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These were selected from 662 studies received by the SEMES Scientific Committee for the SEMES XXV National Congress held in Santiago de Compostela, 12-14 June 2013

Usefulness of procalcitonin measurement to distinguish infectious and microcrystalline arthritis

Utilidad de la determinación de la procalcitonina en sangre periférica en el diagnóstico diferencial de la artritis infecciosa y microcristalina

Guillén Astete CA, García Montes N, Boteanu AL

Hospital Universitario Ramón y Cajal, Madrid, Spain.

Introduction: Up to 5% of patients with episodes of gouty arthritis simultaneously present documented synovial fluid infection. There is great difficulty in distinguishing infectious from gouty arthritis when the latter has been demonstrated by the presence of crystals because both may present with elevated acute phase reactants, leukocytosis in peripheral blood and synovial fluid, with over 50,000 cells. Procalcitonin (PCT) is a calcitonin precursor peptide which is useful in the diagnosis of bacterial infections in various clinical settings, including monoarthritis.

Objective: To determine the usefulness of PCT quantification in peripheral blood as a discriminative test for infectious and microcrystalline arthritis.

Method: We performed a prospective 6-month study with PCT determination in 39 consecutive patients consulting the emergency department for monoarthritis of the knee, with temperature > 38ºC and a previous diagnosis of gout. All patients underwent knee arthrocentesis, microcrystal study, Gram stain, culture in "enriched medium BMI" and leukocyte count in synovial fluid (SF) with a determination of CRP, ESR and blood count. Comparisons (ANOVA) were performed according to the final diagnosis: infectious arthritis, microcrystalline arthritis, and both simultaneously.

Results: Mean age was 49 ± 6.9 years, 74% male. Time from the onset of symptoms was 4 ± 0.7 days. The final diagnoses (documented microbiologically and/or by intracellular crystal findings) were: 9 infectious arthritis, 28 gouty arthritis and 2 had both simultaneously. Age, sex, time from onset of symptoms and CRP, ESR and peripheral leukocytosis showed no significant differences between the three groups. SF leukocyte count was similar in the three groups. Mean PCT (ng/ml) for the three groups was: 2.01 ± 0.4, 0.63 ± 0.2 and 2.51 ± 0.9 (infectious, gouty and both types of arthritis simultaneously, respectively). The difference in PCT values between the first two groups was statistically significant ($p < 0.01$). A PCT value > 1,475 ng/mL was associated with a diagnosis of infectious arthritis, sensitivity 100% and specificity 88.89% (likelihood ratio: 9.00).

Conclusions: The determination of PCT may be considered a useful test to rule out the presence of infectious arthritis in patients with acute monoarthritis and a previous diagnosis of gout. The high sensitivity and specificity for the diagnosis of joint infection demonstrated in this paper means PCT could be used as a routine test in such situations, although our results need to be confirmed in larger series, especially in cases with both types of monoarthritis. The estimated cost of PCT determination in our hospital is € 12.75, which is justified considering that the test could prevent a hospital admission.

Prophylaxis of venous thromboembolism in patients admitted from the emergency department: Do we also manage this poorly?

Profilaxis del tromboembolismo venoso en pacientes que ingresan desde urgencias: ¿tampoco lo hacemos bien?

Jiménez Hernández S[1], Ruiz Artacho P[2], Merlo Loranca M[3], Llorens Soriano P[4], Antolín Santaliestra A[1], Carrizosa Bach M[5], en representación de ETV-SEMES (Grupo de trabajo de enfermedad tromboembólica venosa de la Sociedad Española de Medicina de Urgencias y Emergencias)

[1]Hospital Clinic, Barcelona, Spain. [2]Hospital Clínico San Carlos, Madrid, Spain. [3]Hospital de Getafe, Madrid, Spain. [4]Hospital General de Alicante, Spain. [5]Hospital de Bellvitge, Barcelona, Spain.

Introduction: Emergency departments (EDs) are the ideal stage for identifying patients at risk of venous thromboembolism (VTE) and for the establishment of appropriate thromboprophylaxis in patients requiring hospital admission. Most studies on these aspects have been performed in hospitalized patients, but very few from the perspective of the ED.

Objective: To analyze the adequacy of thromboprophylaxis in medical patients admitted from the ED, and to evaluate the development of thromboembolic events, in-hospital bleeding and death.

Method: A prospective observational multicenter study, conducted in seven Spanish EDs from December 2011to July 2012. We included patients with medical conditions that required hospitalization. Independent variables included were: demographics, health status and reason for admission, comorbidity, risk factors for developing VTE, and factors associated with EDs and the doctor who treated the patient. We also analyzed thromboprophylaxis contraindications (risk of bleeding) and mortality, the development of VTE and/or bleeding during hospitalization. Dependent variables included the introduction of thromboprophylaxis in patients at moderate or high risk. The adequacy of thromboprophylaxis was assessed using PRETEMED scales.

Results: 610 patients were included, but in 30 cases there was no PRETEMED scale score, leaving a total sample of 580 patients (aged 70.1 ± 16.9 years, 56.6% male). These patients had Charlson comorbidity index (me, IR) of 2 (1-3) and a baseline Barthel index (me, IR) of 95 (75-100). The main reasons for admission were heart disease and respiratory infection (44.6%). Using the PRETEMED scale, 44.1% of patients had moderate or high risk, and 44.1% of these did not receive thromboprophylaxis on admission despite requiring it; 55.9% were at low risk according to the same scale and of these, 29.6% received thromboprophylaxis, despite not requiring it. Thus, 34.8% of patients improperly received thromboprophylaxis. The variables independently associated with not administering thromboprophylaxis in patients with moderate or high risk were: existence of any contraindication for bleeding risk (OR 15.00, 95% CI 4.61 - 48.67, $p < 0.001$), admission from first visit or observation unit versus short stay unit (OR 12.28, 95% CI 1.35 to 113.12, $p = 0.005$), severe baseline dependence (OR 6.88, 95% CI 1.59 to 29.83, $p = 0.004$), poly-medication (OR 2.09, 95% CI 1.00 to 3.69, $p = 0.046$), hematologic disease (OR 4.32, 95% CI 0.85 - 21.83, $p = 0.062$) and urinary tract infection (OR 2.39, 95% CI 0.90 to 6.37, $p = 0.079$) as reasons for admission. Analysis of a ROC curve predictive model showed an area under the curve of 0.751 (0.691 to 0.811). During admission 38 patients died (6.6%), of whom 2 (0.6%) died of fatal VTE (they had received thromboprophylaxis), with no mortality from hemorrhage, 6 (1%) developed VTE, of whom 4 were at moderate or high risk and two had not received thromboprophylaxis, 8 (1.4%) developed bleeding, 2 of whom were at high to moderate risk and had received thromboprophylaxis.

Conclusions: More than a third of patients admitted from the EDs improperly received thromboprophylaxis. Nearly half of patients needing thromboprophylaxis on admission from the ED did not. In these patients, no thromboprophylaxis was associated with the existence of some hemorrhagic risk factor, severe dependence, some comorbidity and reason for admission. VTE risk assessment and the establishment of thromboprophylaxis are considered two indicators of hospital quality. It is crucial that EDs properly implement thromboprophylaxis when indicated.

Advantages of ultrasound-guided arterial puncture over the classic technique

Ventajas de la punción arterial ecoguiada frente a la técnica clásica

Fadrique Millán L,
Vaquerizo Carpio E,
Torres Sancho R,
Benito Bernal S,
Del Pozo Vegas C,
Royuela Ruiz P

[1]*Hospital Universitario Río Hortega, Valladolid, Spain.*

Introduction: Arterial puncture is a frequent procedure in the emergency department (ED) for arterial blood gas testing. It is an invasive and painful technique in which nurses obtain blood samples by direct puncture of an artery. Classical puncture technique (CPT) is based on indirect localization of the artery to be punctured using surface anatomic landmarks and arterial pulse assessment. The normal anatomic variants - location, size, depth – and other conditions typical of critically ill patients such as pulse weakness or vascular stiffness and inexperience of junior personnel can mean that CPT is associated with complications or failure at times. Ultrasound devices are used to guide percutaneous puncture procedures in multiple locations. Vascular ultrasound allows nurses to visualize the target artery in real time as well as the other surrounding anatomical structures before and during needle insertion.

Objectives: To demonstrate the advantages of ultrasound-guided arterial puncture (USP) over PCT in terms of the number of punctures needed to obtain a blood sample and time spent on this procedure; to assess the usefulness of ultrasonography in cases of difficult arterial access (increased limb diameter, weak pulse, limb rigidity, lack of cooperation, etc.); to compare USP with CPT in terms of perceived pain as reported by the patient.

