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Point of care testing in critical care – Do blood gas and laboratory measurements correlate?

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Introduction Initial assessment and management of the acutely ill patient partly relies on the biochemical and haematological assessment of a condition. Whilst a medical laboratory provides the definitive test, there is an inevitable delay in results. Point of care testing by arterial blood gas analysis, is widely used to provide more rapid clinical information which can inform therapy, place of care and prognosis. Despite both techniques being performed to UK standards [1] there may be a difference between the reported results, and whilst these may be within the normal variance of the technique, discrepancies could potentially affect immediate clinical care. ***Methods*** 89 patients were included in the study. Laboratory and blood gas sodium, potassium, and haemoglobin results were compared from matched samples taken for routine daily bloods. Groups were compared with an unpaired t-test. ***Results*** Both sodium and potassium levels were statistically different when the two techniques were compared, with the blood gas analyser tending to report higher results. Blood gas sodium levels in particular also had a wider standard deviation compared to the lab. The differences in haemoglobin levels were not statistically significant. ***Discussion*** Caution should be exercised when basing clinical decisions upon biochemistry results from the blood gas analyser; however with the exception of sodium measurements an extremely high or low result is likely to represent the true clinical state of the patient. Consideration should be given to repeating samples and also to using trends to guide therapy rather than individual numbers. This study does not look at decision making by the clinical staff, nor actual clinical relevance to the individual patients.

Table 1.

Parameter	Sodium (mmol/l)		Potassium (mmol/l)		Hemoglobin (g/dl)	
	Lab	ABG	Lab	ABG	Lab	ABG
Mean	134.0	137.8	3.9	4.3	9.51	9.76
SD	6.0	14.4	0.52	0.52	1.7	1.7
SEM	0.65	1.54	0.06	0.06	0.18	0.18
p value	$p=0.027$		$p<0.001$		$p=0.36$	

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Implementation of antimicrobial copper in Neonatal Intensive Care Unit

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Aim The aim of this study was to investigate the effectiveness of the application of antimicrobial copper alloys (Cu+) in a Neonatal Intensive Care Unit (NICU) in relation to the reduction of microbial flora. ***Materials and methods*** At a Level III Neonatal Intensive Care Unit of a pediatric hospital, with the capacity of twenty six (26) incubators, antimicrobial copper (Cu+) was implemented on touch surfaces and objects. The copper alloy contains Cu 63% – Zn 37% (Lead Low). Microbiological cultures were taken in three different time periods, before and after the application of Cu+, using dry and wet method technique. ***Results*** In the

above NICU, the reduction of microbial flora after the implementation of the antimicrobial copper (Cu+) on the selected surfaces and objects was statistically significant (n=15, p<0,05) and was recorded at 90%. The pathogens isolated at high rates (CFU/ml) prior to copper implementation were as follows: *Klebsiella* spp., *Staphyloccocus epidermidis, Staphylococcus aureus*, *Enterococcus* spp. ***Conclusions*** This study highlights the positive impact of antimicrobial copper (Cu+) and demonstrates that copper implemented surfaces and objects are effective in neutralizing bacteria, which are responsible for Health Care Acquired Infections in the nosocomial environment (HCAIs). The innovative implementation of antimicrobial copper in the NICU and the significant reduction of microbial flora heralds the reduction of antimicrobial drugs use, and a possible reduction of hospital acquired infections and hospitalization time.

Patient satisfaction with anaesthesia and intensive care at The Heart Hospital, London

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Introduction and objectives Patient satisfaction is an increasingly important measure of quality of care and is playing an influential role in policy structure and institutional funding [2]. We conducted a survey at the Heart Hospital intensive care unit (ICU) in order to determine patient satisfaction relating to anaesthesia and ICU stay. ***Methods*** This prospective survey was conducted over two months using a validated questionnaire adapted to the patient population [1]. It was distributed to and collected from patients who required ICU admission following general anaesthesia for cardiothoracic surgery, prior to discharge from hospital. ***Results*** 100 questionnaires were received and analysed. 95% of patients were satisfied with the amount of information they received about their operation, their anaesthetic and ICU stay, the majority being very satisfied. The identity and role of the anaesthetist was understood by 90% of patients and 93% felt able to ask questions. Varying degrees of anxiety relating to awareness during surgery, pain and ICU stay were reported by 36%, 66% and 39% of patients respectively; 85% reported that their healthcare team helped alleviate these anxieties. Postoperative analgesia was discussed and understood by 90% patients. Varying degrees of pain and sore throat were the commonest postoperative complaints, 80% and 60% of patients respectively, however 99% of patients felt all was done to relieve their symptoms. More than 90% of patients were satisfied or very satisfied with their healthcare teams regarding professionalism, politeness, respect for dignity and privacy. 94% of patients were very satisfied or satisfied with attention received from healthcare teams regarding their questions and needs. Operations were delayed in 23% of cases; 85% of patients received an explanation for the delay and 95% found the explanation acceptable. Overall 97% of patients reported their anaesthetic journey and intensive care stay were well organised. ***Conclusions*** Patient satisfaction was generally high and patients were complimentary about their experience. We aim to instigate changes to enhance patient satisfaction through the use of checklists and protocols to ensure a minimum standard of information and care. Stringent and validated patient satisfaction questionnaires will likely become a necessity in the future.

