe hypophosphataemia described as the hallmark thereof.

Objective. To determine the incidence of refeeding hypophosphataemia developing despite the controlled introduction of nutrition according to refeeding guidelines.

Methods. A retrospective review of electrolyte disturbances occurring within 72 hours of commencement of perioperative nutritional support in patients identified at risk of RFS (University of Cape Town HREC 800/2018).

Results. Seventy-six patients (mean age 54.2 years (range 26 - 80 years; 44 (57.9%) male) admitted for perioperative nutritional optimisation at risk of RFS with a median admission body mass index (BMI) of 18.47 kg/m², (interquartile range (IQR) 16.26 - 22.47 kg/m²) were included. The most common underlying pathology was gastric outlet obstruction (70; 92.1%). The majority (90.8%) had at least one major risk criterion for RFS according to the National Institute for Clinical Excellence. Enteral nutrition (via nasojejunal tube in 82.9%) was given in 41 (53.9%) patients; and parenteral nutrition in 35 (46.1%). Forty-four patients (57.9%) met the criteria for refeeding hypophosphataemia (drop in phosphate to < 0.65 mmol/L or a drop by > 0.16 mmol/L). Forty-two (55.3%) required intravenous electrolyte replacement (potassium in 35.5%, phosphate in 38.2%, magnesium in 27.6%, calcium in 2.6%).

Conclusion. Despite strict adherence to refeeding guidelines, the majority of patients at risk of RFS developed refeeding hypophosphataemia, with most requiring one or more electrolytes replaced.

Bedside ultrasound: A reliable tool to assess musculoskeletal quantity and quality in critical illness

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Background. Bedside ultrasound (US) is a non-invasive tool to monitor musculoskeletal quantity (cross-sectional area (CSA)) and quality (echogenicity) in critically ill patients.

Objective. This pilot determined the accuracy and reliability of imaging performed by investigators and of analyses by blinded assessors.

Methods. The study was approved by the Stellenbosch University Health Research Ethics Committee (M20/08/023). The investigators (one trained for US and one a trainee) performed rectus femoris quadriceps B-mode US with a 4-12 MHz linear transducer array (Philips Lumify 795005, RSA) using standardised methodology. For inter-rater accuracy, imaging was performed independently on 32 participants by both investigators, and for intra-rater reliability both obtained a second image on 15 participants. Two blinded assessors performed image acquisition analyses (CSA and echogenicity) on 11 of the participants using ImageJ software (NIH, Bethesda, MD). Inter- and intra-rater reliability were determined by calculating intraclass correlation coefficients (ICC) and 95% confidence intervals, based on an absolute-agreement, 2-way mixed-effects model. ICC values were classified as poor (ICC<0.40), fair (ICC=0.40 - 0.59), good (ICC=0.60 - 0.74) and excellent (ICC=0.75 - 1.0).

Results. Imaging accuracy showed good to excellent reliability for inter-rater (ICC=0.85 - 0.95) and excellent intra-rater reliability (ICC=0.91 - 0.94). There were no statistically significant differences between the two investigators (mean for CSA=0.18 cm², 95% confidence interval (CI) 1.10 - 0.75, $p=0.704$; mean for echogenicity=-6.62, CI 11.97 - 25.22, $p=0.479$). Inter-rater reliability for measurement analysis between assessors was excellent (ICC=0.97 - 1.0).

Conclusion. US technique showed good to excellent reliability and reproducibility. Training dietitians to perform bedside US is potentially valuable to identify high-risk patients with low muscle mass and quality.

Malnutrition prevalence and severity grading in South African public and private hospitals using the GLIM criteria

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Background. The Global Leadership Initiative on Malnutrition (GLIM) is a developed consensus to standardise global diagnosis of adult malnutrition and comparison across clinical and geographical settings.

Objective. To determine the prevalence and severity of malnutrition according to the GLIM criteria in South African public and private hospitals, and to determine its comparative validity relative to the ESPEN malnutrition diagnostic criteria (EDC).

Method. A diagnostic accuracy study was conducted in three public and two private hospitals, following ethical approval. Malnutrition risk was assessed using the Malnutrition Universal Screening Tool (MUST). For GLIM, bio-electrical impedance quantified muscle mass, and biomarkers the presence of inflammation. Associations were evaluated with chi-square tests, while Cohen's kappa, sensitivity (Se), specificity (Sp), and positive (PPV) and negative predictive values (NPV) determined strength of agreement.

Results. Half ($n=350$) of 696 patients screened for malnutrition risk (MUST>1), were at increased risk (public $n=580$, 51%; private: $n=116$, 48%) and included in the final sample; 29% ($n=203$) were malnourished according to GLIM, with public hospital patients significantly more ($p<0.001$) malnourished ($n=183$, 31.6%) than private hospital patients ($n=20$, 17.2%). Of the final, whole sample, 55% and 39% were classified as moderate malnutrition and 31% and 27% as severe according to percentage weight loss and low body mass index, respectively. Agreement between GLIM and EDC was low (kappa=0.161; 95% CI 0.057 - 0.265; $p=0.03$; Se=64%; Sp=52%; PPV=64%; NPV=49%).

Conclusion. A third of patients were malnourished (per GLIM), of whom almost a third were severely malnourished. Low agreement existed between GLIM and EDC to diagnose malnutrition.