Methods: We performed a prospective descriptive cross-sectional study in ED patients during 5 months. We included patients > 14 years of age requiring arterial blood sample extraction during ED shifts when any of the professionals trained in USP were present. We excluded those patients < 14 years and those not consenting to be included in the study. Data collected included age, sex, target artery, successful and unsuccessful punctures, arterial or venous sample, time spent on the procedure, self-reported pain on a visual numerical scale (VNS), difficult arterial access and oxygen saturation. Statistical analysis included Student t test and Chi-square test, with a significance level of $p < 0.05$.

Results: A total of 112 patients were included; 65 (58.03%) underwent USP and 47 (41.96%) standard CPT. First attempt success rates were: USP 87.7% vs CPT 55.3% ($p < 0.001$), and arterial samples were obtained in 93.8% by USP vs 63.8% by CPT ($p < 0.001$). In about 15% of cases, CPT failed to obtain blood after several attempts and these were resolved with a single attempt using USP. Difficult access was found in 47.69% of USP, due to increased limb diameter (soft tissue edema, obesity) 12.3%, weak pulse (coma, shock, hypotension) 14.4%, limb rigidity 10.8% and non-collaboration (agitation, disorientation, etc.) 9.2%. Time spent on the procedure, comparing USP vs CPT, was: less than 2 minutes 66.2% vs. 59.6%, more than 4 minutes 3.1% vs 21.3% respectively ($p = 0.007$). Mean perceived pain score on the VNS was lower in the group undergoing USP than CPT: 2.98 vs. 4.39 ($p = 0.008$).

Conclusions: Ultrasound-guided arterial puncture is a useful technique for nursing professionals, requiring minimal training. It ensures obtaining blood samples, reduces time spent on the procedure and could minimize complications. It was associated with decreased number of punctures required to obtain samples , improved comfort with lower pain scores. Finally, it contributes to higher quality nursing care.

Effectiveness of new information and communication technologies in reducing delay of reperfusion therapy in acute myocardial infarction on the island of Tenerife

Eficacia de las nuevas tecnologías de la información y la comunicación en la disminución de los tiempos de retraso para el tratamiento de reperfusión del infarto agudo de miocardio en la isla de Tenerife

García González MJ[1],
Bosa Ojeda F[1],
Matos Castro S[2,3],

Introduction: Early reperfusion by primary angioplasty is the most efficient therapy in patients with ST elevation acute myocardial infarction (STEMI). The use of new information and communication technologies could contribute to that. Specifically, the 7-

González Cabezas E[1], Posca Maina M[4], Redondo Revilla F[4]

[1]Complejo Universitario de Canarias-Universidad de la Laguna, Santa Cruz de Tenerife, Spain. [2]Servicio normal de urgencias de la Orotava-Atención Primaria, Tenerife, Spain. [3]Facultad de Ciencias de la Salud-Universidad Europea de Canarias, Tenerife, Spain. [4]Servicio de Urgencias Canario (SUC), Tenerife, Spain.

port hub manager MBeat® device, due to its portability and easy handling, can be used for monitoring electrocardiographic and other vital signs (peripheral O_2 saturation, heart rate, non-invasive blood pressure and temperature) anywhere in the initial care of the patient – at home, in public places or out of-hospital emergency care. The monitor, connected to a tablet pc wirelessly using ZigBee technology, is able to present biomedical information collected by sensors and relay it to servers using 3G/GPRS, WiFi or network technology that allows Internet access for centralized data storage and transmission to the Emergency 112 Coordination center and the attending hospital cardiologist in real time, using mobile phones.

Objective: To analyze the impact of implementing this system in medicalized ambulances of the Canary Emergency Medical Service (CEMS)-112 during the first year of operation of a health care network for STEMI, the mode of patient access to the health system and delay times until revascularization by primary angioplasty.

Methods: We studied a cohort of consecutive patients with STEMI admitted to the Coronary Care Unit of the Hospital Universitario de Canarias from December 2011 to March 2013. The study population was divided into two groups depending on the route of access to health care: Group 1: patients directly accessing the catheterization laboratory and interventional cardiology by CEMS-112 after ECG in situ, transmitted electronically to the cardiologist on call) and Group 2: patients receiving conventional care via by CEMS or hospital emergency department or other emergency systems. The following times were defined and studied: T1: time from symptom onset to first medical contact (delay attributable to the patient); T2: time between first medical contact and first ECG (delay in diagnosis), T3: time between first medical contact to initiation of angioplasty (delay attributable to the system) and T4: time between the onset of symptoms and initiation of angioplasty (total ischemia time).

Results: We included 177 patients; mean age in years was 60.4 ± 11.5 in group 1 vs 62.4 ± 14.6 in group 2 (P ns). GRACE score was 164 ± 42 in group 1 vs 175 ± 60 in group 2 ($p < 0.05$). No significant differences between groups were found regarding ECG location of the infarct. A greater proportion of patients in group 1 underwent primary angioplasty than in group 2: 95.4% vs 63.3%, $p < 0.01$). Group 1 showed reduced delay time attributable to the patient (T1) 80 vs 120 min ($p < 0.003$), reduced time delay attributable to the system (T3) 128 vs 187 min ($p < 0.01$) and total ischemia time (T4) 210 vs 330 min ($p < 0.001$). No significant differences in diagnostic time delay (T2) were observed: 5 vs 9 min ($p = 0.058$).

Conclusions: The use of the new MBeat® device in assisting patients with STEMI was highly effective at increasing the proportion of STEMI patients undergoing primary coronary revascularization and reducing delay time before the procedure. Currently, only a small proportion of STEMI patients benefit from early reperfusion through this system.

Agreement between venous thromboembolism risk assessment scales used in hospital emergency departments

Análisis de la concordancia entre las escalas de valoración del riesgo de enfermedad tromboembólica venosa utilizadas en los servicios de urgencias hospitalarios

Ruiz Artacho P[1], Merlo Loranca M[2], Llorens Soriano P[3], Aguillo García A[4], Franco Sorolla JM[5], Jiménez Hernández S[6] en representación de ETV-SEMES (Grupo de trabajo

Introduction: Venous thromboembolism (VTE) in hospitalized medical patients is a major problem that can in most cases be prevented with thromboprophylaxis. The emergency department (ED) is a key place for identifying patients at risk of VTE and initiating prevention protocols which have achieved a significant reduction in the incidence of this disease. The risk scales used in Spain to classify patients as being at high or risk low are the PRETEMED and ACCP scales (8th and 9th editions). Few studies have addressed differences between these scales in terms of outcomes.

Objective: To evaluate the correlation between the different scales used in the ED and assess the incidence of VTE within three months according to classification as being at high or low risk.
Method: We performed a prospective observational multicenter study, conducted in 7 Spanish EDs in the period December 2011to July 2012, of patients with medical conditions requiring hospitalization. Data collection included: demographics and reason for admission, risk factors for VTE, low and high risk for VTE according to PRETEMED and ACCP (8th and 9th editions), and the development of VTE at three months after admission. We evaluated the correlation between the different scales and described the incidence of VTE according to risk classification.
Results: 610 patients were recruited during the study period. Of these, PRETEMED and ACCP (8th and 9th editions) risk scores were obtained for 580 patients. Patients classified as high risk according to the ACCP 8th and 9th edition scales were 314 (54.1%) and 368 (63.4%), respectively. According to the PRETEMED scale, 256 (44.1%) patients had moderate to high risk on admission. Analysis of agreement between the scales showed a Kappa index of 0.385 between PRETEMED and ACCP 8th ed. and 0.392 between PRETEMED and ACCP 9th edition i.e. weak concordance. Discordance between the scales was over 30%. The incidence of VTE in patients classified by ACCP 8th and 9th edition scales as high risk at 3 months of admission was 7 (2.2%) and 12 (3.2%), respectively, and by PRETEMED scale this was 8 (3.1%). The incidence of VTE in those classified as low risk was 9 (3.1%) 4 (1.7%) and 8 (2.5%), respectively. Of the 16 patients in the sample who developed an episode of VTE, half had not received thromboprophylaxis during hospitalization. Of these eight patients who developed VTE and not receiving prophylaxis, the 9th edition ACCP scale classified most as high risk with five (62.5%), while the PRETEMED scale classified only one (12.5%) as being at high risk.
Conclusions: There is significant discordance between the scales used in the ED (PRETEMED and ACCP) to identify patients at high or low risk of developing VTE during hospitalization. In our study, the ACCP 9th edition scale correctly classified more patients as being at high and low risk of developing VTE than the other scales.

de enfermedad tromboembólica venosa de la Sociedad Española de Medicina de Urgencias y Emergencias)

[1]Hospital Clínico San Carlos, Madrid, Spain. [2]Hospital de Getafe, Madrid, Spain. [3]Hospital General de Alicante, Spain. [4]Hospital de Donosti, San Sebastián, Spain. [5]Hospital Miguel Servet, Zaragoza, Spain. [6]Hospital Clinic, Barcelona, Spain.