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A case of hyperammonaemia on the intensive care unit and its subsequent management

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Background Hyperammonaemia can lead to significant morbidity and mortality if not treated appropriately. Most often seen as a result of genetic mutations in newborn babies, these metabolic disorders may also be unmasked in adults by concurrent disease. ***Objective*** To review a case of hyperammonaemia precipitated by sepsis and diabetic ketoacidosis while providing diagnostic options for future cases. ***Design*** Case Report. ***Setting*** Teaching hospital, inpatient setting. ***Patient*** A 58 year old female was assessed and admitted by the intensive care team after a period of fluctuating Glasgow Coma Scale (GCS) prior to developing encephalopathy. This was found to be due to a raised ammonia level of 1200 micromol/ L. ***Interventions*** A variety of clinical, biochemical and genetic studies were undertaken to establish a cause. Pharmacological and non-pharmacological techniques were utilised in an attempt to control the ammonia levels. ***Results*** We aim to provide a useful guide to investigating and diagnosing potential conditions causing hyperammonaemia

on the intensive care unit. ***Conclusion*** This case demonstrates the potential difficulties in diagnosis and treatment of a condition that is seen within intensive care units across the country. It offers a review of diagnostic pathways and treatment options for the treating clinician.

A review of patients admitted to critical care with decompensated liver disease - a District General Hospital experience

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Introduction Liver disease is the fifth commonest cause of death in the UK with alcoholic cirrhosis representing 50—70% of chronic liver disease in the West. Decompensated liver disease is associated with a hospital mortality of 40—100% [1, 2, 3]. Predictors of mortality include acute kidney injury (AKI), use of vasopressors and mechanical ventilation [1]. A recent outcome review in a University Hospital critical care unit (CCU) revealed a hospital mortality of 60% in ventilated patients, 86% in those requiring vasopressors and 87% in those with AKI [2]. To our knowledge, there is no similar study in a district general hospital (DGH). ***Objectives*** To review the outcome of patients with decompensated liver disease in a DGH CCU. ***Methods*** The hospital CCU database identified patients with liver disease and any of ascites, encephalopathy, variceal bleeding, jaundice, hepatocellular cancer and hepatorenal syndrome between January 2003—December 2010. Primary outcome measures were CCU and hospital mortality and secondary outcomes the liver disease aetiology, length of CCU stay and organ support. ***Results*** 15 patients were identified with a mean age of 54 years and CCU stay of 5.5 days. Alcohol was the underlying aetiology in 87%. Overall mortality was 67% with all patients surviving to CCU discharge also surviving to hospital discharge. Ventilatory support was received by 47% of patients with 100% and 83% mortality with non-invasive and invasive ventilation respectively. Mortality was 86% with ventilatory support and 63% without. Reasons for higher mortality could be delayed initiation of treatment, patient population or simply patient number. Vasopressor support was received by 47% of patients with 100% mortality and 38% in those who did not. Renal replacement therapy (RRT) was received by 20% with 67% mortality, the same as those who did not require it. Identification of patients who had AKI but not receiving RRT was not made and may account for the discrepancy. ***Conclusions*** Overall mortality amongst patients with decompensated liver disease was 67% with alcoholic cirrhosis the most common aetiology. Patients requiring ventilatory and vasopressor support had 86% and 100% mortality whereas the need for RRT did not appear to be associated with increased mortality. However, the poor prognosis of these patients and the costs to limited resources remains an ethical challenge.

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The rate of blood culture contamination in an intensive care unit

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Background Early positive blood cultures provide valuable guidance on appropriate antibiotic prescription. False-positive results have both financial and patient health implications [1, 2]. The Department of Health (DoH, 2007) reported that contamination rates of peripheral blood cultures may be up to 10%. They suggested that rates of peripheral blood culture contamination should be less than 3% and issued supporting guidance on best practice of taking blood cultures. Strategies to reduce contamination are aimed at either prevention or detecting contaminated cultures before clinical decisions are made [1, 2]. Our audit looked at 12 months of data either side of a change in the Blood Culture Taking Protocol at The James Cook University Hospital Intensive Care Unit. ***Methods*** We conducted a complete audit cycle over a two year period examining contamination rates in positive cultures on a 16 bedded general ICU. Initially, a retrospective audit was conducted examining all positive blood cultures from January to December 2010. They were classified as true positives or as contaminated based on criteria designed in conjunction with Microbiology depending on the site, organism isolated, the number of positive cultures and other potential sites of infection. Each positive culture was independently reviewed by two assessors. These results that demonstrated both a high number

of cultures being taken and high contamination rates were assessed culminating in a change in unit protocol in line with DoH recommendations. ***In situ*** central and peripheral lines were no longer used for sampling routine blood cultures, and specific blood culture taking packs were introduced. All staff were trained in the new protocol. A second prospective audit, from January to December 2011, examined the results of these changes.The total number of blood cultures taken annually was estimated by the Microbiology department. ***Results*** Table 1. Results of data collected to establish peripheral contamination rates.

Discussion In summary there has been a significant decrease in the rate of peripheral blood culture contamination, to nearer the target set by DoH, following a change in clinical practice. We hope that this has been mirrored by an improvement in our antibiotic prescribing. This yearly audit is to continue on our Intensive Care Unit.

Table 1.

