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Original Article

Internal Medicine Section

The Knowledge of the Physicians about Sepsis Bundles is Suboptimal: A Multicenter Survey

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ABSTRACT

Objectives: Sepsis is a severe condition with possible high mortality outcomes. A multicentre-survey to detect the knowledge of the physicians who are involved in sepsis management in daily work was conducted.

Materials and Methods: The study was held in October 2013. A questionnaire consisting of questions about sepsis bundles was prepared. Eight centers from different regions of the country were invited to join the survey. The questionnaires were introduced to physicians from infectious diseases, internal diseases, emergency (ER) and anaesthesiology departments.

Results: Two-hundred-and-twenty-three physicians from eight different centers were included. Of total 112 (50%) were male, median age was 30 years (24-59 years). Median working duration of participants was 5 years; 153 (69%) were residents, 70 (31%) were consultants. Of total 131 (59%) declared that they have enough knowledge on sepsis management. About the most important approach in sepsis, 151 (68%) voted for fluid replacement while 59 (26%) and 13 (6%) said early antibiotic use and inotropic support are the most important approaches respectively. Physicians from ER (56.5%) and anaesthesiology departments (55.4%) were more aware of the fluid replacement element of the bundle (30ml/kg, 3-hours bundle) in severe sepsis. The ID physicians, who routinely follow sepsis patients, were not aware of the fluid resuscitation (only 20% replied the element correctly) but almost all of them answered the question on early antibiotic use and blood culture sampling correctly. The knowledge of target CVP and MAP in severe sepsis were also below expectant among ID physicians. The overall knowledge of sepsis bundles of internal medicine physicians was poor. Almost all of the ER physicians knew that they have to measure lactate level upon admission but they were not aware of the threshold of the lactate level.

Conclusion: The knowledge of the sepsis bundles of the physicians, who are in charge of sepsis patients in routine work, was suboptimal. Most of the participants were unaware of SSC and new bundles. Training of the physicians of all centers about sepsis bundles is suggested according to these results.

Keywords: Improvement, Sepsis performance, Septic shock, Severe sepsis, Surviving sepsis campaign

INTRODUCTION

Sepsis is a serious clinical condition as a result of severe infections. In the United States the annual incidence of sepsis was reported to be 750,000 cases in 2005 and over 1,665,000 cases were reported with high mortality rates as 20 to 50 percent in 2009 [1,2]. In Spain the incidence of severe sepsis and septic shock is 104/100.000 adults and 31/100.000 adults per year with 20.7% and 45.7% hospital mortality respectively [3]. In the Netherlands 15,500 cases with severe sepsis and 6000 patients with septic shock were admitted to hospitals annually [4]. In Asia, in Taiwan severe sepsis incidence rate was reported to be 507/1000 with 45% mortality in 2008 [5].

Surviving Sepsis Campaign (SSC) is an international programme that makes guidelines to improve the management of this serious clinical condition and to reduce the high mortality rates. The first SSC guideline which published in 2004 classified the recommendations as resuscitation bundle including elements for first six hours resuscitation and management bundle including elements for first 24 hours management [6]. The guideline was renewed in 2008 [7]. Many studies revealed that clinical implementation of these bundle elements improve the quality of sepsis care; reduce the hospital mortality rates [4,8,9]. In 2012 the SSC 2008 guideline was updated; recommendations classified as to be completed within three hours and to be completed within six hours [Table/Fig-1] [10].

Although there is limited data about sepsis related mortality in Turkey, the rates range between 7.6% and 15.8% [11-13]. Aygen et al., reported that nosocomial sepsis incidence was 33.1% in a university hospital in Turkey [14]. Although anaesthesiology, infectious disease, internal medicine and emergency departments carries authority about the management of severe sepsis and septic shock in Turkey, the educational programme on sepsis is limited in these clinics.

To be completed within 3 hours	To be completed within 6 hours
Measure lactate level	Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure 65 mm Hg
Obtain blood cultures prior to administration of antibiotics	In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥ 4 mmol/L (36 mg/dL): - Measure central venous pressure (CVP)* - Measure central venous oxygen saturation (ScvO2)*
Administer broad spectrum antibiotics	Re-measure lactate if initial lactate was elevated*
Administer 30 mL/kg crystalloid for hypotension or lactate >= 4 mmol/L	

[Table/Fig-1]: Sepsis Bundles, Surviving Sepsis Campaign (SSC) 2012

*Targets of quantative resusication included in the guidelines are CVP of 8 mm Hg, ScvO2 of 70%, and normalization of lactate

In this study we aim to determine the state of the knowledge about the sepsis bundles of the physicians who care for sepsis patients in daily work. A multi-centre survey was conducted. Our objective in this study was to establish the knowledge of the physicians on sepsis and use these results for educational activities for further programmes so improve the quality of the sepsis care.