Factors associated with a positive stress test in patients with chest pain and low-moderate risk of acute coronary syndrome

Factores asociados con una ergometría positiva en pacientes con dolor torácico y riesgo bajo-moderado de síndrome coronario agudo

Gil Román JJ, González Méndez A, Alonso Morilla A, Irimia A, Maujo Fernández J, Herrero Puente P

Hospital Universitario Central de Asturias, Oviedo, Spain.

Introduction: Chest pain suggestive of coronary origin is the reason for a significant number of visits to emergency departments. Chest pain units (CPUs) direct their efforts to early diagnosis of this condition, which improves management. It is clearly important to properly select patients to be included in these units to improve diagnostic yield.
Objective: To determine the factors associated with a positive stress test in patients seen in a CPU.
Methods: We performed an observational, cross-sectional study of chest pain patients with low-moderate risk of ischemic heart disease (chest pain suggesting coronary origin without ST segment elevation on electrocardiography (ECG), and negative serial myocardial markers) seen in the CPU of a tertiary hospital. Data were recorded on a specific computer record made for this purpose. Variables: Age and sex. initial classification of patients, cardiovascular risk factors (CVRF), history of heart conditions, ECG abnormalities, chronic drug treatment and the outcome of an exercise test: positive (E+) or negative (E-). We excluded patients whose test was not assessable. Statistical analysis: Student's t to compare quantitative variables, chi-square for categorical variables, and logistic regression multivariate analysis of valid values for all variables.
Results: 2,277 patients were included, of whom 310 (13.6%) were E+. The E+ patients were older [64.1 (11.1) vs 58.4 (13.2) years, $p < 0.0001$] and predominantly male

(68.3% vs 59%, p = 0.002). E+ result was more common in those having at least one CRF (84.2% vs 76.6%, p = 0.005), and in those with diabetes (28.3% vs 17.3%, p < 0.0001), hypertension (63.9% vs 54.5%, p = 0.008), dyslipidemia (56.7% vs 43.7%, p < 0.0001), peripheral arterial disease (8.6% vs 2.7%, p < 0.0001), history of previous coronary events (50.7% vs 28.6%, p < 0.0001) and in those already taking antiplatelet agents (83.9% vs 71.7%, p = 0.002). Regarding pain characteristics, only differences in duration time were significant; E+ was more common in patients whose chest pain lasted between 5 and 20 minutes (51.8% vs 47.6%, p = 0.01), in those who had no pain on arrival at the emergency department (83.9% vs 71.7%, p = 0.002) and in those whose ECG was not completely normal (15% vs 7.3%, p = 0.001). The result of multivariate analysis showed that the model that best predicted E+ included: Sex: male (OR 1.61, 95% CI 0.97 to 2.66), age (per year) (OR 1.03, 95% CI 1.01-1.06), hypertension (OR 1.58, 95% CI 0.96 to 2.60), history of coronary disease (OR 1.66; 95% CI 1.01 to 2.75) and some ECG abnormality (OR 2.65, 95% CI 1.28 to 5.49).

Conclusions: Older men with hypertension, history of coronary disease and some ECG alterations were more likely to have a positive treadmill test and therefore the origin of chest pain was coronary. This should be taken into account when selecting patients for inclusion in a CPU and may improve diagnostic performance.

Usefulness of mid-regioinal-proadrenomedullin and copeptin as predictors of 30-day mortality in patients with acute heart failure

Utilidad de la MR-proadrenomedulina y de la copeptina como predictores de mortalidad a los 30 días en pacientes con insuficiencia cardiaca aguda

Marino Genicio R[1], García García M[1], Prieto García B[1], Rodríguez Casado V[1], Jacob Rodríguez J[2], Herrero Puente P[1]

[1]Hospital Universitario Central de Asturias, Oviedo, Spain. [2]Hospital Universitario de Bellvitge, Barcelona, Spain.

Este estudio se ha realizado dentro del proyecto PI10/01918 del Instituto de Salud Carlos III y ha sido financiado con Fondos FEDER.

Introduction: MR-proadrenomedullin (MR-proADM) and copeptin are biomarkers, of neurohormonal activation and acute stress, respectively, considered prognostic determinants in different diseases. Their usefulness in acute heart failure (AHF) is still not clearly defined.

Objective: To evaluate the usefulness of MR-proADM and copeptin values as predictors of 30-day mortality in patients with heart failure (HF) treated in an emergency department (ED).

Methods: We performed a prospective multicenter non-interventional cohort study of patients presenting to the ED for AHF meeting the Framingham criteria. Variables: mortality within 30 days of care, age and gender, cardiovascular risk factors (hypertension, diabetes mellitus and dyslipidemia), established cardiovascular disease [Ischemic heart disease, previous heart failure (CHF), stroke, chronic obstructive pulmonary disease (COPD), functional impairment as measured by the Barthel index, dyspnea functional class NYHA III-IV, anemia, systolic blood pressure (SBP), arterial oxygen saturation on ED arrival, urea levels, estimated glomerular filtration rate, glucose, hemoglobin and MR-proADM and copeptin values. The usual statistical tests were applied and survival analysis was performed using Cox proportional hazards. The study was approved by the Ethics and Clinical Research Committee, HUCA and all patients signed informed consent.

Results: The study included 344 patients, 56.4% women, with a mean age of 80.4 ± 9 years. During follow-up 34 patients (9.9%) were lost to follow up. Mortality at 30 days was 5.2%. Compared with survivors, those who died had a lower prevalence of dyslipidemia and increased SBp < 100 mmHg, higher copeptin levels [287.88 (547.84) vs. 84.32 (177.94), p = 0.024] and higher MR-proADM levels [1.97 (1.09) vs. 2.77 (2.35), p = 0.034]. Patients with copeptin levels in the fourth quartile showed higher mortality: 11% versus 2.6%, 4% and 3.8% of the first, second and third quartiles respectively (p = 0.03). No significant differences in survival were found on comparing MR-proADM quartiles. In the survival analysis, controlling for the other factors, the fourth quartile of copeptin has a hazard ratio for mortality of 4.03 (95% CI 0.83 to 19.65), p = 0.037 while that for MR-proADM was 1.14 (0.25 to 5.14).

Conclusions: The biomarker copeptin showed the highest prognostic capacity of 30-day mortality after the episode of HF, although not significantly so, probably related with the small sample size and advanced patient age. These results warrant further investigation into the usefulness of these biomarkers in elderly patients with HF.

Acute rhythm and rate control of atrial fibrillation in the emergency department: an essential contribution but can it also improved? (The HERMES-AF Study)

Control agudo del ritmo y la frecuencia de la fibrilación auricular en los servicios de urgencias: una contribución necesaria pero… ¿también mejorable? (Estudio HERMES-AF)

Martín Martínez A[1], Malagón Caussade F[1], Varona Peinador M[1], Coll-Vinent i Puig B[1], Suero Méndez C[1], Montull E[2]

[1]Grupo de Arritmias Cardiacas. Sociedad Española de Medicina de Urgencias y Emergencias. [2]Sanofi, Spain.

Introduction: The earlier the attempt to restore sinus rhythm, the greater the odds of success, and controlling the heart rate also prevents the appearance of cardiac complications if performed early. In Spain, emergency departments (EDs) are the main stage in the healthcare system attending patients with atrial fibrillation (AF) when symptoms begin and/or to which they are referred for evaluation with newly diagnosed arrhythmias. As in other fields of clinical medicine, it is essential to know the patterns of treatment in daily practice to identify areas for improvement, and apply the recommendations of the guidelines and scientific evidence regarding management strategies.

Objectives: To analyze the adequacy and results of rhythm control and heart rate (HR) control of patients with AF in the ED, to identify specific areas for improvement in management.

Method: We performed a prospective, multicenter, observational study in 123 EDs (18 regions) from May 23 to June 5, 2011. We included all patients older than 18 years with AF documented by ECG performed in these EDs. Appropriate management was assessed according to clinical practice guidelines for the management of AF in the ED (SEMES-SEC 2003 and 2012 consensus documents). Thus, episodes with rapid ventricular response (HR > 100 bpm; beta blockers and calcium channel blockers are the agents of choice unless acute heart failure is present) were considered eligible for heart rate control, and those with sinus rhythm duration of < 48 hours were considered eligible for rhythm restoration (using electrical cardioversion or antiarrhythmic drugs). No management recommendations were made beforehand. Informed consent was obtained in all cases.

