5th Anniversary International Fluid Academy Days
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Oral (O) and Poster (P) Presentations

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ORAL PRESENTATIONS

O1A. A STANDARDISED REPORTING PROFORMA FOR POINT OF CARE LUNG ULTRASOUND IN INTENSIVE CARE MEDICINE

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Introduction: Point of care lung ultrasound (US) in ICM whilst fairly new was once the remit of enthusiasts. As more clinicians embrace its usefulness to evaluate and manage both the acute and more chronic dyspnoeic patient on the intensive care unit, there is a need for standardised reports. Standardisation of the report would allow consistency of information reported, audit and research projects and most importantly, maintain a high level of clinical governance. The Core Ultrasound in Intensive Care Medicine (CUSIC) accreditation programme has just been introduced in the UK (1). The lung component is based on the BLU protocol (2) by Liechtenstein and colleagues, ensuring a formalised, competency-based training programme.?

Objectives: There are no standardised national reporting proformas available in the UK or Europe. We developed our own using the template provided in the CUSIC accreditation pack. This proforma can then be freely disseminated online.

Methods: It is important that the proforma is clinical relevant and yet user friendly. Suggestions and experiences of colleagues who regularly performed and reported on lung US were used to guide its design. Several version of the proforma were developed and each was piloted under real world conditions on an adult ICU in a tertiary-level, teaching hospital. It is a living document and will continue to evolve as our practice and knowledge in lung US continues to improve.

Results: The final reporting proforma contains all the necessary information required when reporting lung US findings but is arranged in a more visually intuitive layout and includes a decision making tree on the reverse side as an aide memoire.

Conclusions: We believe that the current version of the reporting proforma is much more user friendly whilst maintaining clinical usefulness. It is freely available on our website in the spirit of Free and Open Access to Medical Education (FOAMed). The standardised format means that audit and quality improvement projects can be undertaken with minimal interferences. Collaborative working and projects can also be conducted across several institutions. Other future plans include the development of an online document, which would impart other benefit including cloud backup. We welcome suggestions from interested colleagues in order to further improve this document.

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2. Liechtenstein D. Lung ultrasound in the critically ill. Annals of intensive Care 2014; 4: 1 (http://www.annalsofintensivecare.com/content/pdf/2110-5820-4-1.pdf)

O1B. THE DEVELOPMENT OF A NEW NATIONALLY-ACCREDITED TRAINING PROGRAMME IN POINT-OF-CARE ULTRASOUND FOR INTENSIVE CARE MEDICINE

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Introduction: Although championed by enthusiasts, the use of ultrasound in ICM has lagged behind that of other specialties including Emergency Medicine. This lack of formal training structure and programme is a recurring issue across the rest of Europe. It poses the question of whether scans performed have been appropriately performed and reported, and whether there exists proper clinical governance. The Intensive Care Society (UK) recently introduced the Core Ultrasound Skills in Intensive Care (CUSIC) in order to provide a formal and robust training structure to attain these competencies. We describe the experience of a university, tertiary-level hospital in developing a training programme to achieve these goals.

Methods: Through a modular system, with each module lasting 3 months, the training pathways comprised of an initial theoretical and practical training. Supervised practice until competence demonstrated in acquiring and saving images. Mentored practice with completion of logbook demonstrating knowledge of an appropriate range of pathology. Completion of competency assessments within the range of practice - heart, lung, abdominal and vascular. In combination with a triggered assessment to investigate a clinical question. The varying modules ensure that the clinician is armed with the breadth of knowledge and skill to deal with the range of clinical situations that he/she is likely to encounter within ICM. Robust clinical governance policies are maintained through formalised working practice with all stakeholders including radiology departments. This requires a considerable degree of preparation and discussion prior to the commencement of the programme. A formal and structured training programme ensures the highest level of competency-based training. Learning objectives and outcomes are defined from the onset for both the trainer and trainee. A modular system allows for a degree of flexibility and ensures that a balance is achieved between service-provision and training/learning periods.

Conclusion: The CUSIC accreditation is one of the few nationally recognised competency-based training programmes available in Europe. Through collaborations with other bodies including those from other specialties, the delivery of point-of-care ultrasound training maintains a high standard which will ultimately result in improved patient care. It is crucial that appropriate protocols are formalised to ensure clinical governance. We believe that our model for delivering point-of-care ultrasound training, although undoubtedly in its infancy and will continue to evolve, forms a good starting point for other institutes who wish to develop their own programme.

LUNG ULTRASOUND REPORTING FORM

Patient details / Hospital Sticker
Name
Date of birth
Hospital Number

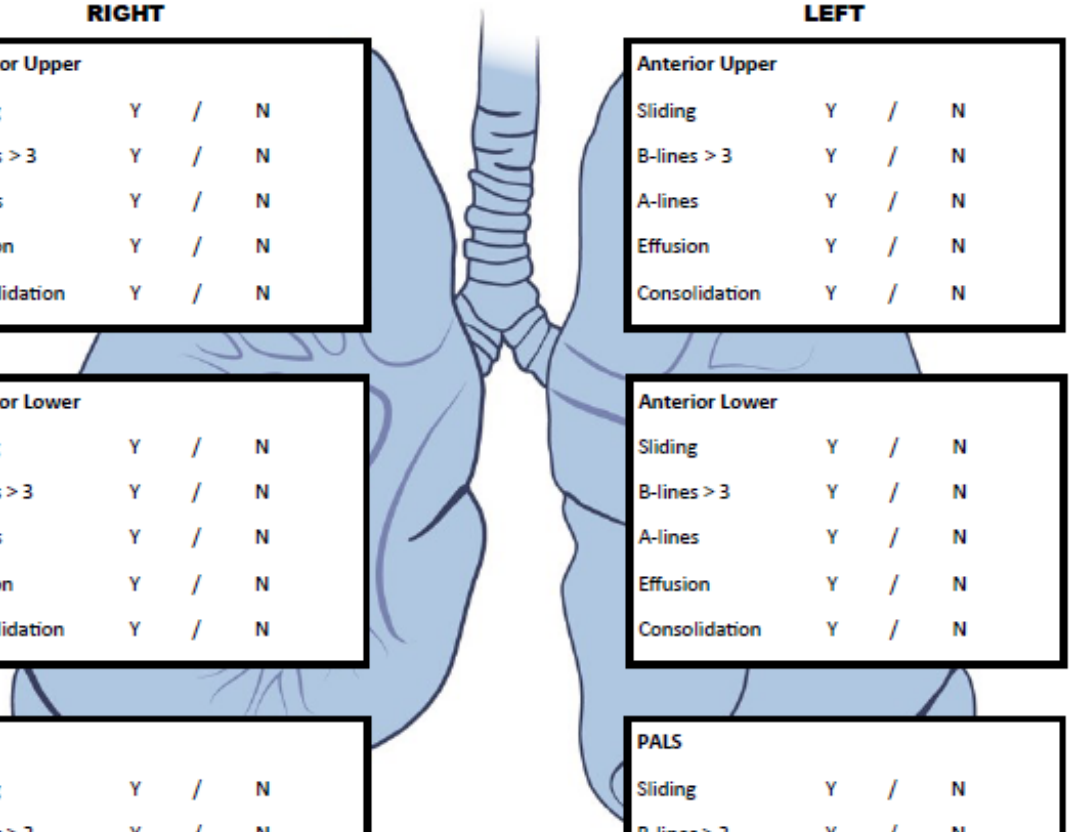
Date of Study

Location

Name of sonographer

US Machine

Indication for scan



RIGHT			
Anterior Upper			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

LEFT			
Anterior Upper			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

Anterior Lower			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

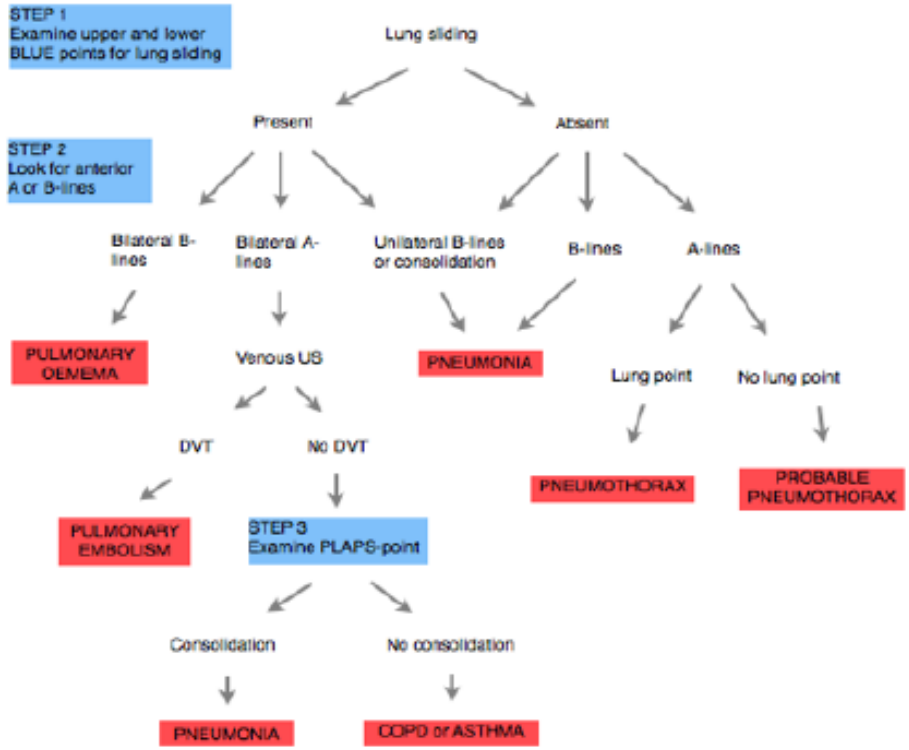
Anterior Lower			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

PALS			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

PALS			
Sliding	Y	/	N
B-lines > 3	Y	/	N
A-lines	Y	/	N
Effusion	Y	/	N
Consolidation	Y	/	N

COMMENTS/CONCLUSION	
EXPERT REFERAL REQUIRED— Y / N	DISCUSSION WITH CLINICAL TEAM— Y / N
SIGNATURE	MENTOR SIGNATURE

DECISION TREE—LUNG ULTRASOUND



Lichtenstein DA, Mezière GA (2008) Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol. CHEST July 2008 vol. 134 no. 1 117-125

GLOSSORY OF LUNG ULTRASOUND

A-lines —Hyperechoic equidistant horizontal artifacts arising from the pleural line

Lung sliding and seashore sign — The pleural line normally separates two distinct patterns (in M-mode). This demonstrates lung sliding, without Doppler

Quad sign — Quad image between pleural line, shadow of ribs, and the lung line (deep border, always regular)

Sinusoid sign —Inspiratory movement of lung line toward pleural line

Lung consolidation (Alveolar syndrome) — A shredded line, instead of the lung line: a specific sign

Lung consolidation (Alveolar syndrome): Translobar form — A fluid disorder looking like a solid organ

B-lines—a comet-tail artifact arising from the pleural line (100%) and moves with lung sliding

Lung point—Sudden, on-off visualization of a lung pattern (lung sliding and/or B-lines) at a precise area where the collapsed expiratory lung slightly increases its surface of contact on inspiration.

O2. CRYSTALLOID FLUID-REPLACEMENT WITH INFERIOR VENA CAVA ULTRASOUND EVALUATION CAN REDUCE ARTERIAL HYPOTENSION RATE AFTER SPINAL ANESTHESIA

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Objectives: Spinal anesthesia causes a decrease in systemic vascular resistances with frequent arterial hypotension, commonly treated via an empiric fluid administration (1-3). Aim of the study is to determine whether Inferior Vena Cava analysis performed by trans-thoracic ultrasound (IVCUS) is effective in guiding a titrated fluid repletion, in order to decrease post procedural significant hypotension rate, while avoiding fluid. The trial is registered on www.clinicaltrials.gov (NCT02271477)(4).

Materials and Methods: This prospective, randomized, case-control trial compares post-spinal anesthesia hypotension rate in patients undergoing elective surgery, with or without preventive IVCUS-guided titrated volume repletion. Primary outcome is a reduction in significant arterial hypotension rate after spinal anesthesia. Secondary outcomes are: the rate of vasoactive drugs administered; the total amount of fluids required throughout the procedure. We randomized consecutive ASA 1 to 3 patients into two groups via blind allocation (Fig 1). The spinal technique was standardized according to institution guidelines. The control group received the standard treatment, while patients in the treatment group were assessed preoperatively with IVCUS and, if found fluid-responsive (IVC-breathing collapse more than 36%), treated with a 500 ml crystalloids bolus followed by reassessment until found euvolemic.

Results: Of 185 patients enrolled, a total of 160 patients met the inclusion criteria and were randomized. The global significant post-spinal arterial hypotension rate was 35%. A statistically significant difference was observed in the two groups (Fig 2), with a lower incidence in the IVCUS group (42.5% vs 27.5%, p = 0.044). The mean total fluids volume was significantly higher in the IVCUS group (350 vs 665 ml), while the need of vasoactive drugs used was significantly lower (13.5 vs 6.5%, p = 0.015).