MATERIALS AND METHODS

Study design

The study was held in October 2013. A self-structured-questionnaire prepared to evaluate the approaches of the consultant doctors to sepsis and to find out their knowledge about recommendations of international guideline of SCC. The self structured questionnaire included questions on three hours and six hours sepsis bundles and targets shown by SCC guideline (timing of and/or limits of following: fluid administration, antibiotic therapy, blood cultures, arterial blood pressure and defining of hypotension, central venous pressure, venous oxygen saturation, lactate levels, type of fluid to be given, type of vasopressor to be given (epinephrine, norepinephrine, dopamine, dobutamine, etc) as well as demographic variables-like age, gender, department and title. The questionnaire was not validated, only includes direct questions about the approach to the sepsis management and each question is evaluated seperately; no positive predictivity or negative predictivity was provided.

Local ethical committee approval of the hospital was taken. Attendance to survey based on volunteering. No educational programme was implemented before or after the day of the practice of the survey.

Eight centers from all over the Turkey were invited to participate to the study. The invitation was send to the infectious disease and clinical microbiology departments and the study was carried out by infectious disease specialists. The questionnaire was directed to the physicians from infectious diseases, internal diseases, emergency and anaesthesiology departments in all centers. Finally all the data were reviewed by the coordinator center, Yildirim Beyazit University, Ankara Ataturk Training & Research Hospital.

Setting

In Turkey, tertiary healthcare services are organized in two different organizations; university hospitals and training and research hospitals. Three university hospitals, four training and research hospitals and one city public hospital were attended from different regions of the Turkey. The characteristics of the hospitals and the number of the attendants are given in [Table/Fig-2].

STATISTICAL ANALYSIS

Statistical results were evaluated by SPSS 15.00 (USA Inc). Mean and median values were used in parametric and nonparametric variables, percentages were given as indicated. To compare values between two groups, Pearson's chi-square test was used.

RESULTS

Totally 223 physicians completed the questionnaire; 112 (50%) were male, median age was 30 years (24-59 years). Of total 59 (26.5%) were infectious diseases physicians, 62 (27.7%) were internal diseases physicians, 46 (20.5%) were emergency physicians and 56 (24.4%) were anaesthesiology physicians. Median working duration of participants was 5 (1-36) years; 153 (69%) were residents/registrars, 70 (31%) were consultants. Ninety-seven (43.5%) declared that they see 1-5 sepsis patients in a month while 54 (24.2%) and 72 (32.3%) see 5-10 and more than 10 sepsis patients respectively.

Questionnaire Part I: First approach to sepsis

Of total 131 (58.7%) participants declared that their knowledge is enough for sepsis management, while 92 (%41.3; 28% of consultants and 46% of residents) declared the opposite.

The first part of the questionnaire was about approach to sepsis; 151 (67.7%) participants said that the most important component of treatment is fluid replacement, while 59 (26.5%) and 13 (6%) said antibiotic administration and inotropic support are the most important components of the management respectively.

To the question who to be called first for the consultation of sepsis patients, 116 (52%), 70 (31%) and 37(16%) of the participants said anaesthesiology, infectious diseases and internal medicine consultants should come first respectively.

Of all 175 (78.5%) participants stated that APAHCE II score is important for the patients with severe sepsis and septic shock while remaining participants replied the question as the opposite. Answers to other questions are given in [Table/Fig-3,4].

Questionnere Part II: Knowledge on elements of sepsis bundles

All the bundle elements and measures were asked and correct answers of different departments are given in [Table/Fig-5]. A comparison of residents/registrars and specialists are given in [Table/Fig-6].

City	Center	Type	Beds	Attendants
Ankara	Yildirim Beyazit University, Ataturk Training and Research Hospital	University hospital	677	33 physicians
Ankara	Ankara Numune Training and Research Hospital	Training and Research Hospital	1140	37 physicians
Ankara	Ankara Training and Research Hospital	Training and Research Hospital	550	21 pyhsicians
Ankara	Ankara Turkish Armed Forces Health Command Health and Veterinary Services	Military hospital	250	13 physicians
Istanbul	GATA Haydarpasa Training Hospital	Training and Research Hospital	1200	22 physicians
Istanbul	Dr. Lutfi Kirdar Kartal Training and Research Hospital	Training and Research Hospital	706	68 physicians
Tokat	Gaziosmanpasa University Hospital	University Hospital	300	20 physicians
Kars	Sarıkamıs Public Hospital	Public Hospital	35	9 physicians

[Table/Fig-2]: The characteristics of the hospitals and the number of the attendants

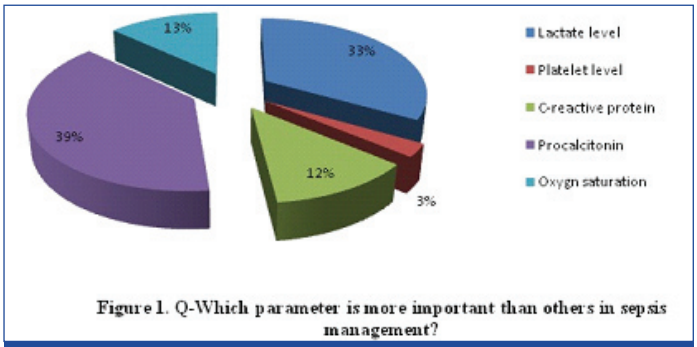

Figure 1. Q-Which parameter is more important than others in sepsis management?