Year	Estimated annual blood cultures taken	Total positive cultures	Contaminated cultures	Peripheral contamination rate (%)
2010	1020	246	83	8.5
2011	950	120	39	4.1

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Critical care unit and neutropenic sepsis – a United Kingdom District General Hospital experience

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Introduction Sepsis is a significant cause of mortality while neutropenia is commonly associated with haematological malignancy which is responsible for 5% of critical care unit (CCU) admissions [2]. Although most studies are on cancer patients, neutropenic sepsis is associated with CCU and hospital mortality of up to 66% and 78%, and a reluctance to admit these patients [1, 2, 3]. In recent tertiary cancer centre and University hospital CCU studies, significant predictors of hospital mortality include invasive ventilation (62%), vasopressor use (61%), renal replacement therapy (RRT) (62%) and ≥2 organ failure (63%). Neutropenia (53%) was not predictive and recent studies seem to contest its impact patient on survival particularly in cancer patients [1, 2, 3]. To our knowledge, the outcome of these patients does not appear to have been studied in a district general hospital (DGH) CCU. ***Objectives*** To review the outcome of patients with neutropenic sepsis in a DGH CCU. ***Methods*** The hospital CCU database identified patients between Jan 2008—Dec 2010 admitted with confirmed neutropenic sepsis. Primary outcome measures were CCU and hospital mortality and secondary outcomes the primary underlying pathology, length of CCU stay and organ support. ***Results*** 14 patients were identified with a mean age of 63 yrs (range 28—80 yrs) and 2 days (range 0.5—7 days) CCU stay. Haematological malignancy was identified in 86% with remainder due to aplastic anaemia and liver failure. Overall CCU and in-hospital mortality was 64% and 79% respectively and comparable to published data. All patients required ventilatory support with 64%, 29% and 7% receiving non-invasive, invasive or both. CCU mortality was 100% with invasive ventilation. CCU and hospital mortality was 0% and 25% with non-invasive ventilation (NIV) alone. Vasopressor support was required by 71% with 90% mortality compared to 25% who did not. Concurrent vasopressor and non-invasive ventilation support was associated with 100% mortality. No patients developed acute kidney injury requiring renal replacement therapy. ***Conclusions*** Overall CCU and hospital mortality was 64% and 79% with haematological malignancy the most common underlying pathology. Patients requiring invasive ventilation or vasopressor had worst prognosis while NIV only group did best suggesting escalation beyond this should be considered carefully in the interests of outcome and resources.

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Is Intensive Care National Audit and Research Centre data reliable?

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Introduction This study aimed to determine the number unplanned admissions of elective surgical patients to the High Dependency Unit (HDU) of a district general hospital. However, what became apparent was the poor quality of data control of the Intensive Care National Audit and Research Centre (ICNARC). ***Method*** Using ICNARC data, admissions to HDU from 01.01.2010—31.12.2010 were collected. The number of elective and unplanned admissions was then identified. ***Results*** 350 patients were admitted to HDU, of which, 31, were elective and unplanned. Of the 31 case notes requested, 16 were available. Of these, only 6 were elective and unplanned admissions and therefore 10 were not unplanned and elective admissions. This indicates inaccuracy of 62.5% in this small sample. ***Conclusions*** This brings into question the validity of ICNARC data. If two straightforward questions have such a degree of inaccuracy, what other discrepancies are there? This represents a significant area of concern as ICNARC data is where intensive care units receive funding. ***Recommendations*** National research investigating ICNARC data to identify overall accuracy and specific areas of high and low accuracy. A designated person to be assigned lead of ICNARC data quality control at a national, regional and trust level. Regular audit of a randomised sample of ICNARC cases. Detailed guidance to identify appropriate factors to be assessed during audit. A standard of accuracy required to ensure ICNARC data is deemed reliable and valid. Financial penalties for trusts failing to provide evidence for this.

Reviewing x-ray reports on the intensive therapy unit; current practice and the need for change

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Introduction In 2007 the National Patient Safety Agency (NPSA) published the alert: „Early identification of failure to act on radiological image reporting" [1]. This highlighted the importance of reviewing radiological image reports and taking appropriate action when required. From June to November 2012, 519 reports were issued for chest x-rays (CXRs) performed on the ITU. Of these 84 (16.1%) had been marked on our IT system as having been reviewed. ***Method*** We produced a questionnaire and interviewed the 8 consultants that run the ITU. We asked about the number of CXRs taken on the unit, how many of these are formally reported and whose responsibility it is to ensure they get reviewed. ***Results*** See table 1. Opinions varied as to who was responsible for reviewing the report: whoever ordered the x-ray, the consultant in charge of the unit and the parent team were all mentioned. 8/8 said there was no system in place to ensure reports were reviewed. No-one was aware of how IT could help. 5/8 felt it was important to review all reports and that the ITU department should take responsibility for this. ITU consultants commented that the delay in reporting reduced the usefulness of the reports. However, the Radiologists felt that because the majority of CXR reports are not reviewed, reporting of them is not a priority. ***Discussion*** Our investigation shows that there is no system in place to ensure that radiological image reports are reviewed. However, our hospital's IT system (webICE) could be used to facilitate this process if doctors used it to „file" reports. We suggest that the consultant on the unit checks webICE weekly and ensures that any reports issued are reviewed, acted upon if necessary, and then filed. This would be a simple, robust system that would meet NPSA guidelines. Reviewing our reports would also add weight to any requests we make to reduce the reporting time.

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Reconciliation of patient medications following ICU admission

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Table 1. Comparison of consultant estimates to actual values.

Parameter	Consultant estimate median (range)	Actual value
Number of CXRs	45 (20—110)	86 (mean over 6 months)
Percentage reported	20% (5—50%)	100%
Time for report to be issued	5 (1—14) days	Generally about 14 days, but no specific target

Purpose ICU admission has been associated with an increased incidence of unintentional discontinuation of medications for chronic diseases. We examined whether this was the case in our hospital. ***Methods*** A retrospective analysis was performed on the clinical notes of 71 randomly selected patients with a critical care stay of more than 7 days between April 2010 and October 2011. The effect of ICU admission on prescription of patients' regular medications was evaluated with particular focus on five medication groups where discontinuation has been associated with adverse events. ***Results*** 53 patients (median age 57 years, 60% male) had all the desired data points complete. 16 patients (30.2%) had significant medicines unintentionally discontinued at the time of ICU discharge, this rose to 18 patients (34.0%) by the time of hospital discharge. Antihypertensives and respiratory inhalers were amongst the most commonly discontinued medications. Admission to ICU was not stated on 10 (18.9%) of the patient hospital discharge letters. ***Conclusions*** We discovered a significant incidence of unintentionally discontinued medications following ICU stay, affecting approximately one third of patients. This finding was present at both ICU and hospital discharge. To address this issue we intend to introduce a specific ICU discharge letter to each patient's GP. We also advocate advising parent teams via an ICU Discharge Summary of intentionally discontinued or withheld medications, highlighting those to be reinstated when appropriate.