Conclusions: In our experience IVCUS is a non-invasive, safe and quick method to check for fluid responsiveness in mechanically ventilated patients. We showed that IVCUS in spontaneous breathing patients could be effectively used to guide volume repletion not only in critical care patients, but also to perform a selective and tailored preventive volemic status optimization in elective surgical patients in order to reduce complications after spinal anesthesia.

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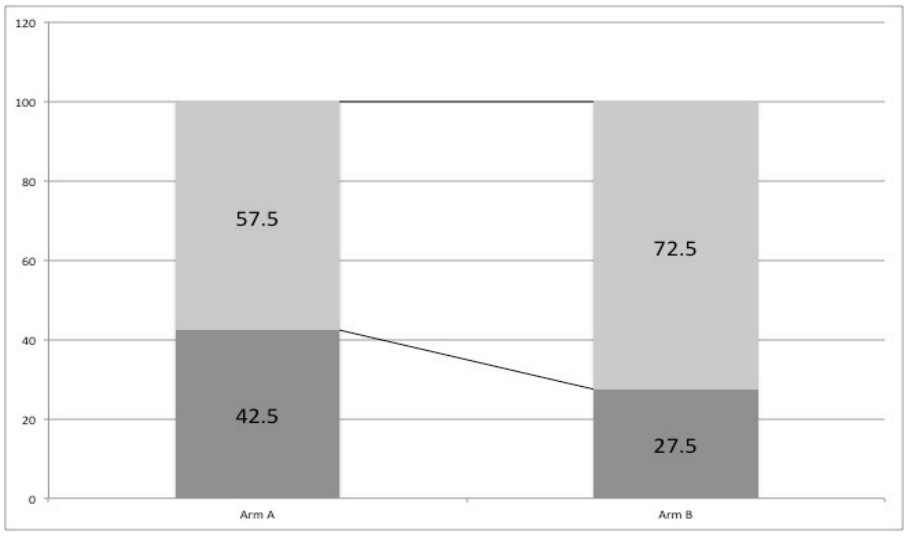
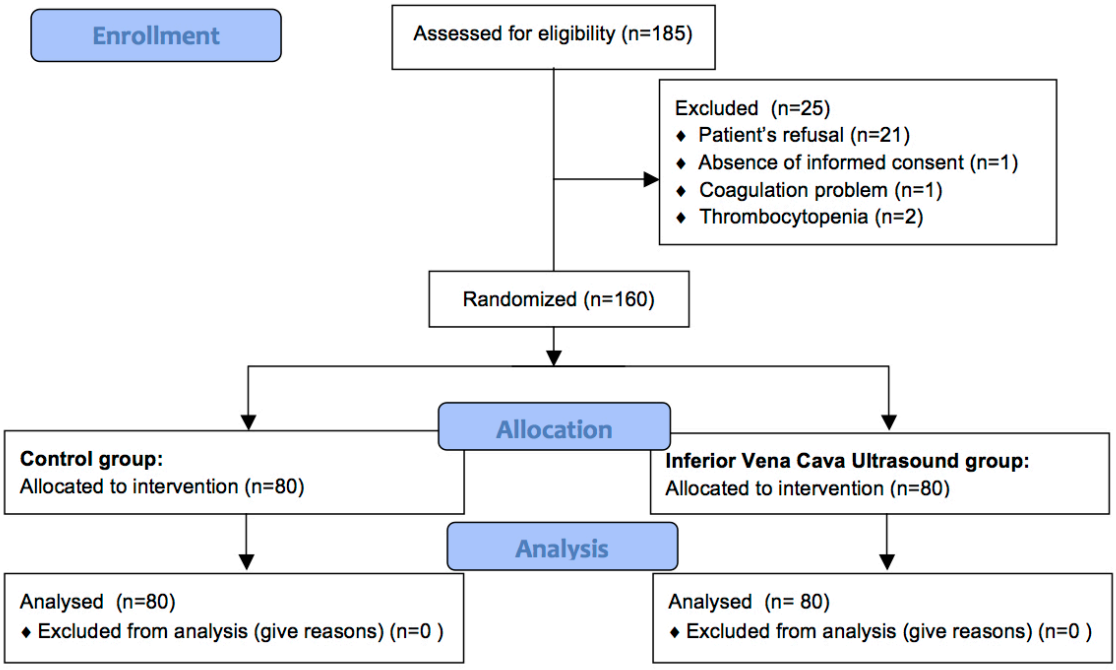


FIGURE 1: Study's flow diagram



O3. PROGNOSTIC VALUE OF ORGAN FAILURE DURING ACUTE NECROTISING PANCREATITIS

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Introduction: Acute necrotizing pancreatitis (ANP) is potentially lethal inflammatory process [1]. Recent researches established that presence of multiorgan failure together with pancreatic infection is a major determinant of mortality during ANP [2]. But significance of different organs failure (OF) in course of ANP still remains unclear.

Patients and Methods: We performed a prospective observational cohort study of 113 patients with ANP, which were admitted to single intensive care department. Patients were included in the current study if they fulfilled the inclusion criteria of signs of pancreatic necrosis and/or peripancreatic necrosis. Moderately severe ANP was defined by the presence of transient organ failure, local complications such as acute peripancreatic fluid collections (APFC) and acute necrotic collections (ANC), or exacerbation of comorbid diseases. Severe ANP was defined by persistent organ failure for more than 48 h. The following parameters were collected for each episode of AP: length of hospital stay, in-hospital mortality, presence of organ failure, and local complications.

Results and Discussion: According to recent revision of Atlanta classification of AP [3] severe form (1st group) was established in 50 (44%) patients with persistent OF and local complication, moderate form (2nd group) was diagnosed in 63 (56%) persons with transient OF or local complications (tab. 1).

Table 1. Patients with acute necrotizing pancreatitis characteristic, M±m

Factors	1st group, n=50	2nd group, n=63	Total, n=113
Age, years	46±2.4	48±5,6	
Sex, male/female	8/42*	17/46	
APACHE II score	18.4±0.6*	7.6±0.8	
Marshall score	5.86±0.75*	1.75±0.32	
Local complications	21 (42%)	18 (29%)	39 (34%)
Creatinine,% >170 µmol/l	30 (60%) 284±17*	4 (6.3%) 119 ±11	34 (30%) 186±16
Hematocrit, %	52.1±0.8*	44±1.1	45.9±0.37
Citrulline, µmol/l	12.1±0.34*	20.7±0.67	16.7±0.32
Mortality	28 (56%)*	3 (9.1%)	31 (27.4%)

* p<0,05 in comparison with 2nd group

Death appeared at 31 (27.4%) cases from 113 patients. High hospital mortality was observed only among persons with severe form of AP. Persistent OF occurred in 50 patients from 1st group, 28 (56%) of them died. Transient OF appeared in 33 patients from 2nd group, there were 3 (4.76%) lethal cases. Intensive therapy, which included rigorous fluids resuscitation, hemodynamic and respiratory support, was ineffective in 17 patients, who have died at early phase of AP (during first or second week of disease) due to pancreatic shock with multiple OF. During late phase of AP (after two weeks from onset) there were 14 lethal cases as result of infection of pancreatic necroses with development of sepsis and multiple OF. Amount of organs with dysfunction were significantly higher in deceased patients compared with survivors (3.48±0.81 and 1.33±0.44, respectively, p<0.05) as well as APACHE II score, age, hematocrit and creatinine level (tab. 2).

Table 2. Influence of organs failure on survival of patients with acute necrotizing pancreatitis, M±m

	Dead (n=31)	Survived (n=82)	Mortality (overall=27.4%)
Persistent organ failure	28 (90.4%)*	22 (42%)	28/50 (56%)
Transient organ failure	3(9.6%)*	60(73%)	3/63(4.76%)
Respiratory failure	28(90%)*	14(17%)	28/42(67%)
Cardio-vascular failure	23(74%)*	16(19%)	23/39(59%)
Neurological failure	11(35%)	24(29%)	11/35(31%)
Renal failure	20(64%)*	16(19.5%)	20/36(56%)
Liver failure	6(19%)	10(12%)	6/16(37%)
Intestinal failure	21(67%)*	18(22%)	21/39(54%)
Amount of failured organs	3.48±0.81*	1.33±0.48	
APACHE II score	21.4±1.2*	13.6±1.6	
Hematocrit, %	51.8±0.9*	45.3±1.2	
Citrulline, µmol/l	10.31±0.42*	16.64±0.68	

* p<0,05 in comparison with survival patients

Univariate logistic regression analysis revealed that amount of organs in multiple OF were the main prognostic factor of death in patients with AP (p<0.01), wherein each OF development significantly worsened outcome too. Respiratory failure (RF) had been dominated in mortality structure. Isolated RF was indentified in 8 cases, 2 (25%) of them died. In patients with RF accompanied by other OF mortality rate increased till 66.7-85.6%. Cardio-vascular (59%), renal (56%) and intestinal (54%) failures were met with equal frequency. Intestinal failure of 3rd level were diagnosed in 21 (75%) among 28 nonsurvived patients of 1st group, lasted more than 5 days and presented by signs of paralytic ileus, acute gastric erosions and ulcers with bleeding. Their venous citrulline concentration during 48 hours after admission consisted 10.31±0.42 µmol/l and was significantly lower than in survived persons. In control group citrulline venous concentration was 36.8±0.43 µmol/l, in patients with moderate ANP it decreased till 20.7±0.67 µmol/l and in persons with severe ANP – it felt almost by three (tab. 1).

Conclusions

1. Multiple organ failure is leading cause of mortality cases as during early either late phases of ANP.
2. Respiratory failure (67%) is dominated in mortality structure of acute pancreatitis, cardio-vascular (59%), renal (56%) and intestinal (54%) failures appear with equal frequency.
3. Plasma citrulline concentration is easy and objective marker of intestinal failure in patients with ANP.

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O4. STANDARDS FOR INTRAVENOUS FLUID THERAPY - AUDIT OF MAINTENANCE FLUIDS IN SURGICAL INPATIENTS

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Introduction: The National Confidential Enquiry into Perioperative Deaths report in 1999 highlighted that a significant number of hospitalised patients were dying as a result of infusion of too much or too little fluid. In response to this, guidelines like British Consensus Guidelines on Intravenous Fluid Therapy for Adult Surgical Patients (GIFTASUP) were published in 2008, followed by NICE GUIDELINE CG 174 *Intravenous Fluid Therapy in Adults in Hospital* (NICE CG 174) in 2013. This audit was designed to review the compliance of the surgical department in a mid-sized district general hospital with these guidelines.

Aims and Objectives: To achieve best standards of IV fluid therapy in surgical inpatients. To assess whether surgical inpatients receive the amounts of water, Na+, K+, and glucose for maintenance IV fluid therapy as recommended by NICE CG 174 and the GIFTASUP

Guidelines & Standards: Comparison was made between department's current practice of prescribing maintenance IV fluids and guideline NICE CG174 and the GIFTASUP. The desired standard was set at 100% compliance with either guidelines.

Table 1: NICE CG174 compared to GIFTASUP

Recommended amounts of	NICE CG174	GIFTASUP
Sodium	1mmol/kg/day	50-100mmol/day
Potassium	1mmol/kg/day	40-80mmol/day
Glucose	50-100g/day	–

Data Collection and Methodology: Prospective review of presciptions for maintenance fluid in 20 surgical inpatients admitted through the acute take over a period of 24 hours over a period of 3 weeks from 02nd to 20th March 2015. Inclusion: Patients who were nil-by-mouth (NBM), defined as NBM or sips of water only, and receiving maintenance fluids, defined as fluid administration rates of slower than 166mL/h. Exclusion: Patients who were not NBM, or were receiving resuscitation fluids, defined as fluid administration rates of faster than 166mL/h. We sampled 20 patients admitted from the acute surgical take (N=20), 1 duplicate data set was excluded leaving 19 patients (n=19). Fluid volumes had to be within +/- 250mL of the recommended daily amounts.

Limitations: Some patients received 'top-up' IV fluid therapy in addition to oral intake. We found these patients' fluid balance charts too inaccurate to assess their compliance with the guidelines and therefore excluded them from the study. This resulted in a small sample size of N=20. GIFTASUP does not routinely advocate the use of IV glucose for maintenance, therefore prescribing practices for IV glucose could only be measured against NICE CG174.

Audit findings

Water

Three patients (16%) received the 20-35mL/kg/day of water recommended by NICE CG174. Five patients (26%) received the 1.5-2.5L of water recommended by GIFTASUP.

Sodium

One patient (5%) received the 1mmol/kg/day of sodium as recommended by NICE CG174 or the 50-100mmol/day recommended by GIFTASUP. Seventeen patients (89%) received doses higher than the recommended sodium dose. One patient (5%) received less than the recommended dose.

Potassium

None of the patients (0%) received the 1mmol/kg/day of potassium as recommended by NICE CG174, one patient (5%) received the 40-80mmol/day of potassium as recommended by GIFTASUP.
Glucose
Two patients (11%) received the recommended 50-100g of Glucose as recommended by NICE CG174.

Observations, Outcomes and Conclusions

1. inadequate levels of potassium supplementation with 0% and 5% of patients receiving the amounts recommended by NICE CG174 and GIFTASUP respectively.
2. over-supplementation of sodium.
3. likely cause: predominant use of balanced cristalloid solutions for routine maintenance. (see table 2)
4. under-supplementation of glucose
5. 16% of patients were receiving the amounts of water recommended by NICE CG174, and 26% meeting the GIFTASUP recommendation.
6. Only 7 patients (37%) had their weight recorded.