Results: 3,276 patients were included, mean age 76 ± 11 years, 51% female. Acute heart failure was diagnosed in the ED in 757 (23%) patients. Rapid ventricular response (HR> 100 bpm) was present in 1,152 (46%), of whom 1,018 (68%) underwent HR control, effective in 805 (80%) of cases. The drugs used for this were digoxin (40%), beta-blockers (36%) or calcium antagonists (18%). At discharge, 93% of patients had a HR < 110 bpm, in accord with guideline recommendations. A diagnosis of recent onset AF (duration < 48 h) was made in 901 patients (27%), and an attempt was made to restore sinus rhythm was made in 667 (75%) of them, 18% by electrical cardioversion (effective in 93% applying biphasic shock in 80% of cases) and antiarrhythmic drugs in 80% (74.5% overall effectiveness). The reasons given by clinicians for not attempting rhythm control in patients theoretically eligible were: spontaneous conversion (28%), a high probability of recurrence (18%) and referral to another level of care (7%). Antiarrhythmic drugs most frequently used were amiodarone (60%), flecainide (32%) and propafenone (4%), with statistically significant differences in effectiveness (70%, 84% and 72% respectively, $p < 0.05$). In logistic regression analysis, factors significantly and independently associated with the effectiveness of pharmacologic cardioversion were the existence of structural heart disease ($p = 0.02$, OR = 0.51), the diagnosis of acute heart failure at ED assessment ($p = 0.03$, OR = 0.33) and linear heart rate ($p = 0.03$, OR = 1,10). The effectiveness of antiarrhythmic drugs was higher in patients without structural heart disease (78% vs 65% in cardiac patients, $p = 0.001$). Relief of symptoms prompting the visit to the ED was achieved in 85% of cases in which these

were related with the arrhythmia. Over one third (38%) of patients were admitted (observation 12%, discharge 47%), mostly due to complications of the arrhythmia (42%) or non-cardiac diseases (48%); only 5% of patients were admitted for study of AF or other management strategies. Fifteen patients died (0.1%), 4 due to AF complications (cardiac or stroke).

Conclusions: While most of the patients were treated according to the recommendations of the clinical guidelines, specific areas for improved care in the ED were identified: 1) one third of patients eligible for heart rate control did not receive this treatment, despite its high effectiveness and heart rate limits set out in guideline recommendations. 2) No attempt was made to restore sinus rhythm in 25% of eligible patients; the use of electrical cardioversion was virtually anecdotal and amiodarone was the most widely used agent despite its lower effectiveness. Therefore, the general recommendations for concrete improvements are to implement measures for heart rate and acute rhythm control in all eligible patients, and prioritize the use of: a) beta-blockers and calcium antagonists in patients treated with digoxin when this latter drug is not the first choice (patients without acute heart failure) and b) electrical cardioversion and other agents that are more effective than amiodarone to increase the effectiveness of rhythm control of the acute phase in daily practice. These recommendations may improve outcomes of patients with AF attended in the ED, and consequently, the prognosis and quality of life of this increasingly large population.

Mortality in emergency department sepsis (MEDS) score and lactate as prognostic factors of mortality and intensive care unit admission in patients sent from triage with a severe sepsis code

La puntuación MEDS y el lactato como factores pronóstico de mortalidad y de ingreso en una unidad de cuidados intensivos en los pacientes activados desde el triaje con código de sepsis grave

Ávila Naranjo MM,
García Pérez D,
Contreras Lovera JI,
Zaglul Ruiz J,
Escale Besa A,
Obiols Torrebadella M

ALTHAIA, Xarxa Assistencial Universitària de Manresa, Barcelona, Spain.

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Introduction: Severe sepsis is associated with high mortality, even higher than that of acute myocardial infarction, which has led to the emergence of a sepsis code. Establishing the determinants of mortality and refractoriness could help identify patients most at risk of imminent death and thus implement measures even before hemodynamic compromise occurs.

Objective: To assess the ability of the MEDS score, the Charlson comorbidity index and serum lactate levels to predict mortality and ICU admission in patients with severe sepsis/septic shock code activated from triage.

Method: A retrospective observational study based on review of medical records of patients with severe sepsis code (SSC) activated from triage at our Hospital Sant Joan de Deu de Manresa between 2008 and 2010. We excluded patients with treatment effort limitations and those for whom the data sheet for SSC activation was not completed. The variables studied were age, sex, Charlson comorbidity index, MEDS score, admission vital signs (blood pressure, heart rate, respiratory rate, temperature, oxygen saturation), initial values of lactate, leukocytes, platelets, and creatinine. Dependent variables included: ICU admission and death at or before 28 days. In the bivariate analysis, chi-square test was used for the comparison of categorical variables and Student t test or nonparametric Mann-Whitney U test for quantitative variables. Differences with a p value < 0.05 were considered statistically significant.

Results: We included 69 patients, mean age 72 ± 16.1 years, 63.8% men. High Charlson comorbidity index was noted in 44.9% of patients. Mean lactate concentration was 3.75 ± 2.38 mmol/l, mean MEDS score 7.0 ± 3.9. Mortality at 28 days was 20.3%, and 37.7% of patients were admitted to ICU. Significantly higher mean lactate levels were observed in patients who died within the first 28 days in comparison with those who survived (5.28 vs 3.36, $p < 0.01$). We found a significant association between MEDS score and 28-day mortality at 28 days with a mean difference of 3.26 points

(95% CI: 1.2-5.4) and mortality rate 15.9% in scores equal to or greater than 8 versus 4.3% in scores below 8 (p = 0.01). Mean lactate was significantly higher in patients admitted to ICU in comparison with those not admitted (4.86 vs 3.07, p < 0.005). There was no statistically significant correlation between lactate levels and MEDS score. No relationship was found between Charlson comorbidity index and 28-day mortality.
Conclusions: MEDS score and lactate levels may be predictors of mortality in patients with severe sepsis. In the present study lactate level was the only parameter that predicted the need for ICU admission of patients with SSC. Charlson comorbidity index proved not to be a predictor of mortality or ICU admission in patients with CSG. Limitations of the study included the small sample size, and all patients were activated from triage as SSC thus excluding those with hidden shock and severe in-hospital sepsis.

Clinical profile and short-term prognosis of patients with acute heart failure under oral anticoagulant therapy

Perfil clínico y pronóstico a corto plazo de los pacientes con insuficiencia cardiaca aguda en tratamiento con un anticoagulante oral

Sánchez González M[1], Fernández Rodríguez A[1], Houghton García R[2], Martínez Zapico A[1], Argüello Junquera M[1], Herrero Puente P[1]

[1]Hospital Universitario Central de Asturias, Oviedo, Spain. [2]Servicio de Atención Médica Urgente (SAMU). Servicio de Salud del Principado de Asturias, Spain.

Introduction: Oral anticoagulation is the basis of prevention of thromboembolic events, regardless of patient age and cardiovascular pathology. No reports describe its use in patients with acute heart failure (AHF) with a high prevalence of pro-embolic pathologies such as atrial fibrillation (AF) and left ventricular dysfunction (LVD).
Objective: To determine the profile of AHF patients on oral anticoagulant treatment (OAT) and its prognostic significance.
Methods: We performed an observational, prospective, multicenter study of patients with AHF, defined by the Framingham criteria, treated in the ED. Variables: mortality at 30 days after ED attention, age and sex, presence of traditional risk factors (hypertension, diabetes mellitus and dyslipidemia), established cardiovascular disease [ischemic heart disease, previous AHF, cerebrovascular accident (CVA)], chronic obstructive pulmonary disease (COPD), AF, valvular heart disease, type of LVD, functional deterioration as measured by the Barthel index (BI), type of AHF and presentation, basal functional class NYHA III-IV for dyspnea, anemia, systolic blood pressure (SBP) and arterial oxygen saturation at the time of ED arrival. Estimated glomerular filtration rate was calculated using the abbreviated formula MDRD [186.3 x (serum creatinine) - 1.154 x age-0.203 x (0.742 if female)]. Comparison of frequencies was performed using Chi square test, and the comparison of means by Student's t test, and multivariate logistic regression was used to control for confounding factors. The study was approved by the Ethics and Clinical Research Committee of Hospital Universitario Central de Asturias and informed consent was obtained from all participants.
Results: The study included 5,745 patients: 2,158 (37.6%) were on OAT, of whom 1768 (81.9%) had a history of atrial fibrillation without differences in type of LVD or gender. OAT patients were younger (78.6 vs 79.7 years, p < 0.001), had less functional impairment BI <60 points 16.9% vs 21.7% than those not receiving OAT, p < 0.0001. Regarding history of cardiovascular disease, OAT patients had less HF (28.4% vs 32.2%, p = 0.003), more stroke (13.9% vs 12%; p = 0.031) and more valvular disease (38.2% vs 19.4%, p < 0.0001). Regarding AHF presentation, the normotensive form predominated in 71.2% of cases with congestive symptoms (dyspnea, elevated jugular venous pressure and peripheral edema) and less respiratory failure. As for chronic treatment, they received more beta-blockers (40.1% vs 28.1%, p < 0.0001), digoxin (33.3% vs. 11.5%, p < 0.0001), amiodarone (9.7% vs 4.6%, p < 0.0001) and all regardless of whether they had a history of AF or not. Mortality at 30 days after ED attention was lower than in non-anticoagulated patients (6.4% vs 10.1%, p < 0.0001) and that association remained after controlling for the other variables: OR 0.57 (95%CI 0.43 to 0.76).