Synchronous tracheostomy and pulmonary surgery: a case-series

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Background Patients presenting for pulmonary surgery are an increasingly higher-risk cohort than historically was the case. Many will have a background of chronic supprative disease. A minority of patients will require a tracheostomy to aid weaning from mechanical ventilation post-operatively. Optimal timing for tracheostomy is unclear; early placement allows effective bronchial toilet and respiratory support in the absence of sedation. In selected, high-risk patients with excessive suppuration at bronchoscopy synchronous pulmonary surgery and percutaneous tracheostomy (SPSPT) may offer a recovery benefit. This retrospective case-series reports our experience of SPSPT. ***Method*** Patients were selected for SPSPT by the surgeon and anaesthetist, based on a raised clinical suspicion of post-operative complications. This was guided by pre-operative assessment and bronchoscopy findings. The local surgical database (DATACAM) was used to identify patients who underwent SPSPT during the period 01.01.2010 to 31.12.2011. Notes were retrieved and reviewed. Sex, age, procedure, pre-operative staging, ECOG performance score, ASA grade and pulmonary function were imported from DATACAM and cross-checked with patient records. Total length of stay was calculated and divided into: time with tracheostomy, time on ICU, and time on ward (days). ***Results*** We identified 14 SPSPT patients and were able to review all notes; 62% were female, average age was 68.4 years. All patients had oncological pathologies; the majority (11) underwent lobectomies; other procedures were sub-lobar wedge resections (2) and pneumonectomy (1). Pre-operative pulmonary function test results reported an average FEV1 of 72% and an average DLCO of 61% (% pre-operative predicted value). Ten patients recovered uneventfully from surgery with no immediate post-operative complications. Two patients experienced tracheostomy associated complications (painful tracheostomy and partial tracheostomy occlusion). Two patients developed pneumonia in the post-operative period with one requiring readmission to ICU. The total length of stay averaged at 13.4 days with a range from 6 days to 43 days. This comprised an average time with tracheostomy (5.5 days), average time in ICU (6.7 days) and average time on the ward (6.7 days). ***Conclusions*** Patients selected for SPSPT were high-risk patients with multiple comorbidities and excessive pulmonary secretions at bronchoscopy. In our series, no patient came to direct immediate or medium-term harm as a result of a tracheostomy. Length of stay for SPSPT patients was comparable with other reported high-risk cohorts

[1]. We are unable to compare the benefits of synchronous tracheostomy with standard care due to the lack of a control arm and cohort size. At our institution, we no longer undertake this procedure, due to the lack of perceived benefit of SPSPT.

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Communication with patients and their relatives in the Critical Care Unit: A study

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Introduction In 2011, complaints to the GMC from the public against the medical profession regarding effective communication with patients increased by 69% [2]. A study of patients and relatives taking legal action against doctors showed insensitive handling and poor communication as the main reasons for litigation [3]. According to the Standards proposed by the Royal College of Anaesthetists (RCoA), families need to be acknowledged and interviewed by a nurse as well as a doctor during the patient's stay in the Critical Care Unit (CCU) and all communication to be documented in the notes with consistency [1]. ***Aim*** This prospective study purported to ascertain how the CCU at The Christie NHS Foundation Trust measured up to the RCoA standards with regards to patient communication, identify areas for improvement and implement changes with a view to enhancing compliance with standards, if necessary. **Method** The study was conducted prospectively at the CCU in The Christie NHS Foundation Trust between March and April 2012. An internally validated bespoke communication form was designed to collect data prospectively from all patients admitted to the CCU; a pilot study was carried out on nine patients to accommodate external validation, and a few pro forma changes were incorporated thereafter before rolling out the study. Both medical and nursing staffs were given the forms to collect the information that was required on the admission day whilst information from subsequent days of stay was collated from the unit's Metavision® electronic Clinical Information System (CIS). Absence of documentation in the notes was designated as absence of communication during data collection. ***Results*** 32 patients and their relatives were included in the study cohort. High compliance with RCoA standards was seen (80~100%) with regard to families acknowledged within 2 minutes of their arrival, families seen by a nurse caring for the patient within 15 minutes, families interviewed by an attending CCU doctor within 30 minutes of arrival and consistency between medical and nursing notes. However, a high proportion of days were noted when no formal communication took place with relatives, even when they were present (41/60 [68%]), and a low proportion of consultant meetings with the relatives were also noted (48% of stay days), the RCoA standard being at least 75% of stay days. No correlation was found between inadequate communication and the level of care of critically ill patients (Level 2/3; p=0.06). A significant number of days out of all patient stay-days (26/60, p=0.0002) were noted in the CIS where no record of any meeting was documented. ***Conclusion*** Addressing inadequate documentation of communication with patient's relatives and increasing the frequency of consultant-led relative interviews were the major learning points of this study. Easier access to dedicated communication forms on the electronic CIS, a tick box added to daily notes on the system, heightened awareness about availability and importance of communication forms amongst CCU staff, addition of a patient satisfaction survey before discharge and regular audit-cycles targeting communication issues should help to improve patients' and their relatives' perception of the CCU and reduce avoidable misunderstandings leading to costly litigations.