Table 2: Most commonly prescribed Infusion fluids

Infusion Fluid	Number of bags prescribed	%
Hartmann's Solution	**35**	**70**
0.9% Saline	11	22
5% Dextrose	4	8

Recommendations: Urgent re-education of doctors of all grades on current guidelines to be carried out at the earliest opportunity and at regular intervals thereafter. All surgical inpatients should be weighed on admission, those who receive IV fluid therapy > 24 hours should be weighed daily. The effectiveness of these interventions should be measured by a re-audit.

References

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O5. IMPLEMENTATION OF EXTENDED HAEMODYNAMIC MONITORING AND TREATMENT PROTOCOLS IN GERMAN, AUSTRIAN AND SWISS ICUS - RESULTS FROM THE OBSERVATIONAL, MULTICENTRE ICU-CARDIOMAN TRIAL

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Introduction: Finding optimal strategies of fluid therapy for different indications in critically ill patients suffering of haemodynamic instability has been discussed a lot lately. Measuring not only blood pressures but also specific cardiac output parameters by extended haemodynamic monitoring provides the basis for goal-directed management. An increasing number of guidelines and recommendations give clear suggestions concerning this matter. So far, it remains unclear to which extend standardized treatment protocols and extended haemodynamic monitoring are generally available and in practice implemented in the clinical setting.

Methods: The study employed an electronic survey, i.e. a web-based case report form, to collect data on the availability of treatment recommendations and modalities for extended haemodynamic monitoring from 161 intensive care units (ICUs) in Germany, Austria, and Switzerland. Those 161 ICUs provided data from 1789 patients encom-

passing detailed information on how haemodynamic monitoring was performed and to which extend treatment protocols were used in those patients on due date throughout the previous 24 hours.

Results: Extended haemodynamic monitoring for cardiac output measuring was widely available (i.e. transthoracic echocardiography in 91.9% and transpulmonary thermodilution in 84.4%). Similarly, 70% of ICUs revealed that they established protocols for haemodynamic treatment of severe sepsis and septic shock. Yet, other guidelines were not comprehensively implemented. While haemodynamic management was still performed according to a treatment protocol in 58% of the patients, monitoring of cardiac output was carried out in only 12.3% and echocardiography only in 1.9%. Also, addition of extended haemodynamic monitoring during the study period was rare (6.5%) and was triggered by haemodynamic instability in only 46.6%. However, when added, this extension led to changes in treatment in 71.6%.

Conclusion: So far, treatment recommendations and guidelines for haemodynamic management, with the exception of procedures for severe sepsis and septic shock, are not comprehensively implemented. Furthermore, extended haemodynamic monitoring beyond measurement of invasive blood pressures, though available in most intensive care units, still plays a minor role in the surveillance and treatment of critically ill patients. This includes also consensus-based recommended diagnostic and monitoring applications such as echocardiography and cardiac output monitoring. Therefore, this observational study helped to reveal that on the hand extended haemodynamic monitoring is widely provided in intensive care units, but on the other hand its standardized use to better detect and treat haemodynamic instability is still rare which thus offers improvement potential.

O6. PHARMACOKINETIC/PHARMACODYNAMIC TARGET ATTAINMENT IN CRITICALLY ILL PATIENTS WITH FLUID OVERLOAD TREATED WITH PIPERACILLIN OR MEROPENEM

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Introduction: In critically ill patients admitted to the intensive care unit (ICU), pathophysiological changes may have profound effects on pharmacokinetics (PK) of hydrophilic antibiotics. These antibiotics are also distributed to second (interstitial) and third space (pleural, peritoneal, and bowel cavity) fluid collections and are predominantly excreted via the kidneys (e.g. ß-lactams, aminoglycosides, glycopeptides). In ß-lactams, bacterial killing is considered time-dependent. Therefore, the pharmacodynamic (PD) parameter of interest, the %fT>MIC, i.e. the percentage of time during the dosing interval (T) that the free (f) drug concentration exceeds the minimal inhibitory concentration (MIC) of the causative microorganism could be important for individual dosage prediction.

Patients and Methods: In this prospective observational pharmacokinetic study seventeen critically ill patients were enrolled (mean age 50 and mean BMI 27.5) admitted to the Surgical ICU of the University Hospital in Hradec Králové, Czech Republic. Reason for ICU admission was multiple-trauma with Injury Severity Score (ISS) > 50 (in 10 patients) and septic peritonitis (in 7 patients). All these patients had a positive cumulative fluid balance (CFB) – i.e. total fluid volume based on 24-hour registered fluid intake minus loss. In 10 patients (59%) empiric intermittent treatment with piperacillin/tazobactam by1-hour IV infusion 4/0.5 g was given every 8 hour while 7 patients (41%) received meropenem 1g every 6h or 2g every 8h using 3-hour infusion. Serial blood samples were collected on day 2 to 8, as follows: predose and at 1, 2.5, 4.5, and 6.5 hours postdose for piperacillin; and predose, and at 1, 2.5 and 4.5 hours postdose for meropenem. Urine samples were taken from 7 and 24-hour urine collections to estimate piperacillin and meropenem-derived PK variables: area under the curve (AUC1-6, AUC1-8), total and renal clearance (CLtot, CLR), volume of distribution (Vd), and elimination half-life (T1/2) using pharmacokinetic analysis. Piperacillin and meropenem concentrations were determined by the previously validated method based on liquid chromatography-tandem mass spectrometry (LC-MS/MS) and corrected for unbound fraction (22%) in case of piperacillin. The 24-h creatinine clearance (CLcr) was calculated as previously described [1] with special interest in assessment of augmented renal clearance syndrome (ARC) with CLcr >130 mL/min. The predefined PK/PD target - 100%fT>MIC was calculated using individual PK parameters of each subject [2]. MIC based clinical breakpoints for Pseudomonas aeruginosa as defined by EUCAST were defined as <16 mg/L for piperacillin and < 2mg/L for meropenem as sensitivity thresholds [3]. The target attainment was tested within day 2 to 8 of treatment during ICU

stay (when CFB increases and afterwards again normalizes). 100%fT>8xMIC was defined as an antibiotic overdose; adequate values were therefore 128 mg/L for piperacillin and 16 mg/L for meropenem. Individual PK/PD target attainment during treatment with time-dependent antibiotics was the primary endpoint. Secondary endpoint was related to the relevant importance of ARC, which is known to be associated with target non-attainment.

Results: A total of 17 subjects, 13 men and 4 women, were enrolled. The plasma sample analysis showed that the time course of unbound plasma piperacillin and meropenem concentrations was best described by a one-compartment linear model. Covariates and their impact on PK parameters were evaluated. Between subjects analysis of patients treated with piperacillin showed a positive correlation between CLcr and CLR ($r_s = 0.84$, $p = 0.002$), a negative correlation between CLcr and AUC1-8 ($r_s = -0.84$, $p = 0.002$), and between CLR and AUC1-8 ($r_s = -0.97$, $p < 0.001$). Within subjects analysis showed a positive correlation between CFB and CLcr ($r=0.48$, $p=0.004$). These results confirm significant covariate effects on piperacillin PK. In patients treated with piperacillin, %fT correlated positively with CFB ($r_s = 0.75$, $p = 0.007$) and AUC1-8 ($r_s = 0.78$, $p = 0.004$) and negatively with CLcr ($r_s = -0.77$, $p = 0.010$) and CLren ($r_s = -0.85$, $p < 0.001$). For piperacillin, the target 100%fT> MIC,pip was attained in 2/10 patients (20%) who experienced the highest CFB (12-22 L and 35-12 L respectively), associated with lower CLcr (111-60 mL/min and <130 mL/min), respectively. In 8/10 (80%) subjects, who did not achieve the target, ARC was present. They only attained the low target 50% fT>MIC.pip. For meropenem, the target 100%fT> MIC,mer was attained in every patient. Three patients (3/7 or 43%) were overdosed. In patients treated with meropenem, between subjects analysis showed a negative correlation between CLcr and AUC1-8 ($r_s = -0.89$, $p = 0.019$). The %fT correlated positively with AUC1-8 ($r_s = 0.79$, $p = 0.036$), and negatively with CLcr ($r_s = -0.86$, $p = 0.014$) and CLR ($r_s = -0.89$, $p = 0.019$).

Conclusions: In patients admitted to ICU after multiple-trauma or severe abdominal sepsis, both renal function and CFB may affect the PK/PD target of piperacillin and meropenem. Creatinine clearance is a key factor in the prediction of PK/PD target attainment. Provided that piperacillin was given as a bolus dose, a subset of patients with increased creatinine clearance (> 130mL/min) was at risk for PK/PD target non-attainment especially at day 4-6 postinfusion. In contrast, meropenem administered as an extended infusion (which is known to improve the %fT>MIC) if administered to patients with CLcr <90 mL/min, may result in drug accumulation and overdosing (CLcr < 50 mL/min). This implies that without dose up-titration with regard to covariate effects and individual drug pharmacokinetics, these patients may be at risk for drug under- or overdosing.

Acknowledgments: The authors are indebted to the Internal Grant Agency of the Czech Rep. Ministry of Health for supplementation of the clinical study – project No. NT 14089-3/2013.

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O7. CONVENTIONAL CHEST X-RAY VERSUS EXTRA VASCULAR LUNGWATER INDEX (PICCO): IS THE INTERPRETATION OF A CONVENTIONAL X-RAY A RELIABLE PARAMETER TO EVALUATE THE EXTRA VASCULAR LUNGWATER (EVLW) IN CRITICALLY ILL PATIENTS?

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Background: Hemodynamic optimization in critically ill patients is necessary to achieve adequate microcirculation and oxygenation. Several clinical parameters are used to evaluate the intravascular volume status, such as blood pressure, urine production and bedside echocardiography. Excessive administration of fluids may lead to a positive fluid balance and a build up of extravascular lungwater (EVLW) which is proven to be harmful to critically ill intensive care unit (ICU) patients. Recent studies show that the quantity of EVLW in critically ill patients correlates with an increased risk of irreversible lung injury and more ventilator and ICU days. In our centre usually a conventional bedside x-ray is performed to evaluate the presence and severity of pulmonary edema and to assess the necessity

of adjusting the fluid balances. Recently, the Pulsioflex® PiCCO device (Pulsion Medical Systems, München, Germany) was implemented to measure the extra vascular lung water index (EVLWI) at the bedside.

Aim: To investigate the correlation between radiological interpretation of conventional x-rays and ELWI measurements by the Pulsioflex® device. (*The Albert Schweitzer Hospital is a teaching hospital in Dordrecht, the Netherlands. The Intensive Care Unit has 18 beds. Nurse practitioners at our ICU contribute to an important part of the hospital's ongoing research.)*

Methods: A prospective mono-center observational study in an 18-bed intensive Care Unit during a five month period was performed. We included twelve critically ill patients with an indication for advanced invasive hemodynamic monitoring. All patients were >18 years old and were given a PiCCO-catheter in femoral position. The patients underwent both chest x-ray and pulse index continuous cardiac output (PiCCO) monitoring at one point during their stay when information about EVLW was needed. When the PiCCO-measurement was performed, a chest x-ray was obtained within a fifteen-minute time frame. The x-rays were anonymized and randomized. Each x-ray was individually assessed by a group of twelve medical (ICU-) professionals and radiologists using a scoring system. The x-rays were examined based on the quality of the x-ray and the amount of presence of pulmonary edema. The scores were expressed in numericals from a scale of 0-3 (0= no signs of pulmonary edema, 3= severe pulmonary edema) The EVLW was calculated and indexed to actual body weight (normal EVLWI ≤10 ml/kg, increased EVLWI 11-15 ml/kg, severely increased EVLWI ≥16 ml/kg). Correlation between the measured EVLWI and the radiological findings were calculated using the kappa of Fleiss.

Results: 12 Patients were eligible for analysis. Mean age was 73,3 years (range: 60-87). Indication of ICU admission in these patients were related to sepsis (n=8), out of hospital cardiac arrest (n=1), cardiogenic shock (n=1), post-surgery after evacuating thoracic empyema (n=1) and dyspnea (n=1). Median EVLWI was 16 (range: 4 to 31) ml/kg. The weighted kappa between the chest x-ray scores of the interpreters was 0.0155. ICU-residents (n=4) scored a kappa of 0.0791, intensivists (n=4) 0.0684 and the radiologists (n=4) kappa was 0.207. There was no correlation found between EVLWI and the chest x-ray score.

Conclusion: No correlation was found between measured EVLWI with the Pulsioflex® monitor and the interpretation of chest x-rays.

Discussion: Quite surprisingly, this study showed that even if chest x-rays are assessed by experienced radiologists the kappa score was considered as poor. However, we have to take into consideration that chest x-rays are not always of sufficient quality. Even though this study had a small number of subjects, it encouraged us to evaluate our approach on recognizing and identifying pulmonary edema.

