Paramedic CAT (Critically Appraised topic)

Title: Outcomes of sepsis patients in prehospital vs. in-hospital intervention

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Clinical Scenario:
You are a 65 year old male patient who is at home. You were working on a project and you dropped a rusty bar which ended u cutting your left calf leaving a cut about 4 inches in length. You attended to your injury and felt you didn't need to go to the hospital and get it looked at. It's been a couple of days now and you are feeling worse and worse as the day's progress. You have decided you should get it looked at but you are unsure if you should call EMS or just go to the hospital by yourself?

PICO (Population – Intervention – Comparison – Outcome) Question:
Does paramedic intervention in the prehospital setting vs. intervention in the hospital affect sepsis patient mortality rates?

Search Strategy:
- (ems OR Emergency Medical Technician OR emt) AND (treatment OR Treatment Outcomes OR intervention OR therapy) AND (out of hospital OR prehospital OR in hospital setting) AND (sepsis) AND (patient*) AND (mortality)
- Database Used: CINAHL Plus with Full Text and Medline; searched simultaneously
- Publication date between 2010-2016; will result in 37 articles (down from initial 50 articles)
- Refer to section titled 'Reproducible Search'

Search Outcome: 37

Relevant Papers:
7; 2 article on intravenous resuscitation, 2 article on arrival to treatment, and 3 on early detection. Articles selected included 2 from early detection and 1 arrival to treatment.

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESING (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Guerra et al (2013)	15,338 patients total, of those 1,069 identified with infection and of those 112 selected meeting lvl. 1 &2 screening tools identified. These patients met the sepsis alert protocol criteria	Multi-method, quantitative design LOE:3 - 1 year prospective cohort study - Retrospective case-control study	- Prehospital Sepsis Alert Protocol - Identification/ treatment - Mortality	- 112 pts., 67 pts transported by EMS and 32 (47.8%) identified with severe sepsis. 35 pts (52.2%) did not meet protocol criteria but were identified in hospital. - 30 of 112 pts (26.7%) was the overall mortality and 5 of 37	Weaknesses Small sample size, selection bias in retrospective design, absence of feedback Strengths All 3 hospitals cooperated fully, only one brand of venous lactate meters used, Denver area which worked

	according to study.			- pts (13.6%) that were alerted - 37 pts of 112 pts were protocol alerted while 75 were not. - Use of prehospital venous lactate measurements. - Decreased intubation rates	under single treatment protocol,
Femling et al (2014)	485 sepsis patients; 378 patients present by EMS and 107 walk-ins. Three scoring systems were used.	Retrospective analysis LOE:4 - Database review	- Mortality - Prehospital volume resuscitation - Scoring systems: SOFA, APACHE II, and SIRS	- 78% of patients transported by EMS verse 22% walk in - EMS patients were older (59%), more altered mental status (57%), and triaged quicker (78%) - EMS patients also had higher respiratory rates, lower lactates, met SIRS criteria, and higher APACHE II scores - No mortality improvements but shorter hospital stay if EMS transported if they survived - Mortality associated with age, first ED lactate, and SOFA score and not method of arrival or fluids received	Weaknesses Retrospective review, small population, >70% of patients arrived via. EMS and sicker, database review, pertain to inner-city New Mexico, no feedback Strengths Approved by committee, arrival to ED (EMS vs. walk-ins) had no significant effect on mortality rate
Hilditch (2015)	Pre-hospital recognition and intervention among severe sepsis patients	Literature analysis 10 articles: LOE:1 - 9 cohorts - 1 multi-method	- More sensitive pre-hospital parameter utilization - Ratified screening tools - Research into IV antibiotic/fluid resuscitation - Continuing education - Better collaboration between primary/ secondary care	- 11.8% increase per annum in sepsis patients transported to hospital (Seymour, 2012) - Mostly community-acquired bacterial infections (UK Sepsis Group, 2011) - Point-of-care lactate measurements and sepsis screening tools (Jansen/Beest, 2008) - Every hour delay in antibiotic admin., 7.6% increase in mortality (Kumar, 2006) - 38% of patients transported by EMS received IV fluids (Seymour, 2010)	Weaknesses Retrospective literature review, older data used, selection and publication bias based on key search terms, no feedback Strengths Reproducible search, suggested changes due to research