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The introduction of Pneumocystis pneumonia prophylaxis for haematology patients and the impact on critical care

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Introduction *Pneumocystis pneumonia* (PCP) is an opportunistic infection caused by the fungus

Pneumocystis jiroveci. It is recognised to be common in patients with human immunodeficiency virus (HIV) infection and low CD4 T-lymphocyte counts but prior to the identification of acquired immune deficiency syndrome (AIDS), PCP occurred mainly in patients with malignancy, following organ transplantation or after receiving corticosteroid therapy. Corticosteroid treatment of haematological malignancies is the most common predisposing risk factor for the development of PCP [3]. It is typically more severe in patients without HIV infection; respiratory failure and need for mechanical ventilation occurring in up to 30% of these cases [1, 2]. ***Objectives*** Prophylactic administration of co-trimoxazole to haematological patients receiving chemotherapy was introduced six months ago within our trust. The aim of this retrospective review was to identify the patients admitted to the intensive care unit with acute respiratory compromise due to proven or suspected pneumocystis infection and assess the impact of prophylaxis on the number of admissions. *Methods* Patients were identified retrospectively from positive polymerase chain reaction (PCR) test results and from the intensive care admissions log from January 2011 to January 2013. Additional patient details were obtained from the Intensive Care Unit (ICU) admissions coding database. *Results* There were five patients with confirmed PCP; with clinical evidence of infection and positive PCR tests on respiratory secretions. Two other patients were identified from the ICU admissions log as having suspected PCP. One of these had received 72 hours of treatment for PCP prior to any specimens being sent for PCR, while the second did not have specimens sent for testing due to poor expectoration of secretions. All of the patients presented prior to the institution of co-trimoxazole prophylaxis for haematology patients receiving chemotherapy. Of the seven patients identified as having laboratory confirmed or clinically suspected PCP, six (86%) were male. The age range was 38—87 years. Five patients had a proven haematological malignancy, one patient had an adenocarcinoma of the large bowel and one patient had a new diagnosis of HIV infection. In the trust, 26 patients received chemotherapy for haematological malignancy prior to routine prophylaxis being introduced and five of these were admitted to intensive care with probable PCP, an admission rate of 19%. 19 patients received chemotherapy following the introduction of PCP prophylaxis and none required ICU admission for probable PCP. Intubation and ventilation was required for three (43%) patients, the remaining four received non-invasive ventilation. Five (71%) of the patients died, four after withdrawal of organ support and one patient declined further treatment. ***Conclusions*** A high mortality rate was observed in patients with respiratory failure secondary to *Pneumocystis pneumonia*, despite appropriate antimicrobial treatment. The majority of patients had haematological malignancies, with PCP occurring as a complication of the disease or the chemotherapy received. These findings are in agreement with previous studies for PCP in critically ill patients. It is noteworthy that in the six months following the introduction of routine prophylaxis being introduced, there have been no new admissions to intensive care with suspected or proven PCP.

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Morbidity in patients admitted to critical care following pre-hospital anaesthesia

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Introduction The aim of this pilot work was to assess the morbidity burden and use of critical care resources associated with pre-hospital (out of hospital) anaesthesia. Pre-hospital medical practice has undergone considerable development during the last two decades [1] and pre-hospital anaesthesia delivered by pre--hospital practitioners is performed much more liberally than in the past, particularly for trauma patients. However, the associated complications and morbidity can be significant and pre-hospital anaesthesia has the potential to impact significantly on critical care resources. ***Methods*** We retrospectively examined the records of trauma patients whom had received pre-hospital anaesthesia, intubation and intermittent positive pressure ventilation (IPPV) at the scene, with subsequent transfer to hospital followed by admission to the Neuro-Critical Care Unit in Cambridge, United Kingdom, during February to May 2011. Patients transferred from another hospital were excluded. ***Results*** 18 patients were included [mean age 42 years (SD=17), 78% males, median initial GCS at scene 8 (IQR: 5—12)]. Seven (39%) were diagnosed with only minor soft tissue or relatively minor orthopaedic limb injuries. In two patients (11%), endotracheal tube malposition was identified by CT imaging. One patient suffered a cardiac arrest following induction of anaesthesia and two patients (11%) had unstable high cervical fractures resulting in tetraplegia. Recordings of vital signs during transport to hospital were located for only three patients, of which two remained significantly hypertensive

throughout (diastolic BP >100) suggesting inadequate sedation. Seven (39%) required pre-hospital thoracotomies to facilitate IPPV and, in one such patient who subsequently died, ventilation issues persisted until adequate decompression was achieved after CT scanning. ***Conclusions*** We believe that this is the first work of its kind and, despite the small patient number and obvious selection bias, resource implications resulting from the brief admission of anaesthetised patients with relatively minor injuries to critical care are evident. Pre-hospital neuro protection has not been convincingly shown to improve outcome, although the necessary delay in transport to hospital may be detrimental. In this evaluation, four (25%) trauma patients had a critical underlying cardiac or neurological comorbidity, making their anaesthesia a seriously high risk undertaking. Clinical assessment in hospital is hindered by pre-hospital anaesthesia and the diagnosis of significant limb injuries can be delayed. Pre-hospital anaesthesia is considered to be a desirable intervention in relatively few patients [2]. For these reasons, along with the necessity of strict patient selection criteria and appropriately trained and equipped practitioners, there is a need for every pre-hospital service to have a governance structure that includes case reviews, auditing and appraisal [2, 3]. There remains an urgent need for a large scale prospective randomised control study to help determine when the risks of pre-hospital anaesthesia may exceed any possible benefit.