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O8. ACCURACY AND PRECISION OF NON-INVASIVE CARDIAC OUTPUT MONITORING IN OPERATING ROOM AND INTENSIVE CARE UNIT: A SYSTEMATIC REVIEW AND A META-ANALYSIS

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Background: Cardiac output (CO) measurement is essential for the assessment and guidance of therapeutic decisions in critically ill patients and/or high-risk surgical patients. Percentage error (PE) of minimally invasive technologies are around 41-42 % [1]. New non-invasive CO technologies are now available and their safety profile may allow an improvement in quality of care. However, their accuracy and precision have not been recently evaluated in a meta-analysis

Methods: We performed a systematic search using PubMed, Cochrane Library of Clinical Trials, Scopus, and Web of Science to review published data (2000-2015) of four non-invasive technologies [Pulse Wave Transit Time (PWTT), Pulse contour Analysis (PcA), Bioimpedance/Bioreactance (BioImp), and CO_2 rebreathing (CO_2r)]. The PRISMA methodology was applied for this meta-analysis. Three reviewers separately assessed the quality of included studies using modified Quality Assessment of Diagnostic Accuracy Studies guidelines. Data could be recalculated according to their initial presentation. Continuous noninvasive CO monitoring was considered acceptable if pooled estimates of PE was not greater than 30%, as recommended by Critchley and Crithley [2]. Pooled mean bias, standard deviation (SD), and mean percentage error (PE) were calculated using a random-effects model. The inter-study heterogeneity was also assessed using an I^2 statistic.

Results: A total of 38 studies (1586 patients) were included (Figure 1). Mean CO was 4.78 L/min. Bias was presented as the reference method minus the tested methods in 15 studies. Only six studies assessed the random error (repeatability) of the tested device. The overall random-effects pooled bias, the limits of agreement, and the PE were -0.01 to 2.01 L/min and 42%, respectively. Inter-study (I^2=83%, $P < 0.0001$) sensitivity heterogeneity was high. Analysis regarding the device is presented figure 2.

Conclusion: With a PE of 42%, totally and continuous non-invasive devices are not interchangeable with bolus thermodilution. However this degree of disagreement is similar as minimally and intruisive devices. Additional studies could precise their roles to demonstrate an improvement of the quality of care.

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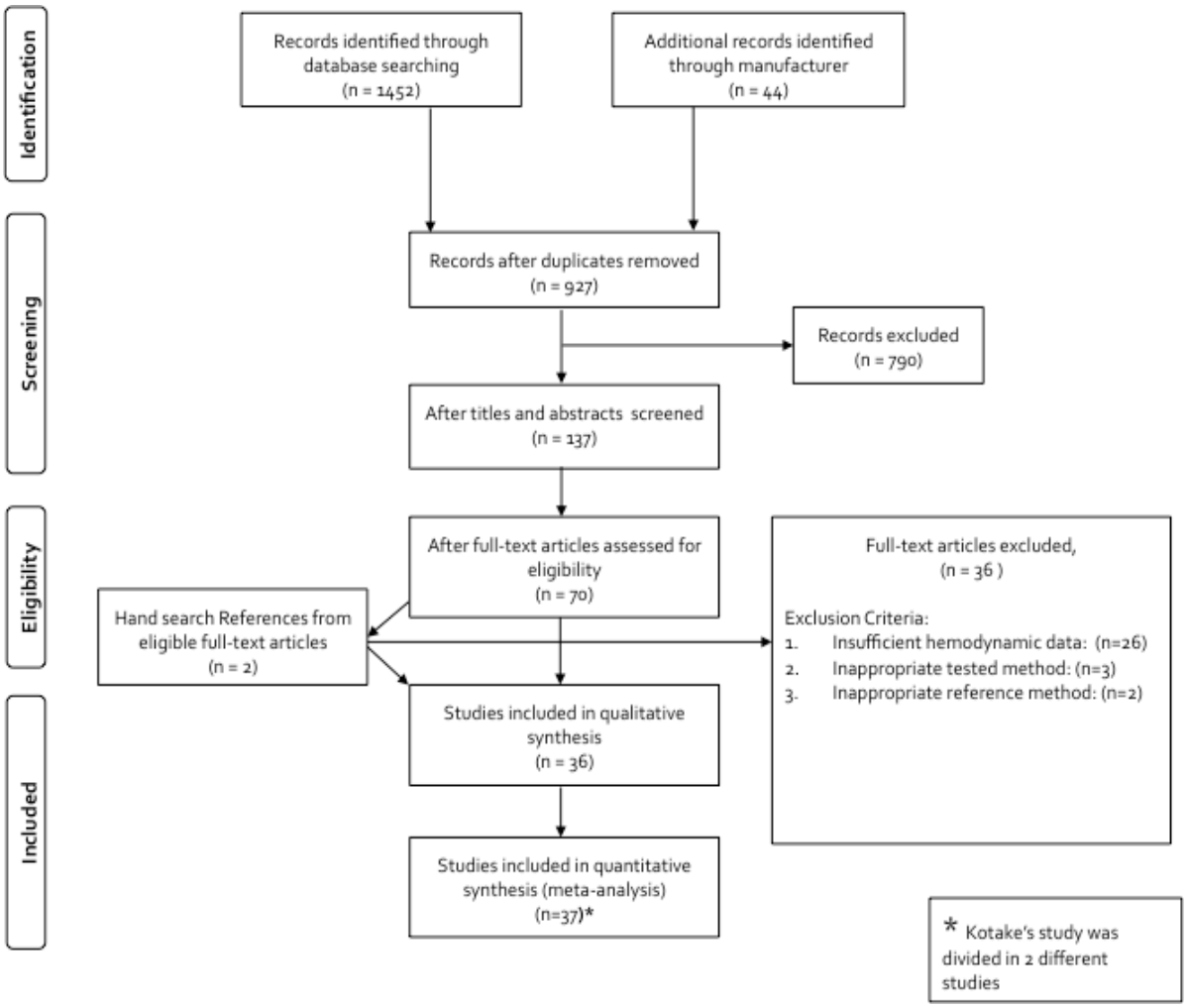
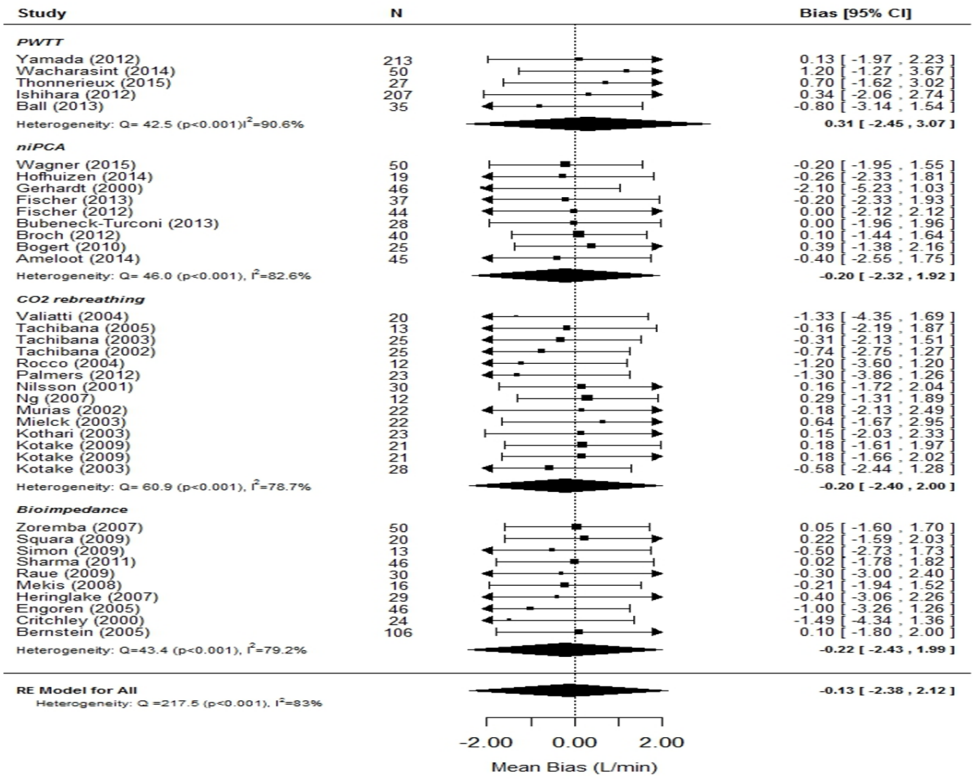

Identification
Screening
Eligibility
Included
Records identified through database searching (n = 1452)
Additional records identified through manufacturer (n = 44)
Records after duplicates removed (n = 927)
Records excluded (n = 790)
After titles and abstracts screened (n = 137)
After full-text articles assessed for eligibility (n = 70)
Full-text articles excluded, (n = 36)
Exclusion Criteria:
1. Insufficient hemodynamic data: (n=26)
2. Inappropriate tested method: (n=3)
3. Inappropriate reference method: (n=2)
Hand search References from eligible full-text articles (n = 2)
Studies included in qualitative synthesis (n = 36)
Studies included in quantitative synthesis (meta-analysis) (n=37)*
* Kotake's study was divided in 2 different studies


Study
N
Bias [95% CI]
PWTT
Yamada (2012) 213 0.13 [-1.97 , 2.23]
Wacharasint (2014) 50 1.20 [-1.27 , 3.67]
Thonnerieux (2015) 27 0.70 [-1.62 , 3.02]
Ishihara (2012) 207 0.34 [-2.06 , 2.74]
Ball (2013) 35 -0.80 [-3.14 , 1.54]
Heterogeneity: Q= 42.5 (p<0.001) I²=90.6% 0.31 [-2.45 , 3.07]
niPCA
Wagner (2015) 50 -0.20 [-1.95 , 1.55]
Hofhuizen (2014) 19 -0.26 [-2.33 , 1.81]
Gerhardt (2000) 46 -2.10 [-5.23 , 1.03]
Fischer (2013) 37 -0.20 [-2.33 , 1.93]
Fischer (2012) 44 0.00 [-2.12 , 2.12]
Bubeneck-Turconi (2013) 28 0.00 [-1.96 , 1.96]
Broch (2012) 40 0.10 [-1.44 , 1.64]
Bogert (2010) 25 0.39 [-1.38 , 2.16]
Ameloot (2014) 45 -0.40 [-2.55 , 1.75]
Heterogeneity: Q= 46.0 (p<0.001), I²=82.6% -0.20 [-2.32 , 1.92]
CO2 rebreathing
Valiatti (2004) 20 -1.33 [-4.35 , 1.69]
Tachibana (2005) 13 -0.16 [-2.19 , 1.87]
Tachibana (2003) 25 -0.31 [-2.13 , 1.51]
Tachibana (2002) 25 -0.74 [-2.75 , 1.27]
Rocco (2004) 12 -1.20 [-3.60 , 1.20]
Palmers (2012) 23 -1.30 [-3.86 , 1.26]
Nilsson (2001) 30 0.16 [-1.72 , 2.04]
Ng (2007) 12 0.29 [-1.31 , 1.89]
Murias (2002) 22 0.18 [-2.13 , 2.49]
Mielck (2003) 22 0.64 [-1.67 , 2.95]
Kothari (2003) 23 0.15 [-2.03 , 2.33]
Kotake (2009) 21 0.18 [-1.61 , 1.97]
Kotake (2009) 21 0.18 [-1.66 , 2.02]
Kotake (2003) 28 -0.58 [-2.44 , 1.28]
Heterogeneity: Q= 60.9 (p<0.001), I²=78.7% -0.20 [-2.40 , 2.00]
Bioimpedance
Zoremba (2007) 50 0.05 [-1.60 , 1.70]
Squara (2009) 20 0.22 [-1.59 , 2.03]
Simon (2009) 13 -0.50 [-2.73 , 1.73]
Sharma (2011) 46 0.02 [-1.78 , 1.82]
Raue (2009) 30 -0.30 [-3.00 , 2.40]
Mekis (2008) 16 -0.21 [-1.94 , 1.52]
Heringlake (2007) 29 -0.40 [-3.06 , 2.26]
Engoren (2005) 46 -1.00 [-3.26 , 1.26]
Critchley (2000) 24 -1.49 [-4.34 , 1.36]
Bernstein (2005) 106 0.10 [-1.80 , 2.00]
Heterogeneity: Q=43.4 (p<0.001), I²=79.2% -0.22 [-2.43 , 1.99]
RE Model for All -0.13 [-2.38 , 2.12]
Heterogeneity: Q =217.5 (p<0.001), I²=83%
-2.00
0.00
2.00
Mean Bias (L/min)

O9A. COMPARISON BETWEEN MALE AND FEMALE BODY COMPOSITION AND FLUID STATUS IN HEALTHY VOLUNTEERS USING BIOELECTRICAL IMPEDANCE ANALYSIS (BIA)

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Introduction: Bioelectrical impedance analysis (BIA) is a widely used method for estimating body composition. The technology is relatively simple, quick, and noninvasive. It allows assessment of different parameters related to the patient's **fluid status** such as volume excess (VE) total body water (TBW), intracellular water (ICW), extracellular water (ECW) and ECW/ICW ratio. BIA is also an important clinical tool for evaluation of **metabolic and nutritional status**; allowing measuring fat percentage (FAT%), fat free mass (FFM), fat free mass hydration (FFMH), resting metabolic rate (RMR), body cell mass (BCM) and malnutrition index (MI) (1,2). Studies show that BIA may provide additional information to the fluid balance in critically ill patients (3). BIA seems even a promising tool to guide fluid management if performed correctly (4). Before being able to use and interpret these parameters in critically ill, one must fully understand intersexual differences. The aim of this study is to observe important differences in body composition between male and female healthy volunteers.