Conclusions: Patients with AHF taking OAT have a different cardiovascular profile than their non-anticoagulated counterparts, different chronic treatment regardless of history, and better short-term prognosis.

International normalized ratio assessment in patients treated with vitamin-K antagonists in the emergency department: preliminary results

Adecuación del INR en pacientes en tratamiento con antivitamina K atendidos en los servicios de urgencias. Resultados preliminares

López Altimiras X[1], Jiménez Hernández S[2], De Giorgi A[3], Gadea Polo A[4], Martín R[1], Gené Tous E[4]

[1]Hospital de Mollet. Barcelona, Spain. [2]Hospital Clínic, Barcelona, Spain. [3]CAPIO Hospital General de Cataluña, Barcelona, Spain. [4]Hospital de Sabadell-Institut Universitari Parc Tauli, Barcelona, Spain.

Introduction: Many patients are treated with anti-vitamin K (AVK) and numerous studies have assessed the adequacy of treatment according to INR range, but most have been conducted with patients making scheduled outpatient visits to primary care centers or hematology clinics. There are very few studies evaluating the adequacy of AVK according to INR in patients treated in the emergency department (ED).

Objective: To determine the prevalence of out-of-range INR in ED patients receiving AVK, and to identify the factors associated with this.

Methods: A descriptive, prospective, observational, multicenter study conducted in four hospital EDs in Barcelona. We included consecutive ED patients treated with VKA and undergoing analytical hemostasis and INR determination. Exclusion criteria: patients who consulted the ED for thrombotic and/or hemorrhagic complications. The primary endpoint was the INR value (in range or out of range). The independent variables analyzed included: demographic and social variables, comorbidities (using Barthel and Charlson indices), use of AVK, level of urgency (MAT) and destination on discharge. The sample size needed was calculated as 360 patients. Statistical analysis was performed using SPSS 15.0. Categorical variables are expressed as percentages and continuous variables as means and standard deviation. Univariate analysis was performed for the description of the sample. We used chi-square test or Fisher exact test for qualitative variables and Student t test for quantitative variables. Significance was considered a p value < 0.05.

Results: We present the results of the first 172 patients included in the study. Mean age was 76.9 ± 11.9 years, 55.8% were female and 29% were obese (BMI> 30); 51% had had at least one admission during the year before and 23.3% were taking >10 drugs; 74.6% were classified as MAT priority 1, 2 or 3 and were admitted to ICUs during 9.3 ± 15 hours. Regarding comorbidity, 15.7% had severe dependence (Barthel Index <45%) and Charlson index score of 4.3 ± 2.1 points; 84.3% had atrial fibrillation, 72.7% hypertension and 45.3% heart failure. Regarding VKA treatment, the main indication was atrial fibrillation (82%) and mean duration of AVK treatment was 6.8 ± 4.4 years and follow up control was conducted in primary care centers (CAP) in most cases (69.2%). Nearly two thirds (63.3%) had an INR out of range. Patients with out-of-range INR, compared to patients with in-range INR, were younger (75.2 years vs. 79.1 years, p = 0.037), had a higher degree of severe dependence (19.4% vs 8.9%, p = 0.052), a Charlson score > 4 (45.2% vs 30.4%, p = 0.04), MAT 1,2,3 level (81.7% vs 72.2%, p = 0.13), hematology patient management (34.8% vs 24.4%, p = 0.13) and a higher percentage of these patients had dyslipidemia (34.4% vs. 24.1%, p = 0,12).

Conclusions: Preliminary results show that a significant portion of patients receiving AVK and attending the ED have an INR that is out of range. Comorbidity (severe dependence, Charlson index> 4 and dyslipidemia) and follow up control of VKA treatment in hematology outpatient consultations show a trend towards an INR value out of range, pending the inclusion of all patients and logistic regression analysis to rule out confounders and determine predictors of out-of-range INR.

Reorganization of emergency department care: impact on patient safety culture

Impacto sobre la cultura de seguridad del paciente de la reorganización asistencial de un área de urgencias

Jiménez Hernández S, Antolín Santaliestra A, Ramos Contreras E, Bertrán Luengo MJ, González López E, Sánchez Sánchez M

Hospital Clinic, Barcelona, Spain.

Introduction: The reorganization of emergency department care (from specialties to levels of urgency within the Spanish system of triage) has already shown improved quality and effectiveness.
Objective: To analyze the effect on the patient safety culture caused by this reorganization of the ED among its professionals.
Method: A comparative study of the level of safety culture in professionals of the emergency department of a tertiary university hospital, using HSOPS survey of AHRQ. The survey was distributed to all professionals at two points in time: before the reorganization (last week of November 2009) and after the reorganization (first week of November 2012). The survey provides information on the perception of safety in 12 dimensions comprising 42 questions. Analysis was performed following the AHRQ methodology of classifying responses as POSITIVE RESPONSES (percentage of positive responses to positively worded questions and negative responses to negatively worded questions), and NEGATIVE RESPONSES (percentage of negative responses to positively worded questions and positive responses to negatively worded questions). STRENGTH was defined as > 75% of positive responses and WEAKNESS as > 50% of negative responses, for each dimension. To analyze differences between the two periods we used chi-square test or Fisher test.
Results: A total of 448 surveys (217 in 2009 and 231 in 2012 were completed and returned from more than 80% of the workforce in both periods). The two groups were comparable in socio-professional terms regarding position, years in the profession, in the hospital and in the ED area and number of hours worked per week. After the reorganization, seven dimensions improved significantly as a percentage of positive responses and 6 dimensions showed decreased percentage of negative responses. In both periods, the dimension "work as a team" almost achieved the rate to be considered a strength (68.9% and 66.8% of positive responses, respectively). The dimensions "staffing" (52.9% and 56.8% negative responses, respectively) and "management support in activities that promote safety "(51.6% and 52.3% of negative responses, respectively) were identified as weaknesses at both times. The dimension "overall perception of safety" improved from being a weakness to being a strength in 2012 (55.7% vs 44.1% of negative responses, respectively, $p < 0.0001$, 95% CI 1.156 to 1.405). The overall safety rating improved (4.9 ± 0.13 vs 6.2 ± 0.12, 95% CI -1.6 to -0.9, $p < 0.0001$), with 25% of professionals scoring this above 7.5 in 2012, compared to 10% in 2009, on performing the analysis by percentiles.
Conclusions: The reorganization of emergency department care improved patient safety culture among its professionals. The dynamics generated by the redesign and reorganization of the area through the creation and maintenance of multidisciplinary working groups has helped to improve the overall perception of patient safety in the ED.

More than half of emergency-department patients receiving an appropriate dose of low molecular weight heparin for thromboprophylaxis have anti-factor Xa plasma levels outside the recomnended range

Más de la mitad de los pacientes de urgencias que reciben adecuadamente tromboprofilaxis con heparina de bajo peso molecular (HBPM) presentan niveles de factor anti-Xa fuera del rango

Medrano Casique N, Borobia Pérez AM, Capilla Pueyo RM, Calvín García E, Reche Martínez B, Quintana Díaz M

Hospital La Paz-Universidad

Introduction: The prevention of venous thromboembolic events (VTE) using low-molecular weight heparin (LMWH) is supported by numerous studies. However, certain groups of patients, especially critical patients, experience altered LMWH pharmacokinetics and pharmacodynamics that result in a low levels of anti-factor Xa after a standard dose of LMWH. These changes could explain the heterogeneity of results in the prophylaxis of VTE in various studies and the high incidence of VTE in these patients despite correct thromboprophylaxis.

Autónoma de Madrid, Madrid, Spain.