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Retrospective audit of management of community acquired pneumonia in Scunthorpe General Hospital Intensive Care Unit

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Introduction and background Severe community acquired pneumonia (CAP) constitutes approximately 6% of all admissions to intensive care units (ICU). The mortality rate among these patients can be as high as 35% [4]. The higher mortality was also noticed in delayed admissions to ICU [3]. Our unit has eight beds and admits approximately 400 patients in a year. The aim of the audit is to review our practice and compare with British Thoracic Society (BTS) guidelines and published evidences. ***Patients and methods*** Patients admitted to ICU from January 2011 to August 2011 were identified using the Intensive care national audit and research centre (ICNARC) case mix programme database. The notes were collected with the help of the audit department. Cases of CAP were identified from pneumonia admissions excluding the patients with nosocomial pneumonias. Data was collected from patient's case notes and ICNARC database. This included patient age, timing of admission to ICU, severity scores such as CURB 65, duration of non invasive ventilation (NIV), duration of intermittent positive pressure ventilation (IPPV), incidence of tracheostomy, timing of antibiotics, timing and results of culture and patient outcome. ***Results*** 18 patients were admitted with CAP during this period. The median age was 61 years. 72% of patients admitted to ICU having presented in Accident and Emergency (A&E) that same day with pneumonia. 41% scored three or more on CURB 65 which was associated with 71% ICU mortality. 83% received antibiotics with in four hours of the admission out of which 22% received within one hour. 66% had their cultures done before antibiotics administration. 44% had positive culture results. The most common organisms were *Streptococcus pneumonia* followed by *Haemophilus influenza* and *Legionella*. 27% had NIV with 100% failure rate. 77% were intubated and ventilated out of which 42% had tracheostomy. Mean duration of IPPV was 10.4 days. Average length of stay in ICU was 11.6 days and hospital stay averaged 18.3 days. Mortality in ICU was 29%. The mortality associated with severe CAP pneumonia in our ICU was lower than the national average which could be due to early admission of severe CAP to ICU and adherence to antibiotic policy [1] of BTS guidelines. We had a high failure rate with NIV in CAP. There was no correlation between ICU admissions and CURB 65 score however there was a positive correlation between CURB 65 score and ICU mortality. ***Conclusions*** We need to adopt a combination of severity scoring systems and effective guidelines for predicting the need for ICU admission and to improve outcome of severe CAP [2].

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Rapid molecular identification of 21 pathogens responsible for bloodstream infection in critical care using high resolution melting analysis technology and molecular gram classification

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Introduction and background Culture based system is a traditional method that can confirm if there is a nosocomial bacterial infection or not in critical care. However, the use of molecular approaches has been increasingly used to get rid of the disadvantages of culture. The main feature of molecular techniques is that they can detect and identify pathogens within short times helping clinicians to treat patients earlier through choosing rational antimicrobial therapy. ***Methods*** The goal of this study is to present the ability of a new, cost-effective and fast technology called high resolution melting analysis (HRMA) combined with molecular gram classification using real time PCR for the detection and identification of 21 common pathogens causing bloodstream infection in critically ill patients. 16S rRNA and gram classification primers were used on a broad range real-time PCR for molecular gram typing and HRMA in a single run. Differentiation of bacterial species was achieved using a multi-parameter, decision-tree approach based on gram type, grouping according to melting temperature (Tm) and sequential comparisons of melting profiles against multiple reference organisms. ***Results*** A preliminary validation was undertaken by blinded analysis of 53 consecutive bloodstream isolates from a clinical microbiology laboratory. 50 isolates contained organisms present on the panel and 96% of these were identified correctly at genus or species level. A correct gram classification was reported for all 53 isolates. ***Conclusions*** This technique shows promise as a cost-effective tool for timely identification of bloodstream pathogens allowing clinicians to make informed decisions on appropriate antibiotic therapy at an earlier stage.

Continuous $SCVO_2$ monitoring in children with septic shock and outcomes

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Background The surviving sepsis guideline recommends the early and aggressive resuscitation of children with severe sepsis and septic shock. It also recommend maintaining central venous oxygen saturation ($SCVO_2$) higher than 70% in those children. It is a useful tool reflecting the global transport and metabolism of oxygen. However, it is uncertain whether $SCVO_2$ levels are associated with better outcome. In order to optimize the hemodynamic support, this study was aim to investigate the outcome of children with severe sepsis and septic shock using continuous monitoring of $SCVO_2$ (Pediasat, Edwards life, USA). ***Material and methods*** Infants and children with severe sepsis and septic shock who admitted to PICU at King Chulalongkorn Memorial Hospital were recruited to this study. The central venous catheter sampling site was in the superior vena cava either via internal jugular or subclavian vein. The pediasat system with special catheters together with vigilio monitor (Edwards life science, USA) were used in this study. The $SCVO_2$ levels were continuously monitor for three days. They were treated according to EGDT sepsis guideline. ***Results*** Ten consecutive patients with severe sepsis and septic shock were enrolled. Their median age was at 17 months with median body weight of 7.5 kg. The mean $SCVO_2$ levels at PICU after initial resuscitation was at 71±8.7%, 72.2±4.5% at 1 hr and 71.9±6.8% at 24 hrs.Their mean of initial lactate was at 4.5±1 mmol/L with initial CVP of 9.7±4.5 mmHg. Continue clinical assessment together with the level of $SCVO_2$ were interpreted accordingly when the level below 70%. The mean of blood transfusion was given at 18.8±6.8 cc/kg and 5% albumin of 27.5±16 cc/kg was given on the first day. Dopamine was given in all of them. 80% of them were also given vasodilator eg dobutamine or Milinone. There was no mortality in septic children using continuous $SCVO_2$ monitoring device. Our previous mortality in septic shock was 40% for the past five years. ***Conclusion*** During early goal direct therapy, it appears that continuous $SCVO_2$ monitoring is a useful tool for hemodynamic optimization. It supports the important of early hemodynamic resuscitation. *Fund* Rachadapisek sompotch/Edwards life science.