Methods: We performed a retrospective data analysis of BIA measurements obtained in 101 healthy volunteers. TBW, ICW, ECW, ECW/ICW ratio, VE, FFM, FFMH, RMR, BCM and malnutrition index where measured by whole-body BIA using the BioScan 920-II multi-frequency analyzer (Maltron International, Essex, United Kingdom). Prior to examinations patient's weight was measured and body mass index was calculated. Two electrodes were placed on the wrist and 2 on the ankle. Bio-impedance was measured at 4 frequencies of 5, 50, 100 and 200 kHz in supine position.

Results: Of 101 volunteers, 68 were female and 33 were male. Median age was 38 years. Mean BMI was 23, 4 (±3) in the female group and 25,3 (±4) in the male group. Significant differences were observed in fluid status. ECW, ICW and TBW were higher in male than in female healthy volunteers (19,8±2,5 vs. 15,2±3,7l; 25,9±2,8 vs. 19,8±3,4l; 45,7±5 vs. 35±6,7l, all p<0,001). On the other hand ECW%, ICW% and ECW/ICW ratio were the same in male and female subjects (43,2%; 56,8%; 0,8). Volume excess in males and females are both slightly negative with a non-significant difference (0±0,1 vs. 0±0,1, p=0,230). Looking at body mass composition, females have a significant higher FAT% and therefore a lower FFM and FFM% than males (28,5±6,5 vs. 23,2±7,4, p=0,001) and (48,1±8,1 vs. 63±6,3kg, p<0,001; 71,5±6,5 vs. 76,8±7,4%, p=0,001). There was no significant difference in FFMH% between female and male subjects (72,7±2,4 vs. 72,5±2,1%, p 0,707). Males have a significant higher resting metabolic rate and body cell mass than female (1971,5±202,2 vs. 1571,2±205,9 kcal, p<0,001; 35,6±4,0 vs. 28±5,1 kg, p<0,001). Finally there was no significant difference in malnutrition index between male and female volunteers (0,8±0,1 vs. 0,7±0,1, p0,025). Median MI was 0,7 in healthy volunteers.

Conclusion: These results allow obtaining a good idea of body composition in man and woman, with significant differences between man and woman but also similarities. Men have higher quantitative volumes of TBW, ECW and ICW than woman, whereas distribution percentages and ratio's (ECW%, ICW%, ECW/ICW) are exactly the same in male and female healthy subjects, except for TBW%. Women have a significant higher FAT% and therefore also less FFM. Men have a significant higher RMR and a higher BCM than woman. Healthy subjects have a slightly negative volume excess (-0,1) and a malnutrition index around 0,7, with no significant difference between male and female healthy subjects.

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Table 1 shows more information about some parameters used to measure fluid, metabolic and nutritional status

ICW	Intracellulair water (body water thet exists inside the cell membrane)
ECW	Extracellular water (body water that exists outside the cell membrane; extracellular can be further subdivided into interstitial, lymphatic, trans-cellular fluid and blood)
TBW	Total body water = ICW + ECW
ECW%	ECW expressed as a percentage of total body weight
ICW%	ICW expressed as a percentage of total body weight
BCM	Body cell mas, the active metabolic component of the body (=intracellular fluids and solids)
ECM	Extracellular mass, all the metabolically inactive tissues of the body (= bone, cartilage, ligaments and extracellular water)
MI	Malnutrition index = ECM/BCM

Table 2 shows different measurements between female and male for all parameters

	Total (n=101)	**Female (n=66)**	**Male (n=35)**	**p-value**
Age	38	37.6	38.9	
BMI	24.20	23.4	25.3	0.020
TBW%	53.2±5.8	52±5.5	55.7±5.7	0.003
TBW (l)	38.5±8	35±6.7	45.7±5	<0.001
ECW%	43.2±2.4	43.2±2.7	43.2±1.7	0.876
ECW (l)	16.7±4	15.2±3.7	19.8±2.5	<0.001
ICW%	56.8±2.4	56.8±2.7	56.8±1.7	0.876
ICW (l)	21.8±4.3	19.8±3.4	25.9±2.8	<0.001
ECW/ICW	0.8±0.1	0.8±0.1	0.8±0.1	0.944
VE	-0.2±0.8	-0.2±0.1	0±0.1	0.230
FAT%	26.8±7.2	28.5±6.5	23.2±7.4	0.001
FFM (kg)	53±10.5	48.1±8.1	63±6.3	<0.001
FFM%	73.2±7.2	71.5±6.5	76.8±7.4	0.001
FFMH%	72.6±2.3	72.7±2.4	72.5±2.1	0.707
RMR (kcal)	1702±277.7	1571.2±205.9	1971.5±202.2	<0.001
BCM (kg)	30.5±5.9	28±5.1	35.6±4.0	<0.001
Malnutrition Index	0.7±0.1	0.7±0.1	0.8±0.1	0.025

Figure 1. Bar graph showing quantitative body water volumes in female and male

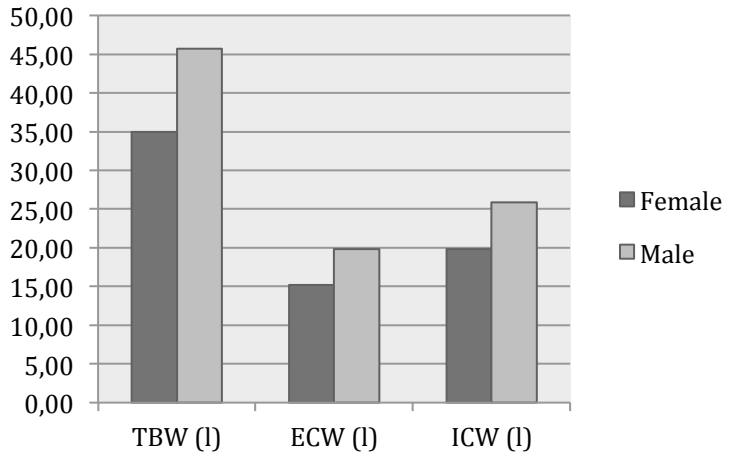


Figure 2. Bar graph showing body water distribution in female and male

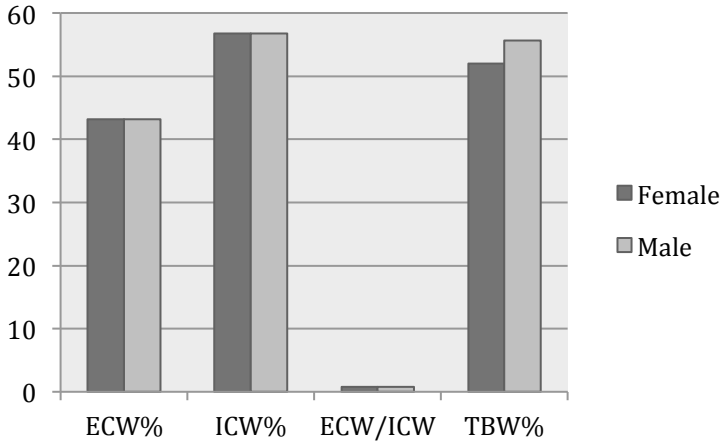
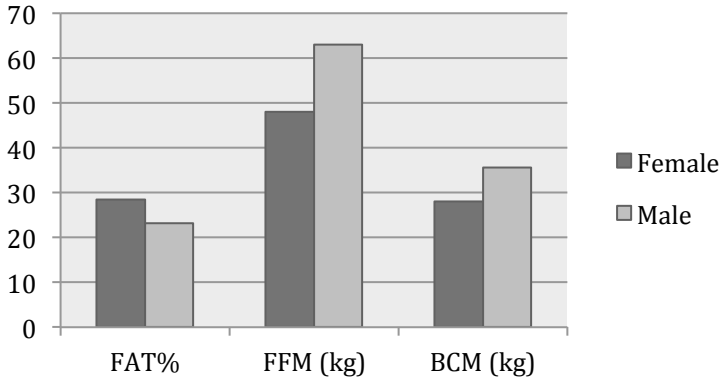


Figure 3. Bar graph showing body composition in female and male



O9B. PROGNOSTIC VALUE OF BIOELECTRICALIMPEDANCE ANALYSIS (BIA) DERIVED PARAMETERS IN CRITICALLY ILL PATIENTS

Stefanie Vandervelden, Suzanne Teering, Britta Hoffman, Yannick Peeters, Jelle Bernards, Michael Mekeirele, Marijke De Raes, Ann Van Rompaey, Ine Witters, Niels Van Regenmortel, Inneke De laet, Karen Schoonheydt, Hilde Dits, Manu LNG Malbrain
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Introduction: Little is known about the water content composition in critically ill.
Massive fluid resuscitation, which is recommended as the initial goal directed treatment for septic shock, may lead to an increase in extracellular water (ECW), intracellular water (ICW) and total body water (TBW) content, because of the presence of vascular endothelial hyperpermeability with capillary leak (1,2). Recent studies show that BIA may provide additional information to the fluid balance in critically ill patients (3). BIA is also a useful method in the nutritional assessment and prognosis of critically ill patients (4).The aim of this study is to compare the variables that can be obtained with bioelectrical impedance analysis (BIA) in healthy volunteers and critically ill patients, as well in survivors and non-survivors in the critically ill group.

Methods: We performed a retrospective data analysis of 235 BIA measurements obtained in 101 healthy volunteers and 101 patients. TBW, ICW, ECW, ECW/ICW ratio, VE, FFM, FFMH, RMR, BCM and malnutrition index where measured by whole-body BIA using the BioScan 920-II multi-frequency analyzer (Maltron International, Essex, United Kingdom). Prior to examinations patient's weight and length was measured. Two electrodes were placed on the wrist and 2 on the ankle. Bio-impedance was measured at 4 frequencies of 5, 50, 100 and 200 kHz in supine position. BIA measurements were performed within the first week of ICU stay (on day 5,1±2).

Results:
ICU vs. Healthy: Of 101 patients, 65% were male, whereas in the healthy group only 35% were male. Median age was 63±15,7 years and mean BMI was 28,5±8,4. Patients were older and had a higher BMI compared to healthy subjects (age 38±12,5; BMI 24±3,6). Mean APACHE II, SAPS and SOFA and scores were 23,1±9; 54,1±19,2;11±8,7.
Looking only at the raw data of impedance, capacitance, reactance and resistance there were significant differences observed between patients and healthy subjects with a p-value <0,001 in every of the 4 frequencies.
Significant differences were found in both fluid and nutritional status between patients and healthy volunteers. Patients had higher values for TBW (46,1±10,8 vs. 38,5±8L, p<0,001) and ECW (23,4±7 vs. 16,7±4L, p<0,001) while ICW (22,7±4,8 vs. 21,8±4,3L, p=NS) remained fairly unchanged. Also ECW% (23,4±7 vs. 16,7±4L, p<0,001), ICW% (49,6±5 vs. 56,8±2,4L, p<0,001) and ECW/ICW ratio (1±0,2 vs. 0,8±0,1L, p<0,001) showed significant differences, taken into account that these parameters exclude a potential gender bias, knowing that ECW%, ICW%, ECW/ICW are the same in man and woman, whereas ECW, TBW and ICW are higher in men.
Patients had a VE of 6,2±6,4 vs. -0,2±0,8L in healthy volunteers (p<0,001).
Looking at body mass composition, differences in FAT% (27,5±12,6 vs. 26,8±7,2, p=NS) and FFM% (72,5±12,6 vs. 73,2±7,2, p=NS) between patients and healthy subjects were not significant. On the other hand FFM and FFMH% were significant higher in patients (58,3±12,4 vs. 53±10,5kg, p=0,001 and 78,8±4,4 vs. 72,6±2,3, p<0,001). Finally malnutrition index in patients was higher than in healthy volunteers (0,9±0,2 vs. 0,7±0,1, p<0,0001).

Female vs. Male in ICU population: Of 101 patients, 36 were female and 65 were male. Mean BMI was 31±10 in the female group and 27±6,6 in the male group. Significant differences were observed in fluid status. ECW, ICW and TBW were higher in male than in female healthy volunteers (24,9±7,4 vs. 20,9±5,8 L; 24,4±4,6 vs. 19,7±3,4 L; 49,3±10,9 vs. 40,6±8,5 L, all p<0,001). On the other hand ECW%, ICW% and ECW/ICW ratio were the same in male and female subjects (50 vs. 51%; 49,9 vs. 49%; 1 vs. 1,1). Also no significant difference was found in VE between males and females (6±9,8 vs. 5,4±5,3, p=NS). Looking at body mass composition, females have a significant higher FAT% and therefore a lower FFM and FFM% than males (22,7±9,9 vs. 35,4±12,6, p<0,001) and (50,9±9,2 vs. 62,7±12,3kg, p=0,001; 64,6±12,6 vs. 77,3±9,9%, p<0,001). There was no significant difference in FFMH% between female and male subjects (79,4±4,2 vs. 78,5±4,5%, p=0,353). Males have a significant higher resting metabolic rate and body cell mass than female (1731±312,6 vs. 1452,4±200,6 kcal, p<0,001; 32,8±6,5 vs. 26,8±5,1kg, p<0,001). Finally there was no significant difference in malnutrition index between male and female volunteers (both 0,9±0,2, p=0,757).