Objectives: To evaluate the efficacy of thromboprophylaxis with LMWH in emergency patients by monitoring the activity of factor anti-Xa and to analyze the factors influencing this efficiency.
Method: We prospectively included patients attended by the ED, La Paz Hospital (HULP) in whom thromboprophylaxis was indicated (according to the PRETEMED 2007 guidelines). At inclusion, they had received at least two doses of LMWH (enoxaparin 40 mg/24 hours or bemiparin 3,500 IU/24 hours, according to medical criteria). The study was approved by our hospital's Ethics and Clinical Research Committee. All patients gave written informed consent before inclusion in the study. Exclusion criteria included the use of therapeutic doses of LMWH, renal failure, pregnancy or breastfeeding and concomitant participation in any other clinical intervention study. We recorded demographic, clinical and laboratory data, and tolerability of each patient and peak anti-factor Xa was measured in blood extracted 4 hours after LMWH administration. A range of 0.2-0.4 U/mL was considered appropriate thromboprophylaxis.
Results: The study included 50 patients, median age 77.50 (39-92) years, 66% women, mean weight 75.66 ± 11.89 kg and mean BMI 27.86 ± 4.46. Enoxaparin was used in 52% of cases. Regarding medical history and predisposing factors for VTE we found: acute infection 60%, severe decompensated COPD 30%, malignancy 28%, CHF NYHA II 8%, DM 20%, previous DVT of unknown causes 4%, previous DVT of known causes 2%, lower limb paralysis less than 2%, chemotherapy 12%, antidepressants 10%, treatment with aromatase inhibitors 6%, age over 60 years 84%, 38% obesity, bedridden for more than 4 days 38%, central venous catheter 6% and smoking 2%. Mean global anti-Xa factor was 0.23 ± 0.14 U/mL; nearly half (49%) were within the range of recommended thromboprophylaxis, 40.8% were undertreated and 10.2% were over-treated. Subgroup analysis showed a difference in the group of patients with active chemotherapy (0.37 ± 0.19 U/mL vs 0.22 ± 0.12 U/mL), which was statistically significant (p = 0.008). One third (33.3%) of patients with chemotherapy were overtreated vs. 6.8 in the group of patients without chemotherapy.
On comparing LMWH levels according to the agent used, the mean peak was 0.25 ± 0.11 U/mL for bemiparin vs 0.22 ± 0.16 U/mL for enoxaparin, with less inter-individual variability for bemiparin (CV = 44% for bemiparin vs 72% for enoxaparin). Over half (58.3%) the patients receiving bemiparin had levels within the range vs. 38.5% in the enoxaparin group (p = 0.139).
Conclusions: Over 40% of patients receiving thromboprophylaxis in the ED showed insufficient levels of anti-Xa factor, which implies increased risk of a thromboembolic event. Patients undergoing chemotherapy had higher levels of anti-Xa factor, resulting in increased risk of bleeding.

Incident and adverse events notification system in an emergency department

Sistema de notificación de incidentes y eventos adversos en un servicio de urgencias

Varo Cenarruzabeitia JJ, Iturrioz Nuñez I, Labiano Turrillas J, Ros Madoz MC, Vila Martín C

Clínica Universitaria de Navarra, Pamplona, Spain.

Introduction: The safety culture implies awareness that errors can occur in each of our actions, causing harm to the patient, making clinical safety an essential dimension of quality care. It is necessary to know and understand the causes of the errors in order to prevent them. One of the tools used to maintain clinical safety is the Register and Notification of Incidents and Adverse Events. Our center started a project to implement the Register and Analysis of Incidents in 2004 in areas of greatest risk to the patient. In the emergency department (ED) this was established in August 2009.
Objectives: To analyze reported incidents in our ED since implementation of the system aimed at reducing morbidity and mortality caused by healthcare action, learning from experience, improving safety and identifying possible improvements.
Method: Descriptive analysis of reported incidents from inception (August 2009) during three years to August 2012. The study included the following variables: date, time and place (in the ED) of the incident, status of those involved and the notifier, incident

type (clinical, equipment failure etc), detailed description of the incident, severity and proposed improvements, scope and consequences for the patient.
Our center's own computer application was used for incident and event registration and notification, with the following characteristics: non-punitive, voluntary and confidential; integrated in the electronic medical record, further analysis of incidents by experts; system oriented; ability to respond by those responsible for the ED. The notifications are systematically analyzed using Root Cause Analysis, Failure and Effects Mode analysis, etc.. Professionals receive feedback at the time the notification is analyzed, as well as through annual reports and case specific sessions.
Results: we recorded 131 incident notifications from 01.08.2009 to 31-08-2012. Severity category: 56.48% perceived by the patient but caused no harm; 9.15% caused some kind of harm that required treatment or hospitalization. Type of Notifications: 16.79% were clinical incidents (communication, diagnostic, or procedural error), 78.62% miscellaneous (patient identification, continuity of attention, samples, medication, delay in care, service organization), 4.58% equipment failures, 0% vascular pathways-drainage-tubes. Notifier: 88.54% nurse, 7.63% physician, 5.34% auxiliary nurse. Improvement actions included: identification bracelet for all patients and review of several internal protocols (transfer of patients to another facility, sepsis protocol, urgent calls to the doctor, evaluation by specialists, communication of critical results, changes in medical order, risk of walkout and/or suicide, supervision of incapacitated patients).
Conclusions: The use of this system has allowed the detection of safety problems in our ED and improvement in some processes and procedures. The classification of the type of incident is overly non-specific considering the large number of notifications in the miscellaneous group. We need to identify barriers to reporting and increase the commitment of professionals. Feed-back to the professionals is necessary for the maintenance of this tool and creating a culture of safety.

Arterial thromboembolism prophylaxis in atrial fibrillation: looking for ways to improve routine practice in the acute phase: the HERMES-AF study (Hospital EmeRgency department ManagEment Strategies of Atrial Fibrillation)

Profilaxis de la tromboembolia arterial en la fibrilación auricular: en busca de opciones de mejora en la práctica diaria de la fase aguda. Estudio HERMES-AF (Hospital EmeRgency department ManagEment Strategies of Atrial Fibrillation)

Coll-Vinent i Puig B[1], **Martín Martínez A**[1], **Suero Méndez C**[1], **Del Arco Galán C**[1], **Sánchez López J**[1], **Montull E**[2]

[1]Grupo de Arritmias Cardiacas. Sociedad Española de Medicina de Urgencias y Emergencias. [2]Sanofi Spain.

Introduction: To avoid the catastrophic consequences of cardioembolic stroke, thromboprophylaxis in atrial fibrillation (AF) should be established early. For this there are simple recommendations in clinical practice guidelines based on the risk profile of stroke and bleeding in patients, but not implemented systematically in daily practice. In Spain, patients with AF generally use the hospital emergency department (ED) to access medical care, and this constitutes a "golden opportunity" to establish early prevention strategies. However, there is little information on thromboprophylaxis in the ED which would allow proposing strategies for improvement.
Objectives: 1) Analyze the embolic risk profile and thromboprophylaxis prescription in AF patients presenting to the ED, 2) identify factors associated with non-prescription.
Method: We performed a prospective, multicenter, observational study in 127 hospital EDs of 15 autonomous communities from May 23 to June 5, 2011. We included all patients older than 18 years with AF documented by an electrocardiogram performed in the ED visit. The following data were collected: demographics, type of AF and associated comorbidities, embolic risk factors (CHADS2 scheme), degree of bleeding risk, thromboprophylaxis before and after the visit and reasons for not recommending anti-

coagulation. There were no treatment recommendations. Informed consent was obtained in all cases. For comparisons we used Student's t and chi-square test. Logistic regression was used to evaluate the association between various factors and anticoagulation or not.

Results: The study included 3,276 patients (51.6% women) aged 76.1 ± 11.7 years. Most (71.5%) had a high embolic risk (CHADS2 ≥ 2) and 19.3% intermediate risk (CHADS2 ≥ 1), but only 1,667 patients (51% of the total, 68% of patients with known AF) were receiving prophylaxis with oral anticoagulation before the ED visit. Of the non-anticoagulated patients, 803 (31.3%) had high embolic risk and no contraindications to anticoagulation. Of these, 309 (38.5%) were recommended anticoagulation at discharge and another 155 (19.3%) antiplatelet therapy. Major reasons for not indicating anticoagulation were advanced age (30.2%), perception of low risk for the patient (16.2%) and referral to other specialists to make the decision (10.2%). Advanced age (≥ 80 years), female gender, history of known AF and consulting for a reason directly related to AF or its treatment were independently associated (by logistic regression) to the absence of prophylaxis ($p = 0.1$, $p = 0.011$, $p < 0.001$ and $p < 0.001$ respectively).

Conclusions: Most patients with AF who visit the ED have a high risk of embolism, but the prescription of anticoagulation is insufficient. This is due, at least in part, to inadequate impact of patient age and gender in the medical decision, to passing the therapeutic decision to other specialists, and the perception of a low risk of embolism despite the presence of risk factors. Therefore, as a strategy to improve the quality of thromboprophylaxis in AF patients, it is necessary to increase the prescription of OAC in the ED to all patients at high risk, through systematic implementation of clinical practice guidelines which should contribute to improve their prognosis and quality of life.

Factors influencing mortality in head-injury patients admitted to a critical and emergency care services

Factores que influyen en la mortalidad de los pacientes ingresados por traumatismo craneoencefálico

Salinas Martín MP, López Caler C, Valero Roldán JI, Del Prado Martínez MF, García Quesada G

Complejo Hospitalario Universitario Carlos Haya, Málaga, Spain.