Interleukin-10 polymorphisms and clinical risk factors in children with severe sepsis and septic shock

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Background Interleukin-10 is an important anti-inflammatory cytokine that play a key role in sepsis. It is a potent endogenous anti-inflammatory cytokine that decrease lung inflammation. Our aim was to identify clinical risk factors and Interleukin-10 (592/1082) polymorphism in children with septic shock. ***Design*** Prospective-Analytic study. ***Methods*** A total of 36 patients with severe sepsis and septic shock admitted to our PICU and 24 healthy individuals were recruited into the study. The genotypes of polymorphisms-1082, -592 were determined by PCR restriction fragment length polymorphism. Clinical factors and PRISM III were also recorded. ***Results*** In the period of our study, we enrolled 36 children with 8.3% (3) of severe sepsis and 91.7% (33) of septic shock. The mean age was at 65.51 (mo). Their mortality was at 19.4% (7) which significantly reduced from the past few year (p=0.02). The mortality was significantly associated with high PRISM III score (16.7±5.7, 10.5±6.3 p=0.02) and delay resuscitation. The A allele of the SNP IL-10-592 polymorphism was more common in septic shock group compared to normal control but no statistically significant. (66.7% VS 56 %, OR=1.94 (0.57-6.76, p=0.2) and A/A allele was also more common in septic shock group (44.4, 29.2 2 OR=1.94, 95% CI 0.57–6.76, p=0.23) The A/A allele of SNP IL10 -1082 polymorphism was no significant different between sepsis and control (32 (88.9%), 20 (83.3%) OR=1.1, 95% CI 0.21–5.92, p=0.9) In addition, there was a trend of A/A SNP-1082 genotype in the mortality group (100% *vs* 86.2%, p=0.2). ***Conclusions*** The mortality was significantly associated with PRISM III score and delay resuscitation. The AA allele SNP IL-10 -592/-1082 polymorphism had a trend to increase severity in children with sepsis.

Tracheostomy usage at the Royal London Hospital in 2011/2012 and the effect of the introduction of the novel Tracoe Twist Plus tube

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Introduction and aims Despite a number of recent trials conclusive evidence to guide optimal tracheostomy timings, care and weaning is lacking. The Tracman study showed early tracheostomy reduces sedative use but does not affect mortality. It recommended further studies shift their focus from mortality to the effects of early tracheostomy on patient care and interventions [1]. Our hospital has recently changed its type of tracheostomy tube from the Tracoe Twist to the new Tracoe Twist Plus. Reported benefits of the Tracoe Twist Plus include a longer length with maximal inner lumen size, less airway resistance and improved phonation [2]. We aimed to establish whether these changes have affected the number of tracheostomy tube changes, the timing of decannulation and complications at our hospital. ***Methods*** A proforma sheet was used to collect data on all patients who were reviewed on the tracheostomy ward round in 2011 and 2012. Information collected included admitting team, type of tracheostomy tube, time interval between insertion and decannulation, method of insertion (surgical versus percutaneous), number of tracheostomy tube changes and complications. The data was collated and analysed using Microsoft excel. ***Results*** A total of 346 tracheostomies were cared for by the tracheostomy team. The admitting teams were neurosurgery (35%), general surgery/trauma (29%), medical (24%) and head and neck/ENT (12%). The average time from endotracheal intubation to percutaneous tracheostomy was 8 days, and to surgical tracheostomy 9 days (with exclusion of intraoperative tracheostomy). The type of tracheostomy tube inserted with associated number of tube changes and time to decannulation are tabulated below.

Missing data refers to 12 datasheets with inadequate documentation, 33 patients that died with the tracheostomy tube in situ and 78 patients transferred out with the tracheostomy tube in situ. Documented complications included self-decannulation, airway obstruction and bleeding. 10% of Tracoe twist tubes had an associated complication, and 6% of Trachoe twist plus tubes. ***Conclusions*** At the Royal London Hospital between 2011 and 2012 there was a similar interval between endotracheal intubation and insertion of percutaneous versus surgical tracheostomies. Time to decannulation was similar for Tracoe twist and Tracoe twist plus tubes, although complications slightly greater for the former. One hypothesis is the increased maximal inner lumen of the Tracoe twist plus decreases the risk of obstruction. Of additional note, although comprising a small number of total tracheostomy tubes, Shiley tubes had a significantly greater average number of tube changes, time to decannulation and complication rate, although this may reflect the patient group they are selected for rather than the tube itself.

Table 1.

Tracheostomy tube	Total number	Average number of tube changes (range)	Average time (days) to decannulation (range)
Unknown	2	0 (0)	
Minitrach	1	0 (0)	
Portex	4	1.25 (0—3)	37 (19—63)
Portex adjustable flange	6	1 (0—4)	14.5 (11—18)
Shiley	5	1.6 (0—5)	88 (4—227)
Tracoe twist	185	0.8 (0—7)	27 (2—158)
Tracoe twist plus	139	0.5 (0—5)	26 (2—145)
Subglottic	1	2 (2)	

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Efficacy of heparinised flush solutions in preventing arterial catheter occlusion: a literature review