Survivors vs. non-survivors in ICU population: ICU mortality was 39.6 % (n=40) and hospital mortality was 52.6 % (n=53). The non-survivors were older (69,4 vs. 59,6 years) than survivors. Patients who died in the hospital had similar values of ECW and TBW (23,6±5,8 vs. 23,4±7,3 L, p=0,832; 45,1±9,3 vs. 46,9±11,4, p=0,334), but significantly lower values for ICW (21,5±4,6 vs. 23,5±4,9 L, p=0,017), resulting in an increased ECW/ICW ratio (1,1±0,2 vs. 1±0,2, p=0,002).
Non-survivors have a significant higher ECW% and lower ICW% compared to ICU survivors (52,1±5,3 vs. 23,4±7,3 L, p=0,002; 47,9±5,3 vs. 50,7±4,8, p=0,002). Importantly non-survivors had significantly lower values for protein, mineral, muscle and glycogen mass. Also malnutrition index was significantly increased in patients who didn't survive (1±0,2 vs. 0,9±0,2, p=0,003).

Conclusion: BIA analysis allows obtaining a good idea of body water composition in critically ill and may help the clinician to guide fluid resuscitation and de-resuscitation. ICU patients contain more water, with a greater portion pooling in the extracellular compartment after leaking from the intracellular compartment, resulting in a higher ECW% and lower ICW% compared to healthy subjects. Male and female ICU patients show similar water distribution compared to male and female healthy subjects. TBW, ECW and ICW, which are quantitative volumes, are higher in both ICU and healthy men. Distribution parameters (ECW%, ICW%), which are compared to total body volume, as well ECW/ICW ratio are similar in both ICU and healthy male and female. Non-survivors have a significant higher ECW% and lower ICW% compared to ICU survivors. Finally non-survivors were more undernourished, compatible with a significantly higher malnutrition index.

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Table 1 shows different measurements between ICU and healthy population for all parameters

	ICU (n=101)	Healthy (n=101)	p-value
Age	63.3	38.00	<0.001
BMI	28.5±8.4	24±3.6	<0.001
TBW%	57.3±11.3	53.2±5.8	0.001
TBW (l)	46.1±10.8	38.5±8	<0.001
ECW%	50.4±5	43.2±2.4	<0.001
ECW (l)	23.4±7	16.7±4	<0.001
ICW%	49.6±5	56.8±2.4	<0.001
ICW (l)	22.7±4.8	21.8±4.3	0.158
ECW/ICW	1±0.2	0.8±0.1	<0.001
VE	6.2±6.4	-0.2±0.8	<0.001
FAT%	27.5±12.6	26.8±7.2	0.596
FFM (kg)	58.3±12.4	53±10.5	0.001
FFM%	72.5±12.6	73.2±7.2	0.598
FFMH%	78.8±4.4	72.6±2.3	<0.001
RMR (kcal)	1627±301.9	1702±277.7	0.050
BCM (kg)	30.5±6.7	30.5±5.9	0.954
Malnutrition Index	0.9±0.2	0.7±0.1	<0.001

Figure 1. Bar graph showing body water distribution in ICU patients and health volunteers.

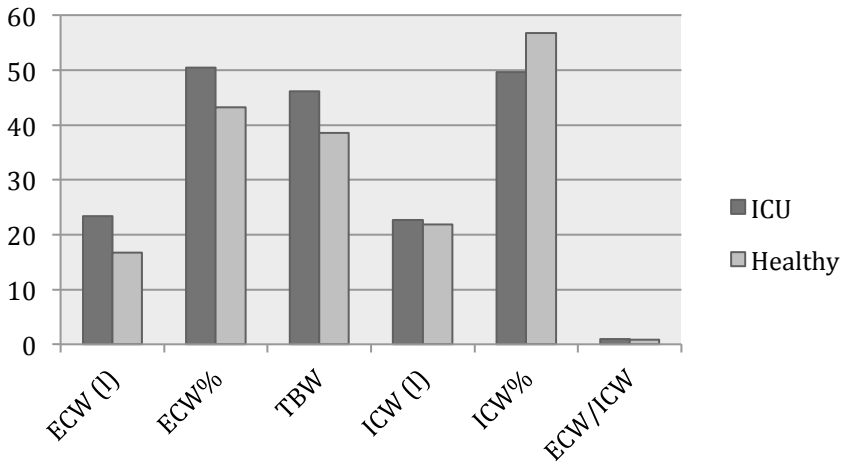


Table 2 shows different measurements between men and women in the ICU

	Male (n=65)	Female (n=36)	p-value
Age	59.9	65.30	
BMI	27±6.6	31±10	0.015
TBW%	60.9±10.1	51.3±10.4	<0.001
TBW (l)	49.3±10.9	40.6±8.5	<0.001
ECW%	50±5.3	51±4.3	0.255
ECW (l)	24.9±7.4	20.9±5.8	<0.001
ICW%	49.9±5.3	49±4.8	0.255
ICW (l)	24.4±4.6	19.7±3.4	<0.001
ECW/ICW	1±0.2	1.1±0.2	0.366
VE	6±9.8	5.4±5.3	0.661
FAT%	22.7±9.9	35.4±12.6	<0.001
FFM (kg)	62.7±12.3	50.9±9.2	0.001
FFM%	77.3±9.9	64.6±12.6	<0.001
FFMH%	78.5±4.5	79.4±4.2	0.253
RMR (kcal)	1731±312.6	1452.4±200.6	<0.001
BCM (kg)	32.8±6.5	26.8±5.1	<0.001
Malnutrition Index	0.9±0.2	0.9±0.2	0.757

Figure 2. Bar graph showing quantitative body water volumes in female and male ICU patients.

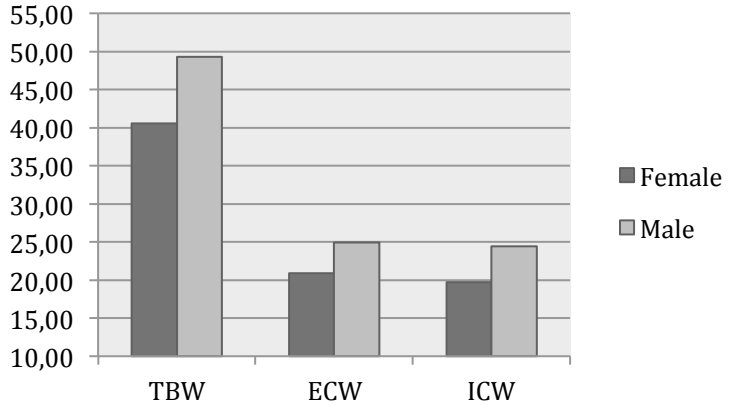


Figure 3. Bar graph showing body water distribution ratios in female and male ICU patients

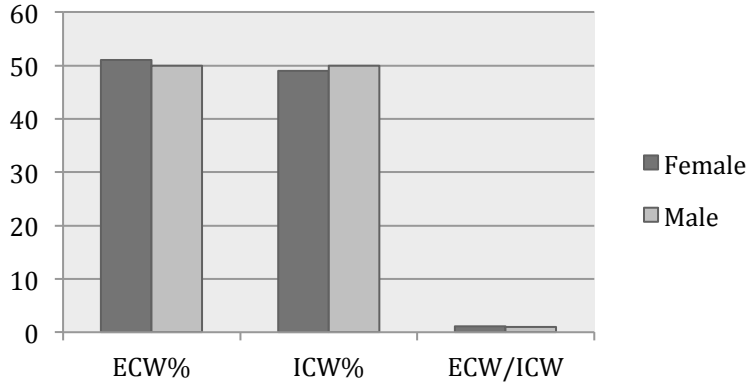
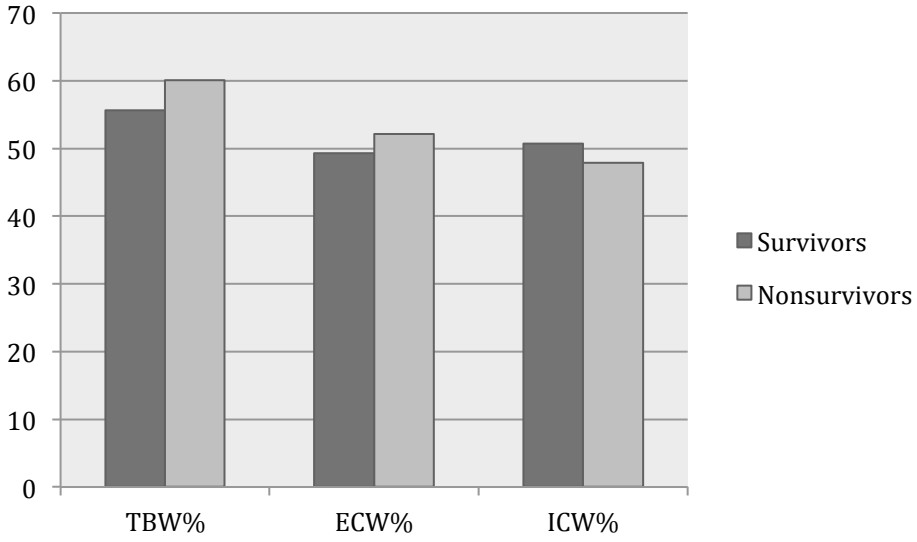


Table 3 shows different measurements between survivors and non-survivors in the ICU

	Non-survivors	Survivors	p-value
Age	69.4	59.60	
BMI	26.9±6.2	29.4±9.1	0.067
TBW%	60.1±11.3	55.6±10.7	0.024
TBW (l)	45.1±9.3	46.9±11.4	0.334
ECW%	52.1±5.3	49.3±4.8	**0.002**
ECW (l)	23.6±5.8	23.4±7.3	0.832
ICW%	47.9±5.3	50.7±4.8	**0.002**
ICW (l)	21.5±4.6	23.5±4.9	0.017
ECW/ICW	1.1±0.2	1±0.2	**0.002**
VE	7.5±5.8	4.6±9.1	0.029
FAT%	24.8±11.2	29.1±13	0.045
FFM (kg)	20.2±12.1	28±21.6	0.009
FFM%	75.2±11.2	70.9±13	0.045
FFMH%	79.5±4.6	78.4±4.1	0.145
RMR (kcal)	1560.4±265.3	1675.3±316.4	0.024
BCM (kg)	29±6.6	31.7±6.7	0.012
Malnutrition Index	1±0.2	0.9±0.2	0.003

Figure 4. Bar Graph showing body water distribution ratios in ICU survivors and non-survivors



O9C. BIOELECTRICAL IMPEDANCE ANALYSIS (BIA) AS A MEASURE OF FLUID OVERLOAD IN ICU PATIENTS

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Introduction: Fluid overload is associated with adverse outcome in critically ill patients. Therefore better methodology is required for its quantification. Bio-electrical impedance analysis (BIA) represents such a non-invasive method for quantification of fluid overload and allows assessment of different parameters related to the patient's fluid status such as total body water (TBW), intracellular water (ICW), extracellular water (ECW) and ECW/ICW ratio (1). Massive fluid resuscitation may lead to an increase in ICW, ECW and TBW content. Studies have already shown that BIA may provide additional information to the fluid balance in critically ill (2). BIA also seems a promising tool to guide fluid management if performed correctly (3)

Methods: A retrospective data-analysis was performed on 134 BIA measurements that were obtained in 101 critically ill patients. Fluid volume excess (VE), TBW, ECW, ICW and the ECW/ICW ratio where measured by whole-body BIA using the BioScan 920-II multi-frequency analyser (Maltron International, Essex, United Kingdom). BIA measurements were performed within the first week of ICU stay (on day 5,1±2). Prior to BIA measurement, other parameters of fluid status were measured, such as indexed extravascular lung water (EVLWI), intra-abdominal pressure (IAP) and cumulative fluid balance. EVLWI was obtained by triplicate transpulmonary thermodilutions (TPTDs; PiCCO, Pulsion Medical-Systems, Germany). IAP was measured via a urinary bladder catheter.

Results: Of 101 patients, 65% were male. Median age was 63 years and APACHE II score was 22,7. In 32 of the 101 patients ELVWI was measured on the same moment. Correlation-index between ELVWI and ECW, ICW and TBW were respectively 0,48; 0,25; 0,49. On the total of 134 BIA measurements, IAP was simultaneously registered in 96 measurements. Correlation-index between IAP and ECW, ICW and TBW were respectively 0,31; 0,20; 0,29.

Conclusion: There seems to be a moderate positive correlation between ECW and ELWI, as well between TBW and EVLWI. However, prospective assessment and day to day changes are required to establish whether BIA measurements can be used to assist fluid management in the ICU.

