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OUTCOME OF MEDICAL INTENSIVE CARE UNIT PATIENTS: CHARACTERIZATION AND A STAGED PREDICTIVE MODEL

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INTRODUCTION. Predicting mortality and length of stay (a proxy for resources invested per patient) are key concerns in intensive care units. Here we report on several basic models for these outcomes derived from an analysis of the characteristics and outcomes of admissions to the Medical Intensive Care Unit (MICU) at the Hadassah Medical Center, Jerusalem, Israel. The unit population comprises mainly of complicated Medical patients with chronic diseases and little reserve. Our approach is novel in constructing not only a model of outcomes based on overall analysis of variables available post-hoc, but also separate models reflecting the information available at milestones in patient treatment.

METHODS. Data on 70 variables was collected on 891 admissions to the MICU during the period 1.3.03-30.6.06 (39 months). Multivariate logistic regression and recursive partition analysis were used to assess the contribution of these factors to the log likelihood of ICU mortality and length of stay. Factors relating to three groups of staged factors: (1) those preexisting hospitalization, such as chronic conditions; (2) factors present at ICU admission (source of admission, APACHE II scores, ventilation, etc.); and (3) events that occurred after admission (ventilation, procedures and complications) were identified.

RESULTS. Data on 891 patients was prospectively collected. 59% were male and 41% female, mean age 60.6 SE 0.66, mean APACHE II score was 22.6 SE 0.35. Our sample showed 21.5% mortality, with over 70% of this associated with a diagnosis of septic shock and multi-organ failure on admission. ICU Length of stay was described by a Weibull distribution, mean 10.5 days SE 0.45 (median 6), 10% of stays exceeding 24 days and an outlying maximum of 91 days. An overall stepwise regression showed that 43% of the variance in mortality could be accounted for by the following variables: a chronic state of immunosuppression prior to admission; at admission a diagnosis of septic shock or ARDS, the APACHE II score, and whether the admission was from a ward (compared to emergency room or another unit); during ICU stay, ventilation and non-respiratory complications. ICU length of stay was also shown to be significantly associated with several factors, depending on whether ICU stay is concluded by discharge or mortality. Pre-existing neurological diseases, pre-ICU length of stay, APACHE II score, interventions including ventilation and respiratory and non-respiratory complications were associated with a longer ICU stay in surviving patients.

CONCLUSION. We provide an analysis of factors associated with increased ICU mortality and length of stay at the various stages of pre-admission, admission, and events during ICU stay. These initial findings also point to several subgroups of patients for which separate outcome models should be constructed.

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THE PLASMATIC LEVEL OF TRANSTHYRETIN IMPROVES THE PREDICTIVE CAPABILITY OF THE SEVERITY SCALES

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INTRODUCTION. The transthyretin is a visceral protein which has been traditionally used as a marker of the nutritional state. It represents the magnitude of the inflammatory response and has a good correlation with the level of organ dysfunction. Recent studies have demonstrated that this protein is a predictor of the morbimortality outcome in critically ill patients. The Severity score systems and organ failure scores are imprecise and have lack of predictive ability. The use of new variables could improve the existing models. The aim of this study is to determine the inclusion of the transthyretin level in the severity scales and in indicators of organ failure to improve the predictive capability of these models.

METHODS. Prospective cohort study including all patients consecutively admitted at ICU during one year period. First step: designing models including transthyretin to the main severity scales (APACHE II y III, SAPS II) and organ failure scores (SOFA y MODS). Second step: validation, calibration study (Goodness of fit, observed / expected mortality correlations) and discrimination (area under ROC curves, diagnostic index and determination coefficient) of these models.

RESULTS. The models were obtained by multivariate logistic regression including transthyretin to the reference scales (called scale* tr). The validation cohort were 346 patients (62% men, 60.5 ± 17.8 years old). Causes of admission: severe sepsis / septic shock 27.3%, respiratory failure 23.6%, acute neurological events 18.6%, heart failure 10.2%, acute intoxication 5.6%. Mortality at ICU was 25.2% and at hospital was 33.9%. Discrimination study and calibration of the scales (Table 1 below): (S sensibility, E specificity, PPV predictive positive value, r correlation coefficient, r2 determination coefficient). Predictions was more accurate for the main subgroups of critical ill patients (respiratory, sepsis, cardiologic), except for neurological diseases.

TABLE 1.

Discrimination and calibration study

	ROC curves AUROC (CI 95%)	Diagnostic index S - E - PPV (%)	Goodness of fit Chi2 test (p)	Obs/exp mortality r (r2)	p value
APACHE II*th	0.937 (0.88-0.97)	77 - 92 - 83	5.56 (0.65)	0.993 (0.986)	.000
APACHE II	0.853 (0.79-0.91)	58 - 89 - 73	4.07 (0.77)	0.975 (0.950)	
APACHE III*th	0.913 (0.86-0.96)	73 - 91 - 81	5.33 (0.72)	0.992 (0.984)	.000
APACHE III	0.820 (0.75-0.89)	59 - 89 - 73	4.66 (0.76)	0.979 (0.958)	
SAPS II*th	0.927 (0.88-0.97)	77 - 90 - 80	2.43 (0.93)	0.995 (0.990)	.000
SAPS II	0.817 (0.75-0.88)	46 - 90 - 69	7.50 (0.48)	0.939 (0.881)	
SOFA*th	0.917 (0.87-0.96)	77 - 90 - 80	8.26 (0.48)	0.990 (0.981)	.000
SOFA	0.826 (0.76-0.89)	56 - 87 - 69	4.12 (0.76)	0.974 (0.948)	
MODS*th	0.908 (0.86-0.95)	77 - 89 - 78	5.56(0.69)	0.989 (0.978)	.000
MODS	0.805 (0.73-0.87)	52 - 84 - 71	8.23 (0.22)	0.967 (0.935)	

CONCLUSION. The inclusion of plasmatic levels of transthyretin as an additional variable improves the predictive ability of the severity scales and indicators of organ failure.