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Introduction Arterial catheters are commonly placed in critical care patients for invasive measurement of blood pressure and blood sampling. The indwelling catheter is usually attached to a combined transducer and flushing solution, which runs at a low rate in order to maintain catheter patency. This solution may be heparinised to attempt to decrease the incidence of catheter thrombosis. The United Kingdom National Patient Safety Agency (NPSA) released a report in 2008 [5] highlighting potential dangers related to arterial catheters. Thrombosis can lead to distal ischaemia, inaccurate measurements and patient harm from repeated catheter placement. Potential harm can occur when the wrong flush solution is connected to the transducer system. Two deaths were reported due to the inadvertent use of glucose as a flush solution causing falsely elevated blood glucose readings and subsequent overdose of insulin. The NPSA recommended that only 0.9% saline (unheparinised) should be used in flush solutions, which represented a change in practice for many United Kingdom intensive care units. ***Objectives*** Perform a systematic review of published literature and establish whether the use of heparinised flush solutions is associated decreased catheter thrombosis. ***Methods*** A systematic literature review was conducted of available scientific publications up to December 2012 using databases (Medline, Embase, PubMed) and search engines (Google Scholar). English language and English abstract publications were searched, using keywords and filters, for studies comparing heparinsed and non-heparinised arterial lines in adults where primary or secondary outcomes were arterial catheter patency. ***Results*** Four randomised control trials have examined whether there is any benefit in using a heparinised flush solution for maintaining patency of the catheter. The largest was performed in the United States and involved 5139 patients [1]. In this study, heparinised flush solutions led to a greater chance of patency at 24, 48 and 72 hours after insertion ($p<0.00005$). The major methodological problem for this study is that no attempt at blinding took place despite the fact that it is made clear by the authors that the standard practice at the time was for heparinised flush solutions. Procedures and equipment were also not standardised. The other three studies were much smaller with questionable power. The results were inconsistent, with one finding an improvement with heparin [2] and two finding no difference [3, 4]. ***Conclusions*** The current literature is inconclusive as to the efficacy of heparinised flush solutions in preventing occlusion of arterial catheters. An adequately powered study of sufficient methodological quality is urgently required to establish whether heparinised flush solutions prevent catheter thrombosis.

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Audit of assessment and management of mechanical ventilation

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Background Mechanical ventilation is one of the most common interventions done in intensive care units. On the other hand, prolonged ventilation increases complications such as ventilator associated pneumonia, injury to larynx, barotrauma to lungs. Furthermore it substantially increases the cost of Intensive Care Unit stay. The secret of success of early weaning from mechanical ventilation is frequent assessment, making a weaning plan, communication and execution of that plan. ***Objective*** To determine whether there is daily assessment of ventilation, plan of weaning and documentation of the plan and to see whether there is a significant difference during weekdays and over the weekends. ***Method*** This was a retrospective audit of all the mechanically ventilated patients over one month in Basildon Intensive Care Unit. We included 19 patients who were on mechanical ventilator for more than 24 hours consisting of 80 ventilator days. Data collection was done from patient notes. ***Results*** Formal assessment of ventilation was documented in 35 out of 63 ventilator days (55%) over the weekdays and 9 out of 17 ventilator days (52%) over the weekend. Written ventilation plan was formulated only in 22 out of 63 (34%) ventilator days over the week days. In weekends this was 6 out of 17 (35%). Ventilation mode/pressure settings were advised in 14 out of 63 (22%) and 4 out of 17 (23%) days during the weekdays and weekends respectively. Targets were set in 8/63 (12%) 2/17 (11%) days respectively for weekdays and weekends. ***Conclusion*** The assessment of ventilation and planning for weaning was inadequate. Nearly half of the ventilator days do not have documentation of medical assessment of ventilation settings. Majority of ventilator days do not have a documented plan of weaning and the targets needed to be achieved. There was no significant difference during weekdays and weekends. We have proposed to improve communication by producing a written daily weaning plan and reaudit.

An audit of hydrocortisone use in the treatment of septic shock

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Introduction Corticosteroid treatment in patients with septic shock is controversial. Large, multicentre, randomised controlled trials provide conflicting results regarding the role of corticosteroid therapy [1, 3], whilst the current Surviving Sepsis Guideline [2] gives relatively little advice on the subject. Given the above, it is the author's experience that the prescription of corticosteroids varies greatly between practitioners, often deviating from what may be considered „best practice". ***Methods*** In this retrospective case note audit, we looked at the use of hydrocortisone for the treatment of septic shock in a seven bed ICU in a district general hospital. Ethics approval was not required. In a six-month period we identified 19 patients meeting the inclusion criteria. We evaluated the vasopressor/inotrope requirement upon corticosteroid initiation, the duration of therapy in relation to the duration of vasopressor/inotropic support and patients response to corticosteroid. The primary aim of the audit was to identify inappropriate initiation and continuation of corticosteroid therapy. ***Results*** 15 (79%) patients had septic shock resistant to conventional vasopressors/fluids prior to initiation of hydrocortisone, whilst 4 (26%) had treatment started whilst on a single vasopressor (noradrenaline) at a dose of <25 mcg/min. Of those with resistant shock only 6 (40%) were prescribed vasopressin, whilst 5 (33%) were prescribed dobutamine. 12 (63%) patients demonstrated a reduction in cardiovascular support post hydrocortisone, although 6 (50%) still died. Of the steroid „responders" the mean duration of vasopressor/inotrope therapy was 4.4 days (SD=2.2), median of 4 days (IQR 2). Within this group the mean duration of steroid therapy was 11.5 days (SD=6.8), median of 10 days (IQR 6.5). Overall mortality in this small cohort of patients was 61%. *Discussion* Our results indicate that greater consideration to the correct type of vasopressor/inotrope required is often necessary prior to hydrocortisone therapy. Attention also needs to be paid to the duration of therapy therefore avoiding potential corticosteroid related side effects. We recommend greater local emphasis regarding the development of guidelines concerning the escalation of cardiovascular support and corticosteroid therapy in sepsis.

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