"ventricular fibrillation (VF)," 12-lead STEMI (ST-elevation myocardial infarction) interpretation, and return of spontaneous circulation (ROSC). Methods: As part of our "Resuscitation Boot Camp," we taught 2010 ACLS to 19 senior medical students in didactic (12 h) and experiential (6 h) format. Immediately prior to the course, subjects were recorded performing a standard acute coronary syndrome/VF arrest scenario. We taught and assessed basic and advanced airway management. As the ACLS course's final test, each student was recorded repeating the same scenario. Two expert ACLS instructors scored the before and after performances on a 121-point scale. Each student served as their own control; we used *t*- and McNemar tests for paired data with statistical significance of $p < 0.05$. Results: Prior to instruction, average time to CPR after arrest was 112 s, and to first DF 3.01 min. Students scored 45 $\pm$ 9/121 points, and 9/19 (49%) performed dangerous actions. After instruction, time to CPR was 12 s ($p = 0.004$) and to first DF 1.53 min ($p = 0.03$). Time to DF was delayed as students showed mastery of bag-valve-mask ventilation prior to DF. After instruction, students scored 97 $\pm$ 4/121 points ($p < 0.0001$) with no dangerous actions. Prior to training, only 4/19 (21%) students performed both CPR and DF within 2 min, and three of these had ROSC. After training, 14/19 (74%) achieved CPR +DF < 2 min ($p = 0.002$), and all had ROSC. Prior to training, 5/19 (26%) students said "VF," 4/19 obtained an electrocardiogram (ECG), but none identified STEMI. After training, corresponding performance was 13/19 "VF" (68%, $p = 0.021$), and 100% ECG and STEMI identification ($p < 0.05$). Conclusion: This course significantly improved content and psychomotor skills. Critical actions required for resuscitation were much more common after training. High-fidelity simulation, despite increased cost, is an important and effective adjunct to traditional ACLS training.

Prehospital – EMS 1

☐ **PATIENTS WITH ACUTE CORONARY SYNDROME AND STROKE THROUGHOUT THE ACUTE HEALTH-CARE CHAIN.** R. Egberink, Centre for Emergency Care Euregio (Acute Zorg Euregio), Medisch Spectrum Twente, Enschede, NETHERLANDS; M. Zwerink, Health Technology and Services Research, MIRA Institute for Biomedical Technology and Technical Medicine, University of Twente, Enschede, NETHERLANDS; H. Droste, P. Brouwers, Department of Neurology, Medisch Spectrum Twente, Enschede, NETHERLANDS; G. Van Houwelingen, Department of Cardiology, Thoraxcentrum Twente, Medisch Spectrum Twente, Enschede, NETHERLANDS; C. Doggen, Health Technology and Services Research, MIRA Institute for Biomedical Technology and Technical Medicine, University of Twente, Enschede, NETHERLANDS