Fig1. Correlation between EVLWI en ECW, with R= 0,48

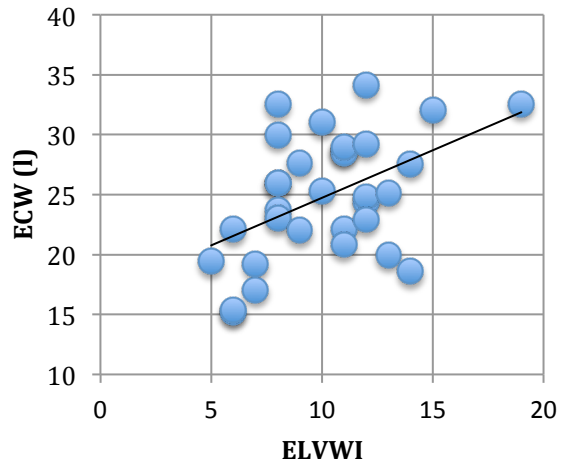
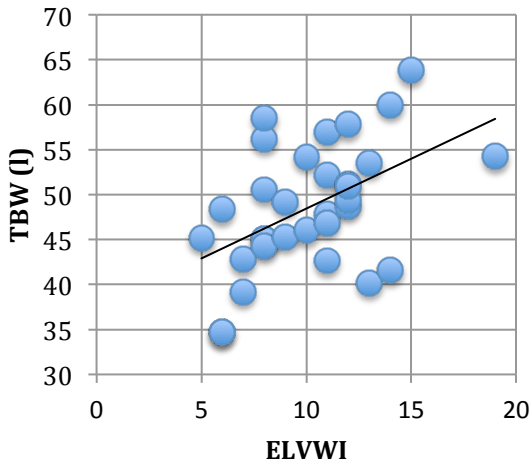


Fig 2. Correlation between EVLWI en TBW, R= 0,49



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O10. ACETYLSALICYLIC ACID AS A THERAPEUTIC MEASURE FOR LUNG INJURY IN PRECLINICAL MODELS

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Background: The acute respiratory distress syndrome (ARDS) is a life-threatening disorder that contributes significantly to critical illness and mortality. Platelet activation is a key component in ARDS pathophysiology and this may provide an opportunity for preventive and therapeutic strategies. The purpose of this study was to systematically review the literature on the effect of acetyl salicylic acid (ASA) in preclinical models of lung injury and to determine the mechanisms of action.

Methods: We conducted a systematic review of preclinical studies published before August 31, 2014, investigating the efficacy of ASA in the setting of lung injury in preclinical models. MEDLINE, EMBASE AND COCHRANE databases were searched.

Results: Twelve pre-clinical studies fulfilled the in- and exclusion criteria. Lung injury was evidenced by increased capillary permeability, alveolar instability, accumulation of inflammatory cells in different compartments of the lungs in conjunction with pulmonary microvascular thromboembolism in all studies. In the preclinical studies the overall effect of ASA was positive. Physiological benefits of ASA, evidenced by improved oxygenation and outcome, are a reduction in intrapulmonary shunt and pulmonary hypertension by attenuating vascular tone and reduction of platelet sequestration in the lung, trough decreased NO-production and blocking of TX-A_2. Other identified pathophysiological mechanisms were the interference of ASA with the neutrophil-platelets interaction and release of pro-inflammatory mediators such as interleukins, Kupffer cells and tumor necrosis factor-α. ASA also increased the biosynthesis of lipoxins that elicit distinct anti-inflammatory and pro-resolution actions. In addition, the reduction of neutrophil extracellular traps (NETs) attenuates lung endothelial injury mediated by exposed extracellular histones, neutrophil granular proteins and extracellular DNA. High dose ASA was more effective than low dose. All studies had methodological short-comings

Reference	Lung injury model	Drug (dose)	Animal	Conclusion
Leeman et al (1988)	OA-induced ARDS	ASA (1 g iv)	Dog	↑ PaO_2, ↓venous admixture ↓ intra pulmonary shunt
Sigurdsson et al (1989)	i.v. ethanolamine oleate induced ARDS	ASA (10 mg/kg)	Sheep	prevent PHT prevent lung edema preserved PaO2
Chelucci et al (1992)	OA-induced ARDS	ASA-low dose (10 mg/kg)	Sheep	no morphological benefit no significant change of static compliance of respiratory system and on flow resistance of the airway at 3h
Gonçalves de Moralis et al (1996)	Local LPS induced ARDS	ASA (50mg/kg)	Mice	↑ inflammation
Fukunaga et al (2005)	HCl-induced ARDS	ASA (0.125 g/kg)	Mice	↓ inflammation
Zarbock et al (2006)	HCL-intratracheal induced ARDS	ASA (1mg/g)	Mice	↓ inflammation ↑ PaO_2/FiO_2 (mmHg)
Jin et al (2007)	LPS-induced ARDS	ASA-Triggered Lipoxin A_4 (0.7mg/kg)	Mice	↓ lung edema ↓ microvascular permeability ↓ Inflammation ↑ survival (at 72 h)
El Kebir et al (2009)	intratracheal carrageenan + MPO or intraperitoneal E. Coli induced ARDS	ASA-triggered 15-epi-lipoxin A_4 (200 µg/kg)	Mice	↓ inflammation
Eickmeier et al (2013)	HCL-induced lung injury	ASA-triggered resolving D1 (0,5-5ug/kg)	Mice	↓ lung edema ↓ resistance ↓ inflammation ↑restitution of lung- barrier function
Tuinman et al (2013)	LPS-induced ARDS	ASA(12.5 mg/kg) ASA(100 mg/kg)	Mice	ASA protect against ARDS. High dose ASA is superior to low-dose ASA.
M. Looney et al (2009)	Two-event LPS-primed/ MHC I mAb	ASA (100mg/kg)	Mice	↓ EVLW/EVPE ↓ mortality
A. Caudrillier et al (2012)	Two-event neutrophil and platelet-dependent TRALI model	ASA (100mg/kg)	Mice	↓NET

Table 1 Pre-clinical studies investigating the role of acetylsalicylic acid in lung injury
ARDS: acute respiratory distress syndrome; ASA: acetylsalicylic acid; BALF-N: Broncho alveolar lavage fluid neutrophil; EVLW: extra vascular lung water; EVPE: lung vascular permeability; HCL: hydrochloric acid; IND: indomethacin; LPS: lipopolysaccharide; NET: neutrophil extravascular traps; OA: Oleic Acid; Pap: pulmonary artery pressure; PHT: pulmonary hypertension; TRALI: transfusion-related cute lung injury;↓: decrease; ↑: increase

Conclusion: This systematic review of preclinical studies shows a beneficial role for ASA in ARDS prevention and treatment. We suggest the identified mechanism of ASA in lung injury to be evaluated in "dose-finding "studies in humans before embarking into randomized controlled trials.

O11. ADHERENCE TO SURVIVING SEPSIS GUIDELINE AMONG PEDIATRIC INTENSIVIST: A NATIONAL SURVEY

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Background: Sepsis is an important cause of mortality in pediatric intensive care units. Although adherence to sepsis management guidelines is associated with better outcome in septic patient, the compliance to these recommendations is variable among pediatric health care providers. The aim of this study was to describe the initial management of pediatric patients with severe sepsis, the compliance of this management to the current sepsis guidelines as well as to describe the main barriers to the adherence to these guidelines.

Methods: A survey using a case scenario to assess the management of a child with severe sepsis was designed and sent out to all consultant pediatric intensivist of the Saudi critical care society. Participants were asked to describe in detail their usual management of these patients including investigations, fluid and catecholamine management, intubation, and specific treatments. Participants were also asked to report what they think being a barrier for the implementation of sepsis guideline in their institutions.

Results: Fifty four pediatric intensivists answered the survey. Thirty nine intensivists (72.2%) reported full compliance to the first 3h resuscitation bundle, the lowest compliance in this bundle was "Obtain blood cultures prior to administration of antibiotics" 77.7%, while the other components have compliance more than 90%. Twenty six intensivists (48.1%) reported a full compliance to the second resuscitation bundle. Two components in this bundle have low compliance, explaining the overall low compliance:" measure$ScvO_2$" 62.9% and "measure CVP" 68.5%. half of the responders think that the main barriers to the adherence to Surviving Sepsis Campaign guidelines is the absence of a locally written protocol.

Conclusions: In this survey, although pediatric intensivists reported high adherence to the current surviving sepsis campaign guideline regarding antibiotic administration, rapid fluid resuscitation, and administration of catecholamines and steroids, the overall adherence was low. The absence of a locally written protocol was the main barriers to the uniform application of current guidelines.

O12. VALIDATION OF LESS INVASIVE HEMODYNAMIC MONITORING DEVICES (CLEARSIGHT, SCANADU AND EARLYSENSE) IN HEALTHY VOLUNTEERS.

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Introduction: In this observational study recently developed non-invasive monitoring devices are compared to standard bedside ICU monitoring. These non-invasive devices include the Scanadu, a small handheld portable device, potentially useful in home setting; the Earlysense, a device which is placed under the patient's mattress for monitoring heart rate and respiratory rate in hospital setting and the Clearsight (formerly Nexfin), a device providing basic hemodynamic monitoring as well as cardiac output using a fingercuff. In this observational study, we compared basic monitoring parameters of the Scanadu (arterial blood pressure, heart rate and hemoglobin saturation), Earlysense (heart rate and respiratory rate) and Nexfin (arterial blood pressure, heart rate and hemoglobin saturation) with the gold standard: a conventional ICU bedside monitor in healthy volunteers.

Methods: In a group of 14 healthy volunteers, measurements were made simultaneously in upright (30° head of bed elevation), supine (0°) and Trendelenburg position (-30°). The mean age was 28.1±6.3 with a male:female ratio

of 1:1 and a body mass index of 23.5 ± 3.8. The different techniques were compared to a conventional ICU bedside monitor (Philips) using Pearson regression and Bland and Altman analysis.

Results: A poor agreement was seen for Nexfin and Scanadu in comparison to standard monitoring for systolic blood pressure. The values were 127.3 ± 12.4 mmHg and 114.7 ± 7.5 mmHg Nexfin and Scanadu respectively; with limits of agreement of -50.1 to 14.2 and -18.7 to 33.1 respectively, a mean bias of -18.0 and 7.4 and a percentage error of 25.3% and 22.7% compared with the conventional cuff manometer. For mean arterial pressure and diastolic blood pressure, both Nexfin and Scanadu also showed a poor agreement with conventional monitoring. Pearson correlation was poor.
For heart rate, the best results were obtained and the values of the Nexfin, Earlysense and Scanadu were 66.7±12 /min, 66±11.8 /min and 66.2±11.2 /min respectively, with limits of agreement of -10.8 to 11.5, -8.2 to 11.6 and -9.3 to 11.1; a bias of 0.3, 1.7 and; 0.9 and a percentage error of 16.7%, 15.0% and 15.4% in comparison to the standard monitor. Pearson correlation coefficients ranged from 0.8 to 0.84.
For hemoglobin saturation measurement, Nexfin showed superior agreement with the conventional monitor than the Scanadu. The values were 98.3±1.3% and 97.2±4.8% respectively, with limits of agreement of -2.4 to 3.7 and -16.4 to 22.4 respectively; a bias of 0.6 and 2.9 and a percentage error of 3.1% and 19.8% in comparison to standard plethysmography. Pearson correlation was poor.
Respiratory rate (RR), measured with the Earlysense, showed poor agreement with conventional monitoring (ECG derived RR). The mean RR in the Earlysense data was 18.5±2.9, with limits of agreement of -9.4 to 7.3, a bias of -1.1 and a percentage error of 45.2% in comparison to standard monitoring. Pearson correlation coefficients were poor around 0.34.

Conclusions: In this pilot study, the newly developed non-invasive monitoring devices, Nexfin, Earlysense and Scanadu showed poor agreement with conventional ICU monitoring for various hemodynamic parameters and thus cannot be used interchangeably with standard monitoring devices (at the exception of heart rate).

O13. POLISH GUIDELINES FOR PERIOPERATIVE FLUID THERAPY AS A SUGGESTION FOR EUROPE

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Introduction: Perioperative fluid therapy has been studied in several countries. Yet, the international guidelines have been not precised. Polish group of experts in perioperative fluid therapy would like to present the national rule for perioperative fluid therapy as a proposition for European guidelines. Polish experts of fluid therapy have proposed to divide the guidelines into: 1. preoperative, 2. intraoperative and 3. postoperative guidelines, according to clinical phases of perioperative period.

Recommendations: We propose to keep a fluid grace for 2 hours in preoperative period. The balanced crystalloids should be infused in patients, who have not received fluids for the last six preoperative hours. We do not recommend colloids in preoperative period. We do not recommend administration of cathartic drugs for preoperative digestive cleansing. Intraoperative fluid therapy and monitoring should be established before surgery. Intraoperative fluid infusion should be monitored in accordance with patients' clinical status. We do not recommend 0.9% NaCl. Fluid infusions should be used only for intravascular fluid replacement. We recommend administration of vasopressors for correction of anaesthesia - related hypotension. Balanced crystalloids are recommended as routine intraoperative infusion. Slow intraoperative crystalloids elimination and capillary refill reduce fluids demand during insignificant bleeding. We recommend to avoid an intraoperative fluid overload. Colloids should be used in patients, who received three fold volume of balanced crystalloids following intraoperative bleeding or who do not respond to vasopressors and crystalloids treatment following anaesthesia-related hypotension. Intraoperative fluid therapy should be continued during early postoperative period. Postoperative fluid therapy should be based on clinical status, postoperative blood loss and diuresis. Monitoring of postoperative fluid therapy should be the same as in intraoperative period. We recommend enteral fluid intake and enteral feeding be instituted as quickly as possible. We recommend daily body mass control. In patients, who require parenteral nutrition, we recommend initial dose of 10 kcal/kg body wt. as quickly as possible.