Poster Sessions

Quality improvement 0442-0453

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INDICATORS OF QUALITY IN THE CRITICAL PATIENT IN OUR UNIT

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INTRODUCTION. As a result of the study initiated by the GT planning, organization and management of the SEMICYUC, we contribute our results of the monitoring of the indicators of quality in the critically ill patient. Objective. Monitoring of the indicators in our unit and afterwards proposal of areas of improvement.

METHODS. Prospective, observational study of the patients admitted in our unit. Our intensive care unit consists of 7 polyvalent beds in private setting, the average ingestion rate is 700 per year. We registered the indicators as proposed in the multicenter study designed by the working party of the SEMICYUC: 1. Early administration of AAS in the acute coronary syndrome (3 months); 2. Semi-upright positioning of patients with invasive mechanical ventilation (15 days) 3. Prevention of tromboembolic events (15 days) 4. Pneumonia associated with mechanical ventilation (3 months) 5. Prophylaxis of gastrointestinal hemorrhage in patients with invasive mechanical ventilation (15 days).

RESULTS. 1. Early administration of AAS in the acute coronary syndrome, during the 3 months of the study we diagnosed a total of 24 patients with ACS, all of them received AAS in the first 24 hours which results in a 100% compliance for this indicator. 2. Semi-upright positioning of patients with invasive mechanical ventilation (IMV), during the period of monitoring we attended 7 patients with IMV > 24 hours, which made a total of 9 days of IMV, we complied to the indicator of semi-upright position 100% 3. Prevention of tromboembolic events, in the 15 days of monitoring we attended to a total of 35 patients with a stay over 24 hours and we achieved prophylaxis of deep venous thrombosis in 31, which leads to a compliance of 88%. 4. Pneumonia associated with mechanical ventilation, during the 3 months of monitoring we recorded a total of 55 days of IMV in a total of 20 patients and 2 pneumonias associated with IMV, which comes down to a total of 36 per 1000 episodes. 5. Prophylaxis of gastrointestinal hemorrhage in patients with invasive mechanical ventilation, during the 15 days of the study we attended a total of 4 patients with IMV > 48 hours with a compliance to the indicator of 100%.

CONCLUSION. Discussion. In our unit the indicators have a high percentage of compliance, the only divergence being the pneumonia associated with mechanical ventilation which is due to the small number of patients with IMV. Due to the characteristics of our unit, with the private setting and the high number of admissions of post surgical patients (70%), IMV > 24 hours constitutes a low percentage of our patients. We also have to stress the fact that there were non-labour days during the time of the study. Conclusions. In our unit the indicators of quality of the critical patient have a high compliance rate. The use of IMV > 24 hours in our unit has a low occurrence rate.

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DRUG INTERACTIONS IN A SURGICAL ICU: AN INCIDENCE AND PATIENT SAFETY ANALYSIS

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INTRODUCTION. Drug-drug interactions can cause adverse drug events (ADEs) and affect ICU patient care. A pharmacist on rounds decreases the number of preventable order-writing ADEs and positively impacts patient safety, outcome and drug costs. The aim of this study is to describe the frequency of drug-drug interactions and its implications on patient outcome.

METHODS. From August 2006 to February 2007 our clinical pharmacist, present on daily rounds, conducted an active screening of all ICU physician orders searching for drug-drug interactions (Eprocrates Rx[®] drug reference). These interactions were classified in seven different groups according to potential adverse effects: neurological, cardiovascular, gastrointestinal, renal / metabolic, pharmacokinetic, hematological and others. Once an interaction was identified the ICU team was warned to detect and report any possible ADE and the pharmacist could make interventions judged necessary like a recommendation of an alternative therapy or dose adjustments. Physicians' acceptance rate of these interventions and incidence of ADEs were recorded.

RESULTS. We analyzed 333 orders with 3118 prescribed items. There were 1661 drug-drug interactions identified (1 interaction per 2 prescribed items) and these interactions were present in 333 orders (100%). Neurological was the leading group with 29.4% (n=489) followed by cardiovascular 24.1% (n=400), gastrointestinal 13.6% (n=226), renal/metabolic 12.2% (n=203), pharmacokinetic 10.8% (n=179), hematological 5.4% (n=90) and others 4.5% (n=74). A great variety of therapies was involved in these interactions. The clinical pharmacist made 27 interventions in order to change the prescribed drug therapy and acceptance rate was 67%. The incidence of order-writing ADEs was 3.3 per 1000 patient days. There was not ADEs-associated mortality rate during the study period.

CONCLUSION. Drug-drug interactions are frequent and involve the majority of routinely prescribed items in ICU environment. Neurological and cardiovascular are the most common affected systems. These interactions can adversely affect patient outcome and a clinical pharmacist integrating the multiprofessional ICU team can help to identify and minimize its effects.