Background: For patients with acute coronary syndrome (ACS) and stroke, prompt diagnosis and treatment is essential. In most cases of myocardial infarction, blood flow needs to be restored through percutaneous coronary intervention (PCI) or through thrombolytic medications. Treatments are most effective if started as early as possible. For patients with ST-elevated myocardial infarction (STEMI), PCI should be started within 90 min. For ischemic stroke patients, thrombolysis with recombinant tissue plasminogen activator needs to be given within 4.5 h after onset of symptoms. Before a patient reaches a PCI center or stroke unit, he may have had contact with a general practitioner (GP), a GP cooperative (GPC), ambulance service, or Emergency Department (ED), and probably with more than one acute health care provider. It is of utmost importance that patients with ACS and stroke are diagnosed as early as possible and promptly reach the right health care provider for optimal treatment. Therefore, optimal use and efficient functioning of the acute health care chain is imperative. To identify possible delays and bottlenecks, insight into the overall acute care chain is necessary. Objective: The aim of this study is to obtain insight into 1) circumstances in which symptoms of patients occur, 2) medical contacts throughout the acute care chain, 3) delays stratified by health care providers, and 4) door-to-balloon time for patients with STEMI and door-to-needle time for patients with ischemic stroke. Methods: The MICK study is a prospective observational study including 202 patients suspected of having ACS (mean age 63.3 years, 65.8% men) and 239 suspected of ischemic stroke (69.9 years, 49.8% men). Patients were hospitalized in one of three coronary care units (CCU) or in one of four stroke units in the region of Twente and Oost-Achterhoek (Euregio), the Netherlands, over a period of 18 weeks. Patients filled out a questionnaire and additional data were obtained using registries. Results: Seventy-five percent of all patients were at home when symptoms occurred and 50% had their own partner present. Over 40% of all patients suspected of ACS waited more than 6 h prior to contacting a health care provider and over 30% of all patients suspected of having a stroke waited more than 4 h. Patients with more severe symptoms sought medical contact earlier. Once a care provider was contacted, 45% of all patients with ACS were hospitalized within 90 min at the CCU and 65% of patients with stroke within 4 h at the stroke unit. Over 80% of ACS patients first contacted the GP or GPC, compared with 72% of stroke patients. After contact with the GP, about half of the patients were transported by ambulance, whereas after contact with the GPC, 80% of ACS patients and 64% of stroke patients were transported by ambulance. Patients reached the hospital through many different health care chains. ACS patients reached the CCU via "GPC-ambulance" (25%), "GP-ambulance" (24%), and various other routes (51%). Stroke patients reached the stroke unit via "ambulance-ED" (24%), "GP-ED" (23%), "GP-ambulance-ED" (23%) and "GPC-ambulance-ED" (14%). For patients who immediately called 112, the emergency number, time to hospitalization was shorter than for patients who first contacted a GP or GPC. Of ACS patients, 87% reached the CCU within 90 min when the only contact was with an ambulance, compared to "GPC-ambulance" (57%) and "GP-ambulance" (40%). Similar results were found for patients with stroke; of the "Ambulance-ED" chain, 77% reached the stroke unit within 4 h, compared to "GP-ambulance-ED" (50%), "GPC-ambulance-ED" (48%) and "GP-ED" (15%). Median door-to-balloon time of the 30 patients with STEMI (out of 202 suspected ACS) who underwent a PCI was 50 min. Only

one patient had a PCI within 90 min after first medical contact. Median door-to-needle time of the 31 patients (out of the 182 patients with ischemic stroke) who received thrombolysis was 43 min. Most thrombolysis (93%) took place within 4 h after the first medical contact. Conclusion: Noticeable are the long patient delays in seeking care, the various chains through which patients reach the CCU or stroke unit, and the different throughput times. Calling 112 and transport by ambulance is the fastest track. Circumstances and characteristics such as type and seriousness of symptoms may explain why most patients first contact a GP or GPC. This may explain why it takes longer for these patients to reach the CCU or stroke unit.

☐ **ACCURACY OF DIAGNOSING SEPSIS AND EARLY ANTIBIOTIC TREATMENT IN THE PREHOSPITAL SETTING.** O. Bayer, F. Bloos, C. Hartog, Intensive Care Unit, University Hospital Jena, Jena, GERMANY; S. Herdtle, C. Hohenstein, Emergency Medicine, University Hospital Jena, Jena, GERMANYB. Kabisch, Intensive Care Unit, University Hospital Jena, Jena, GERMANY; J. Reichel, EMS, University Hospital Jena, Jena, GERMANY; K. Reinhart, Anaesthesiology and Intensive Care Medicine, University Hospital Jena, Jena, GERMANY; R. Schaefer, Emergency Medicine Department, University Hospital Jena, Jena, GERMANY; K. Schneider, A. Stacke, C. Stumme, Intensive Care Unit, University Hospital Jena, Jena, GERMANY