Comments:
Regarding this PICO question, there were some difficulties mainly that all the articles above had retrospective properties. All the articles above had varying small samples sizes and the areas where each respective study was completed was small in size. Geurra et al's (2013) focused their study on implementing a prehospital sepsis alert protocol to improve mortality. If patient met criteria from protocol, patient received more fluids and shorter stays in hospital as opposed to non-alerted patients. The criteria for this sepsis protocol was specific and had to meet at least two of the criteria to active protocol which accounted for 35 patients not being accurately identified (Gerrua et al's, 2013). There was also an emphasis on lactate measurements. Femling et al's (2014) primary outcome was to look at mortality and how patient arrived at the emergency department (EMS vs. walk-in). The study was a database review so feedback wasn't conducted. Of the patient arrivals, >70% arrived via EMS and were also older, more altered mental status, etc. as in table above then walk-ins (Femling et al's, 2014). Arrival by EMS to emergency department were granted access to fluids and antibiotic faster than walk-ins but had no significant outcome in mortality. Hilditch (2015) preformed a literature analysis of 10 articles which used older data. The review stated that in sepsis patients, prehospital intervention can benefit the patient regarding time to treatment when at the emergency department. A more sensitize prehospital parameters, screening tools, etc. as above in table are need to effectively treat sepsis patients (Hilditch, 2015). All three articles emphasized that there is an importance of recognizing sepsis in the prehospital setting but overall mortality rates did not have a significant affect.

Consideration:
Based on the articles above, prehospital treatment can benefit patients regarding treatment when at the emergency department but had no significant result regarding mortality. However, clinical judgement among EMS accompanied with other tools such as the sepsis alert protocol and prehospital lactate measurements can assist in correctly identifying patients in order to provide the most appropriate treatment method. Further research is needed.

Clinical Bottom Line:
Prehospital intervention in sepsis patients' is needed but cannot be based solely predetermined criteria. Using clinical judgement based on patient presentation is the most appropriate method of treatment.

Reproducible Search:

Search ID	Search Terms	Action (Results)
S15	S9 AND S10 AND S11 AND S12 AND S13 AND S14	50
S14	S6 OR S7 OR S8	402,820
S13	S3 OR S4 OR S5	8,314,584
S12	S1 OR S2	62,931
S11	"mortality"	1,104,859
S10	"patient*"	7,039,207
S9	"sepsis"	122,124

S8	"in hospital setting	160,909
S7	"prehospital"	23,039
S6	"out of hospital"	236,683
S5	"therapy"	5,487,572
S4	"intervention"	903,439
S3	"treatment" OR "Treatment Outcomes"	4,758,007
S2	"Emergency Medical Technicians" OR "Prehospital Care" OR "emt"	43,449
S1	"ems"	24,707

References:

1. Guerra, W. F., Mayfield, T. R., Meyers, M. S., Clouatre, A. E., & Riccio, J. C. (2013). Early detection and treatment of patients with severe sepsis by prehospital personnel. *Journal Of Emergency Medicine (0736-4679)*, *44*(6), 1116-1125. doi:10.1016/j.jemermed.2012.11.003

2. Femling, J., Weiss, S., Hauswald, E., & Tarby, D. (2014). EMS patients and walk-in patients presenting with severe sepsis: differences in management and outcome. *Southern Medical Journal*, *107*(12), 751-756. doi:10.14423/SMJ.0000000000000206

3. Hilditch, M. (2015). Can pre-hospital recognition and intervention improve outcome for patients with severe sepsis?. *Journal Of Paramedic Practice*, *7*(4), 168-175.