Introduction: Traumatic brain injury (TBI) is common in industrialized countries, constituting the leading cause of death in young men under 45 years of age, with traffic accidents being the most frequent cause. Mortality is around 20-30% and very high costs are involved. Diagnosis, treatment and outcomes of TBI have changed in recent years due to the introduction of new techniques and a greater emphasis on secondary injuries, leading to prevention and treatment. Knowing the characteristics of these patients and applying early management could lead to a decrease in both mortality and the sequelae of TBI.

Objectives: To describe the characteristics of patients with TBI admitted to a critical care unit (CCU) in the emergency department of a tertiary hospital, and to assess which factors are related mortality.

Method: We performed a retrospective observational study of patients with severe TBI during 2012 s admitted to the CCU. Statistical analysis: Demographic variables (sex, age), risk factors, severity, need for mechanical ventilation and duration, medical and surgical treatment and outcome at discharge. Quantitative variables with a symmetrical distribution were expressed as mean and standard deviation; asymmetric variables as median and interquartile range. Qualitative variables are expressed as percentages. Non-parametric tests included chi-square and Student's t test, with a maximum alpha error of 5%.

Results: The study included 3,046 patients admitted to the CCU from both the emergency department and others. There were 1,821 urgent admissions of which only 76 (4.17%) had were diagnosed with TBI; 76.3% of these had multiple trauma, and 23.7% only TBI. Most (72.4%) were men and the remaining 27.6% women. Mean age

was 46.4 ± 21.1 years. Average APACHE score on admission was 20.54 ± 7.16 and average SOFA score was 4.23 ± 2.39 admission. Mechanical ventilation was required by 93.4% of patients, with an average duration of 6.6 ± 9.6 days; tracheostomy 43.7% (31 of 71 patients); blood transfusion 35%. Barbiturate coma was induced in 17% of cases; mannitol was necessary in 71% of these and muscle relaxants in 21% of patients. Over a third (35%) underwent surgery (27 patients): decompressive craniectomy in 14 and hematoma drainage in 18; both techniques were needed for 5 patients. Complications included dysautonomic crises in 13% of patients, ventilator-associated pneumonia in 36%, with the following causative pathogens in order of frequency being methicillin sensitive *Staphylococcus aureus,* Klebsiella sp, methicillin-resistant Staphylococcus aureus and *Acinetobacter baumannii.* Overall mortality was 21%. A significant association was found between mortality and low hemoglobin levels at admission (< 9.3 g/dl) ($p < 0.01$) and high sodium atdischarge from this unit (> 145 mEq/L) $p = 0.033$, OR: 3.67, 95% CI (1.06 to 12.68), but not between sex and mortality ($p = 1$). Patients receiving appropriate antibiotic therapy had lower mortality, $p = 0.016$, OR: 0.2, 95% CI (0.4-0.8).

Conclusions: TBI is a rare cause of admission to our CCU. It mainly affects middle-aged men. Most require mechanical ventilation. Appropriate antibiotic treatment and high hemoglobin level at admission are associated with better prognosis.

Analysis of the use of a time-control device during cardiopulmonary resuscitation

Análisis de la utilización de un dispositivo de control de tiempo durante la reanimación cardiopulmonar

Mayol Barrera S[1],
Grima Cervantes O[1],
Berbel Castro J[2]

[1]*Hospital Universitari Mútua Terrassa, Barcelona, Spain.*
[2]*Ivemon. Ambulancias Egara, Terrassa, Barcelona, Spain.*

Introduction: Compliance with the task performance times set out in the International Guidelines on cardiopulmonary resuscitation (CPR) can be difficult. In many cases the performance of CPR tasks according to standard objective criteria is conditioned by personal, instrumental and logistic factors. Controlling CPR task times using a Smartphone may be a good solution.

Objective: To analyze whether the use of a Time Control Device (TCD) improves CPR task times, and measure the level of satisfaction in professionals using the device.

Method: We performed an experimental, randomized, longitudinal and prospective study from June 2012 to January 2013. The TCD used was a 3G iPhone with an alarm set to sound every 2 minutes. The study proposal was accepted and supported by the hospital Committee for Ethics and Clinical Research. The sample consisted of 35 episodes of out-of-hospital cardiopulmonary arrest, with randomly assigned use of the TCD. A survey of participating medical personnel, previously instructed in TCD use, was used to measure the degree of satisfaction with the device. We collected data on demographic variables, CPR task times and satisfaction using a numerical scale where 1 was no/poor and 5 excellent. Statistics: we used chi-square and Student's t test.

Results: 152 surveys on the 35 episodes were collected: 84 professionals (55.3%) used the TCD and 68 (44.7%) did not. Mean age was 36 ± 6.18 years, 122 (80.3%) were male, 70 (46.1%) worked in Intermediate Vital Support Units and 97 (63.8%) had more than 10 years of professional experience. Those using the TCD (vs those who did not) showed differences in: exact task time awareness [82 (97.6%) vs 25 (36.7%), $p < 0.001$], compliance (4.30 ± 0.69 vs 3.38 ± 0.69, $p < 0.001$, control of chest compressions (4.46 ± 0.64 vs 3.62 ± 0.71; $p < 0.001$), the degree of effectiveness when administering drugs (4.42 ± 0.54 vs 3.84 ± 0.78, $p < 0.001$) and the degree of difficulty following the recommended task times (1.84 ± 0.76 vs 3.56 ± 0.74, $p < 0.001$). More than half (55.3%) the professionals used the TCD and rated it (on an ascending scale of 1 to 5) for usefulness (4.50 ± 0.61, $p < 0.001$), applicability (4.45 ± 0.66,

p < 0.001), optimizing tasks (4.52 ± 0.65; p < 0.001), improvement in cycle control (4.60 ± 0.62, p < 0.001), increased effectiveness of the procedures performed during CPR (4.46 ± 0.63; p < 0.001) and rated interference with or impairment of task performance (1.31 ± 0.51, p < 0.001).

Conclusions: The use of a TCD significantly improved compliance with the recommendations on task times set out in the International Guidelines on CPR, as well as chest compression control, the degree of effectiveness in managing drugs and diminishing the degree of difficulty in complying with task times. The great usefulness and applicability of the TCD determined the high level of satisfaction expressed by the professionals who used it.

Pulmonary embolism in very elderly patients

Tromboembolismo pulmonar en pacientes muy ancianos

Salas Campos R, Pardo Pelegrín A, Coll Colell R, Sanjaume Feixa M, Fernández Monràs F, Parra Macías N

Hospital Universitari Sagrat Cor, Barcelona, Spain.

Introduction: Pulmonary embolism (PE) is more common in elderly patients. The non-specific clinical symptoms and associated morbidity in this population hinder diagnosis, generating additional tests and therapeutic approaches that are not risk-free.

Objectives: To describe the clinical characteristics of patients aged > 85 years admitted to hospital with suspected PE, to determine the correlation between suspected and confirmed diagnosis, and to assess prognosis using the Pulmonary Severity Index (PSI).

Method: We included 306 patients seen in the emergency department with suspected PE (December 2004 and April 2013). We selected those aged > 85 years (n = 82) and performed a retrospective descriptive study of this sample. We collected data on socio-demographic variables, clinical risk factors, basic complementary examinations, diagnostic tests, prognosis and mortality. We determined the mean and standard deviation of quantitative variables, and the percentage and sample size for qualitative variables. All analyses were performed using SPSS 15.0.