Introduction: Early antimicrobial administration is associated with increased survival in patients with septic shock (1). Actual data showed a relevant incidence rate of severe sepsis with 3.3 per 100 emergency medical service encounters (2). For this reason, three emergency medical services (EMS) vehicles and one rescue helicopter were equipped with a "Sepsis Kit" containing 2 g Ceftriaxone and two blood culture sets. Objectives: Retrospective observational study to evaluate the accuracy of diagnosing sepsis and initiate immediate antimicrobial treatment in the prehospital setting. Methods: Emergency physicians were asked to initiate sepsis therapy with the "Sepsis Kit" directly on site. If sepsis was suspected, the emergency physician obtained blood cultures and started antimicrobials as well as fluid therapy on site. The patient was then transferred to the hospital. The sepsis diagnosis was confirmed by clinical and laboratory findings in the Emergency Department (ED). Also, time from first contact with EMS to the first dose of antibiotic was recorded. Results: Fifty-six patients with suspected sepsis were admitted to the ED between March 2012 and April 2013. Patients' median age was 73 years (interquartile range [IQR] 65–82 years), initial body temperature 39.4°C (IQR 38.7–39.7°C), peripheral oxygen saturation 91% (IQR 86–94%), heart rate 108 beats/min (IQR 91–126), and mean arterial pressure 102 mm Hg (IQR 80–114). Sixty-four percent had tachypnea. SAPS2 (Simplified Acute Physiology Score) was 30 (IQR 26–35). Time until administration of antimicrobials and intravenous fluids was median 19 min (IQR 18–24). No allergic reaction was observed. Patients arrived at the hospital after 56 min (IQR 46–67). Workup in the ED confirmed the sepsis diagnosis in 49 patients (87.5%). Twenty-six patients (46.4%) had severe sepsis or septic shock. Most common sources of sepsis were respiratory (43%), urogenital (21%), skin and soft tissue (8.9%), and abdominal (8.9%). Initial median values were procalcitonin 0.5 ng/mL (IQR 0.2–2.0), leukocytes 11 Gpt/L (IQR 9–15), C-reactive protein 65 mg/L (IQR 35–139), and serum lactate 2.1 mmol/L (IQR 1.4–3.6). Sixty-one percent of patients had a positive blood culture. Ceftriaxone was the appropriate antibiotic therapy in 69% of patients. Patients received 2.5 L (IQR 1.5–3.0) crystalloids until admitted to the ED. Only 5 patients (8.9%) were discharged from the hospital on the same day. Three patients (5.4%) died. Conclusions: The majority of preclinical sepsis diagnoses proved to be correct. Furthermore, in about two-thirds of patients, blood cultures were positive and the initial antibiotic proved to be appropriate. It seems worthwhile to begin early sepsis treatment in the prehospital setting. Preclinical initiation of broad antimicrobial therapy seems to lower the overall mortality rate. Further studies are necessary.

REFERENCES

1. **DURATION OF HYPOTENSION BEFORE INITIATION OF EFFECTIVE ANTIMICROBIAL THERAPY IS THE CRITICAL DETERMINANT OF SURVIVAL IN HUMAN SEPTIC SHOCK.** Kumar A, Roberts D, Wood KE, et al. Crit Care Med 2006;34:1589–96.
2. **SEVERE SEPSIS IN PRE-HOSPITAL EMERGENCY CARE: ANALYSIS OF INCIDENCE, CARE, AND OUTCOME.** Seymour CW, Rea TD, Kahn JM, Walkey AJ, Yealy DM, Angus DC. Am J Respir Crit Care Med 2012;186:1264–71.

☐ **THE ROLE OF HEMOSTATIC PRODUCT-IMPREGNATED DRESSINGS IN THE PRE-HOSPITAL CONTROL OF EXTERNAL BLEEDING. PROSPECTIVE OBSERVATIONAL STUDY.** H. Lefort, S. Travers, C. Ernouf, O. Maurin, Emergency Medical Department, Fire Brigade of Paris, Paris, FRANCE; B. Distinguin, Emergency Medical Department BSPP, Military University of Val-de-Grâce, Paris, FRANCE; E. Fontaine, M. Lemaire, S. Margerin, D. Jost, J. Tourtier, L. Domanski, Emergency Medical Department, Fire Brigade of Paris, Paris, FRANCE

Introduction: Prehospital medical services are, in certain cases, confronted with external bleeding that is poorly controlled by the usual means (compression, compressive dressing, tourniquet, etc.). The use of new dressings impregnated with hemostatic products has been reported in military settings for the management of war wounded. The aim of this study was to review the patients treated with those dressings in civilian settings and confirm their efficacy. Materials and Methods: Multicenter, prospective, observational study. QuikClotGauze™ (QG; Z-Medica, Wallingford, CT) hemostatic dressings (kaolin-impregnated gauze strips) were provided to prehospital medical teams after personnel training. A specific questionnaire was completed after each use to collect age, gender, prior intake of anticoagulant treatment, wound type, hemodynamic parameters, hemostatic procedures already implemented, and reasons for prescription of QG. The efficacy criterion for QG was total arrest of, or decrease in, bleeding. Adverse effects and difficulties encountered in use