POSTER PRESENTATIONS

P1. SYSTOLIC ANTERIOR MOTION OF MITRAL VALVE OCCURRED DURING MASSIVE BLEEDING AND INOTROPIC SUPPORT IN A PATIENT UNDERGOING ROBOT-ASSISTED LAPAROSCOPIC CHOLECYSTECTOMY

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Introduction: We present a case of a patient with normal heart, who developed systlic anterior motion of mitral leaflet, dynamic LVOT obstruction, and mitral regurgitation due to massive bleeding and catecholamine therapy. The overuse of catecholamine to hypovolemic state could deteriorate vital sign, and tansesophageal echocardiography help diagnosis and monitoring the response of treatment. Systolic anterior motion of mitral leaflet with dynamic left ventricular outflow tract obstruction can occur in patients with hypertrophic cardiomyopathy, post-myocardial infarction, post-mitral valve repair, hypovolemia, and excessive catecholamine therapy. In this report, we present a case of a patient, with normal heart, who developed systolic anterior motion of mitral leaflet, dynamic left ventricular outflow tract obstruction, and mitral regurgitation due to massive bleeding and catecholamine therapy. Transesophageal echocardiography helped to diagnosis, treatment, and monitoring the response of the treatment.

Case description: A male patient of 38 years of age (height, 174 cm; weight 100 kg) came to operating thatre for robot-assisted laparoscopic cholecystectomy due to acute cholecystitis and common bile duct stone. He has no specific medical history or abnormal laboratory findings. Starting the operation, CO_2 was insufflated to create a pneumoperitoneum with an intra-abdominal pressure of 12 mmHg. During the insertion of trocar with cannula into peritoneal cavity for cholecystectomy, massive bleeding occurred due to mesenteric vessel injury (3 L for 40 minutes), blood pressure dropped to 65/41 mmHg from 115/60 mmHg, heart rate increased 120 beats/min from 80 beats/min. The patient was tilted to Trendelenburg position, and for continuous blood pressure monitoring, arterial blood gas analysis, and volume replacement, a radial artery catheter and both internal jugular vein catheters with two 14G lumens (Spectrum Central venous Catheter Set, Cook Medical, USA) were placed, the central venous pressure (CVP) was 12 mmHg. Transesophageal echocardiography (TEE) probe were also placed to monitor the volume status through the transgastric short axis view. With a rapid intravenous fluid infusion of crystalloid, colloid solutions, and packed red blood cell transfusion, dopamine 1.7 μg/kg/min, norepinephrine 0.26 μg/kg/min, and epinephrine 0.17 μg/kg/min were infused to maintain the blood pressure by additional manner. With the restoration of blood volume monitored through TEE, blood pressure recovered up to 90/46 mmHg (heart rate, 119 beats/min; CVP, 16 mmHg), but infusion of catecholamine could not be tapered and serial arterial blood gas analysis revealed progressively decreasing arterial O_2 partial pressure (PaO_2) of 80.1 mmHg from 206.1 mmHg (FIO_2 0.5). We tried to find the cause of the deterioration, and midesophageal 4 chamber view of TEE showed dynamic LVOT obstruction, SAM (Fig. 1), and mitral regurgitation (Figs. 2).

Fig 1. SAM

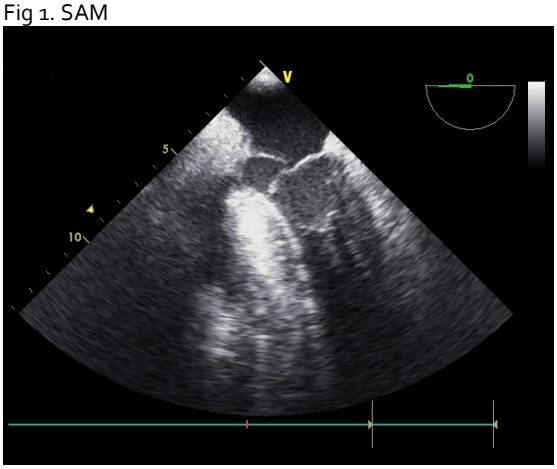
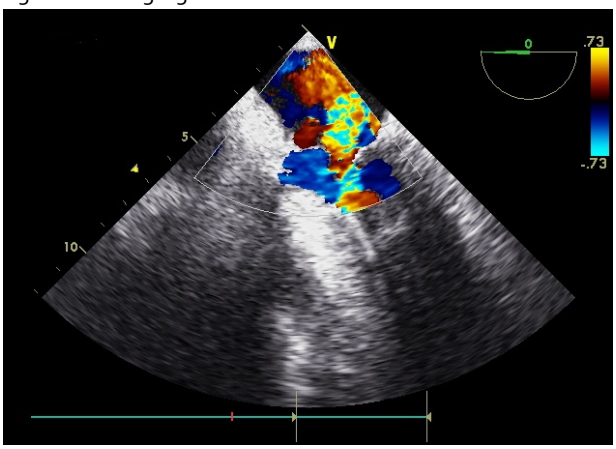


Fig 2. Mitral regurgitation



The infusion of dopamine and epinephrine was rapidly tapered and stopped, norepinephrine infusion was continued to maintain the blood pressure and raise afterload of the left ventricle, and positive end expiratory pressure of 5 cmH_2O was applied to anesthesia machine. Thirty minutes later, PaO_2 recovered to 204 mmHg (blood pressure,

116/46 mmHg; heart rate, 98 beats/min; CVP, 14 mmHg), and TEE showed disappeared SAM, LVOT obstruction, and mitral regurgitation.

After 4 hr 30 minutes, lararoscopic surgery was switched to open laparotomy (estimated blood loss, 6L). It took additional 1 hour 20 minutes to complete the operational procedure, and the total estimated blood loss was 7 L. Chest radiography, taken before transporting to intensive care unit, showed no pulmonary edema. On postoperative day 2, the patient was transported to the general ward, and discharged on postoperative day 23 without any complication.

Discussion: The patho-anatomical mechanism of SAM not due to HCMP includes: 1) excessive anterior or posterior leaflet, 2) the mitral valve coaptation point to move anteriorly towards the LVOT, 3) elongation of the anterior leaflet, 4) change of posterior leaflet height, 5) anterior: posterior leaflet length ratio < 1.3, 6) anterior displacement of mitral valve, 7) reduced mitro-aortic angle 8) bulging sunaortic septum, 9) ventricular hypertrophy, 10) hyperdynamic left ventricle [6]. In our case, elongated chordae, movement of the mitral valve coaptation point toward LVOT, reduced LVOT size due to small left ventricular cavity and hypovolemia, and other changes of ventricular geometry associated hypovolemia and hyperdynamic state due to excessive catecholamine treatment, that increase the outflow tract velocity, increasing the "drag forces" on the mitral valve, represented the most important mechanism for the development of SAM, dynamic LVOT obstruction, and mitral regurgitation.

Treatment of dynamic LVOT obstruction is β-blocker, cessation of catecholamine to slow down the heart rate and for negative inotropism. Rapid substitution of fluid, restoration of preload of left ventricle, in case of hypovolemia may improve the hemodynamic condition dramatically. Catecholamine therapy is often used to maintain the systemic blood pressure in the presence of shock, hypovolemia, or acute myocardial infarction. In our case, the patient showed progressively decreasing PaO_2, and relative hypotension though restored preload of the left ventricle monitored by TEE and massive catecholamine therapy. Eventually TEE showed SAM, dynamic LVOT obstruction, and mitral regurgitation.

Tapering and cessation of the dopamine and epinephrine infusion and continuous volume replacement restored hemodynamic stability, and TEE showed disappeared SAM, dynamic LVOT obstruction, and mitral regurgitation. Decrease of PaO_2 might be result of SAM, the mitral regurgitation and increased left atrial pressure that inhibited drainage of blood from the lungs via the pulmonary veins and lead to pulmonary congestion, but also be due to atelectasis by intra-abdominal CO_2 insufflation and Trendelenburg position that limit the lung compliance, evidenced by rapid restoration of PaO_2 after applying positive end expiratory pressure and chest radiography showing no pulmonary edema.

P2. INTRAOPERATIVE ANAPYLAXIS DUE TO GELOFUSINE – REPORT OF PERSONAL EXPERIENCE

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Background: There are differences between the results of studies performed in different centres, regarding the substances responsible for anaesthetic related anaphylaxis. Epidemiological studies indicate an increase in allergies in the perioperative period. Some allergens can be lifethreatening (1). One of the most difficult and time-consuming issues in practical allergology is to diagnose the reactioninducing agent, particularly in the perioperative period. Our previous paper presents various aspects of the diagnosis of allergy highlighting the usefulness of skin prick testing. The study involved 52 patients (42 women and 10 men). They were selected out of 72,380 patients anaesthetized for surgeries in 2003 and 2010. The physical examination of patients who experienced allergy determined the location, extent and severity of side effects. The tests were always conducted after inserting an intravenous catheter, under full safety conditions. A positive reaction after allergen application occurred in the form of a wheal of 3 mm or more in diameter and erythema. Patients were subjected to skin prick tests and intradermal tests using all anaesthetic drugs, including NMBAs, applied during anaesthesia (according to the anaesthesia protocol). Four patients (7.69 %) had positive SPT to latex, which showed clearly that it was the causative factor of the reaction. One of the patients (1.92 %) had positive SPT to atracurium, the others to augmentin and pethidine. Three patients (5.76%) had positive SPT to NMBA (atracurium, cisatracurium, rocuronium) (wheal size greater than 3 mm compared to the negative control). Positive intradermal test results to NMBA were identified in 27 patients (51.92 %). Patients received a written notice of the occurrence of suspected anaphylactic reaction during anaesthesia, the potential cause and the implemented therapeutic procedure. Increased dermographism made the

skin tests in patients difficult to interpret, and therefore the following results were also taken into account: tryptase, specific IgE and clinical symptoms manifested during anaesthesia, recorded in patient records. Detailed history, skin prick testing, laboratory methods, and double-blind placebo-controlled challenges are still the gold standard for the diagnosis of hypersensitivity, although sometimes results can lead to difficulties of interpretation or can be even misleading. Anaphylaxis due to colloid plasma expanders is a recognized but rare life-threatening complication in patients.

Methods: For 5 years (January, 2009 - June, 2013) the patients presenting with perianaesthetic anaphylaxis were analyzed in the Pomeranian area in Poland. The diagnosis was based on case history, skin prick and intradermal tests, specific IgE measurement and serum mast cell tryptase. Reactions were defined as IgE-mediated (anaphylactic-type), if positive skin tests, and/or specific increase in IgE did occur.

Results: Out of 25 referred patients (18 females, 7 males, ages ranging between 22 and 67) 5 consented to complete all investigations needed for identifying the gelofusin of the allergic reaction. An IgE mediated mechanism was confirmed in all patients.

Conclusions: In the all of the 5 cases studied an IgE mediated mechanism was identified as cause for the allergic reaction to gelofusin. Patients with suspected allergic reactions during anaesthesia should be referred for further investigation in specialist centres whenever possible.

Reference

1. Michalska-Krzanowska G (2014) Skin Prick Test in the Diagnosis of Allergy in the Perioperative Period – 8 Year Experience. J Allergy Ther 5:188 doi: 10.4172/2155-6121.1000188

P3. EVALUATION OF THE PROGNOSIS OF SEPSIS WITH MASS SPECTROMETRY

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Introduction: Using mass spectrometry, we aim to identify protein profiles that can be used to evaluate the prognosis of sepsis. The diagnostic and treatment of sepsis continues to be a challenge and more specific diagnostic methods are absolutely necessary.

Methods: 15 patients were included in the study: 10 patients with diagnosis of sepsis who exhibited different outcomes after treatment (5 cases who survived: SS-I, SS-II, SS-III, SS-IV, SS-V; 5 non-survivors: SNS-I, SNS-II, SNS-III, SNS-IV, SNS-V) and 5 patients without sepsis (controls: C-I, C-II, C-III, C-IV, C-V). Plasma samples from SS and SNS patients were collected at three different periods of evolution: Phase I: first 12-24 hrs after diagnosis; Phase II: 3-5 days of evolution; Phase III: 7 days of evolution. In patients without sepsis (C), the samples were collected within 12-24 hrs of the evolution. In total, 100 mcg of protein of each sample were subjected to trypsin digestion. Peptides were fractionated and analyzed using a nano-LC coupled to an LTQ-Orbitrap. After processing and "label-free" quantitation, MS/MS spectra were confronted with the NextProt database. The STRING 9.1 was used for interactions and functional annotation.

Results: The average number of proteins identified in each condition studied was 298. The areas of the SS and SNS phases and C spectra were compared. Several proteins were identified as differential: haptoglobin, serum amyloid A protein, apolipoprotein A-II, fibrinogen, prothrombin, thrombospondin, fibronectin, kininogen, hemopexin, zinc finger protein, and complement C_3 and C_4. The quantification data of these proteins revealed differences in expression between the sepsis survivors and non-survivors as well as their phases and controls. The set of identified proteins was subjected to an interaction interface for the classification of biological processes related to these proteins, revealing a large number of pathways that are involved in sepsis.

Conclusions: By using a systems biology analysis of protein abundance changes measured by quantitative mass spectrometry followed by bioinformatics analyses, we identified a network of molecular pathways that are altered in SS and SNS patients. These data improve our knowledge in the stratification of sepsis.

Reference

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