Results: Of the 306 patients with suspected PE, 82 (26.7%) were older than 85 years. Socio-demographics: mean age 89.3 ± 3.99 years, women 67 (81.7%). Origin: own home 70 (85.2%) residence 9 (11.1%). Reasons for referral: sudden dyspnea 36 (43.9%), chest pain, 26 (31.7%), hemoptysis 3 (3.7%), other 43 (52.4%). Risk factors were identified in 47 (57.3%); immobilization 23 (48.9%), previous PE 12 (25.5%), cancer 9 (19.1%), recent surgery, 3 (6.4%). Comorbidities were found in 76 (92.6%) patients: hypertension78.9%, congestive heart failure 36.8%, COPD 26.3%, femur fracture 19.7%, diabetes 11.8%, AVC 11.8%, obesity 9.2%, smoking 7.9% and recent AMI 2.6%. Physical examination data: Temperature 36.63 ± 0.82, heart rate 91.2 ± 18.6, respiratory rate 26.4 ± 7.3, systolic BP 181.19 ± 154.9 and diastolic BP 72.6 ± 12.8 mmHg and signs of DVT 10 (12.2%). Laboratory test data: mean creatinine (n = 80) 1.2 mg/dl ± 0.51, hematocrit (n = 78) 35.6% ± 5.5, pH (n = 71) 7.43 ± 0.062, PO_2 (n = 67) 64.33 ± 17.9 mmHg, PCO2 (n = 66) 39.06 ± 8.09 mmHg, bicarbonate (n = 66) 26.01 ± 5.11 meq/l, D-dimer (n = 61) 3648.73 2808.64 ng/dl, ECG (n = 82) pathological 35 (42.7%), chest X-ray (n = 82) normal 24 (29.3%). Diagnostic tests: lung scan in 44 (53.6%), thoracic CT angiography in 43 (52.4%), pulmonary angiography 1 (1.2%). PE was confirmed in 39 (45.7%) of the 82 patients over 85 years by angiography in 24 (29.3%) and scintigraphy in 14 (17.1%). Venous Doppler (n = 37) with PE 15 (40.5%). DVT as first diagnosis on admission (n = 82): 36 (46.8%). PE as first diagnosis on admission confirmed (n = 39): 27 (69.2%). Clinical Wells probability scale (n = 81): low 31 (37.8%), intermediate 28 (34.1%), high 22 (26.8%). Wells probability scale of PE confirmed (n = 38): low 10 (13.0%) intermediate 20 (26%), high 8 (10.4%). PSI scale (n = 33): PSI I-II 1 (2.6%), PSI III 10 (25.6%), PSI IV 15 (38.5%), PSI V 7 (17.9%) Mean PSI score was 113.18 ± 17. Mortality during hospitalization: of 39 patients with PE, 6 (15.4%) died and 4 (66.6%) of these who died were classified by PSI as being at high risk. Other diagnoses (n = 82): HF 17 (21%), COPD exacerbation 7 (6.5%), pneumonia 6 (5.6%), other 13 (12.1%).

Conclusions: PE was confirmed in less than half of our patients with initially suspected

PE. The non-specific clinical symptoms, associated morbidity, Wells scale and initial complementary examinations did not help the diagnosis. In our series, CT angiography allowed confirmation of the suspected diagnosis in a greater number of patients than scintigraphy. Detailed medical history on admission and a pretest probability scale adapted to this population would probably improve the clinical suspicion index in this group of patients. Most of our patients were at high-risk according to the PSI scale and this correlated well with hospital mortality.

Is mean arterial pressure associated with complete neurological recovery after cardiopulmonary resuscitation?

La presión arterial media tras la reanimación cardiopulmonar. ¿Variable asociada a la recuperación neurológica completa?

Pastor González E,
Pozo Soler P,
Sabín Gómez ML,
García-Ochoa Blanco MJ,
Camacho Leis C,
Caniego Rodrigo C

SAMUR-Protección Civil, Madrid, Spain.

Introduction: Mean arterial pressure (MAP) estimates the mean blood pressure of the whole cardiac cycle of systole and diastole. Normal adult MAP values range between 70 and 110 mmHg. MAP less than 60 mmHg indicates that the heart, brain and kidneys are not receiving sufficient blood and oxygen to function, implying poor perfusion of target organs and this may contribute to cerebral anoxia and multiorgan failure.

Objective: To measure MAP in patients with return of spontaneous circulation (ROSC) after out-of-hospital cardiac arrest (OHCA) in order to analyze its association with complete neurological recovery (CPC I-II).

Methods: We performed an observational analytical study in a cohort of consecutive patients attended between 2006 and 2011 by advanced life support units (ALS) who suffered OHCA and, after advanced cardiopulmonary resuscitation (CPR), were transferred to hospital with ROSC. Exclusion criteria: patients not receiving in CPR or those without ROSC after 30 minutes of ALS maneuvers. Variables analyzed: epidemiological (age and sex), clinical (initial heart rhythm: shockable/non-shockable) and therapeutic measures (starting time of CPR, OHCA witnesses, OHCA witnessed by the emergency medical service (EMS)) and as an outcome variables: optimal MAP > 70 mmHg [calculated as: (2 * DBP + SBP)/3)]. Statistical analysis: quantitative variables described as central measures and dispersion, qualitative variables as frequencies. We used chi square test, Student's t test, and multivariate binary logistic regression with results shown as odds ratios and 95% confidence intervals. Statistical significance was considered as p values < 0.05. Data were processed using SPSS v17.

Results: The study sample comprised 633 patients, 77.1% male with mean age 59 ±18 and 65 ± 19 years for women (p = 0.001). Just over half the sample (52%: 329) had shockable initial rhythms (VF, PVT). PCR starting time was a median 7 minutes (IQR: 4.3) (excluding witnessed OHCA). OHCA was witnessed by the EMS in 19.3% (122) and by bystanders in the remaining 34.8% (178). Complete neurological recovery (CPC I-II) was found in 39.7% (251). Regarding initial MAP: this was optimal in 68.4% (433) and positively associated with neurological integrity (p = 0.032), odds ratio 1.46 (95% CI 1034-2082). Logistic regression analysis showed that MAP was as an independent predictor of full neurological recovery, (CPC I-II), together with CPR by witnesses, shockable initial rhythm and witnessed OHCA, with odds ratios of 1.493 (95% CI 1.01 to 2.20), 1.516 (95% CI 1.01 to 2.25), 4.655 (95% CI 3.15 to 6.87) and 7.079 (95% CI 4.32 to 11.58), respectively.

Conclusions: MAP in our series proved to be an independent predictor of recovery "ad integrum". So, baseline MAP > 70 mmHg increases 1.5-fold the probability of complete neurological recovery (CPC I-II), and this confirms that measuring initial vital constants provides useful information for decision making and optimizing post-resuscitation care.

Optimization of cardiopulmonary resuscitation using the iRCP® informatics application

Optimización de la reanimación cardiopulmonar mediante la utilización de la aplicación informática iRCP®

Mayol Barrera S[1], **Grima Cervantes O**[1], **Berbel Castro J**[2]

[1]*Hospital Universitari Mútua Terrassa, Barcelona, Spain.*
[2]*Ivemon. Ambulancias Egara, Terrassa, Barcelona, Spain.*

Introduction: Performance of optimal cardiopulmonary resuscitation (CPR) maneuvers according to established international standards can be a difficult task due to the many variables involved in the procedure and external factors. With the advent of the latest generation mobile phone devices and health-related applications for Smartphones, use of the iRCP® application may help optimize CPR procedures.

Objective: To analyze the utility of the iRCP® application in advanced CPR.

Methods: We performed an experimental, randomized, prospective pilot study. The study sample consisted of 42 cases; half were randomly assigned to the group in which the iRCP® application was used with a Laerdal® ALS Simulator mannequin, in a unique setting designed for the occasion, where we simulated cardiac arrest rhythms of asystole and ventricular fibrillation. We evaluated a total of 126 volunteer doctors and nurses in groups of 3 per case. For data collection we used a specially designed template completed by instructors of advanced life support (ALS) who objectively evaluated and recorded the proper execution of all CPR tasks according to international standards. The dependent variable used was the dichotomous yes/no and the independent variable was right/wrong. Statistics: descriptive chi-square and Student t tests.

Results: There were 42 evaluations of the different cases, in which iRCP® was used for 21 (50%) and not used for the other 21 (50%) cases. Comparisons (iRCP® vs no iRCP®) showed: number of cycles in 2 minutes (5 vs. 6.48 ± 1.07; $p < 0.001$) 30:2 compression/ventillation ratio [21 (100%) vs 11 (52.38%), $p < 0.001$], compressions frequency between 100-120 x min [21 (100%) vs 6 (28.57%); $p < 0.001$], control execution times [21 (100%) vs 7 (33.33%), $p < 0.001$], drug administration 3-5 min [21 (100%) vs 11 (52.38%), $p < 0.001$], minimization of pauses in chest compressions [18 (85.71%) vs. 7 (33.33%); $p = 0.001$], reversible causes assessment [18 (85.71%) vs. 7 (33.33%), $p = 0.001$], rescuer change every 2 min [17 (80.95%) vs 6 (28.57%), $p = 0.001$], correct depth chest compressions [16 (76.19%) vs 6 (28.57%), $p = 0.002$], chest recoil [18 (85.71%) vs 6 (28.57%), $p < 0.001$], heart rhythm evaluation every 2 min [21 (100%) vs 12 (57.14%), $p = 0.001$], no interruption of chest compressions to assess rhythm before 2 min [18 (85.71%) vs. 8 (38.09%), $p = 0.001$] and single leader [15 (71.42%) vs 11 (52.38%), $p = 0.20$].

Conclusions: Use of the iRCP® application significantly improved CPR procedures and variables according to established international standards. This optimization was reflected in the excellent compression/ventilation ratio, rate of chest compressions, time control and the administration of drugs between 3-5 min. At the same time it improved the minimal interruption of chest compressions, reversible causes assessment and rescuer change every 2 minutes, correct depth of chest compressions, rhythm evaluation every 2 minutes and non-interruption of chest compressions to evaluate heart rhythm every 2 minutes.