[Table/Fig-3]: Q-Which parameter is more important than others in sepsis management?

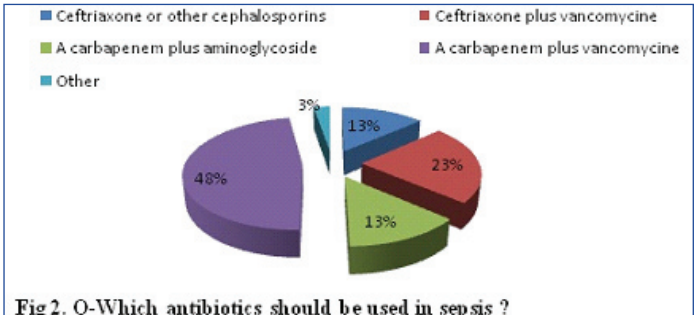

Fig 2. Q-Which antibiotics should be used in sepsis ?

[Table/Fig-4]: Q-Which antibiotics should be used in sepsis?

	Infectious Diseases (59) n (%)	Emergency (46) n (%)	Internal Medicine (62) n (%)	Anaesthesiology (56) n (%)
Need for measuring lactate level	50 (84.7)	42 (91.3)	29 (46.8)	54 (96.4)
Take blood culture within 3 hours prior to antibiotics	58 (98)	41 (89.1)	53 (85.5)	47 (83.9)
Administer crystalloid in hypotension (30 ml/kg)	12 (20.3)	26 (56.5)	21 (33.9)	31 (55.4)
Lactate threshold in sepsis (>4mmol/L)	13 (22.0)	20 (43.5)	5 (8.2)	21 (37.5)
Target mean arterial pressure (≥65mmHg)	33 (55.9)	39 (84.8)	29 (46.8)	29 (51.8)
Target central venous pressure (8-12mmHg)	31 (52.5)	31 (67.4)	38 (61.3)	41 (73.2)
Target central venous oxygen saturation (>70%)	3 (5.1)	6 (13)	7 (11.3)	14 (25)
Re-measure lactate if initial lactate was elevated	42 (71.2)	34 (73.9)	45 (72.6)	46 (82.1)

[Table/Fig-5]: The rate of correct answers to sepsis bundle survey of different departments

Bundle element	Residents (n=153) n,%	Specialists (n=70) n,%
Blood lactate measurement (need for measurement within 3 hours)	113; 74%	54; %77
Threshold of blood lactate level in sepsis (>4mmol/L)	45; 30%	27; 39%
Blood culture, within 3 hours prior to antibiotic use	135; 88%	63; 90%
Target mean arterial blood pressure (>65mmHg) (severe sepsis)	89; 58%	41; 59%
Target central venous pressure (8-12mmHg) (septic shock or lactate>4mmol/L)	97; 63%	44; 63%
Target central venous oxygen saturation (>70%) (severe sepsis)	18; 12%	11; 16%
Fluid resuscitation, 30ml/kg within 3 hours, (hypotension or lactate >4mmol/L)	53; 35%	37; 53%

[Table/Fig-6]: Knowledge of sepsis bundles: residents versus specialists

DISCUSSION

The knowledge of the sepsis bundles of the physicians, who are in charge of sepsis patients in routine work, was far below from acceptable rates. Although the threshold of the lactate level and the volume of fluid replacement (30ml/kg) are extremely important, the number of correct answers was low in these subjects. Most of the participants were unaware of surviving sepsis campaign and new bundles. Though, more than half of the participants declared that they see more than five patients in a month: 97 (43.5%) declared that they see 1-5 sepsis patients in a month while 54 (24.2%) and 72 (32.3%) were seeing 5-10 and more than 10 sepsis patients respectively.

Only a few studies exist on sepsis in Turkey and severe sepsis and septic shock epidemiology in Turkey is not well-known. A one detailed study by Yegenaga et al., had evaluated sepsis/systemic inflammatory response syndrome and acute kidney injury (AKI) in an intensive care unit of a tertiary care hospital in Turkey. There was a high incidence of AKI (56.83%) in septic patients in the Turkish ICU population compared with similar studies from Europe. The mortality rate was found 65% for AKI and 35% for non-AKI rates in these sepsis patients [15]. This result can be limited to the study population. In 2010 another study by Turkish Neonatal Society, Nosocomial Infections Study Group evaluated the epidemiology of nosocomial infections in Turkish neonatal intensive care units. They found out that sepsis frequency was 6.4% (2.1-17%) throughout the country [16].

The SCC was first created in 2002; consisting of severe sepsis management guidelines and a sepsis performance improvement program. Several publications appeared since then. In 2013 the guideline was revised, which was supported by 30 international scientific organizations. The revision included changes in recommendations for fluids and vasopressor administration [10]. The new 3 and 6 hour sepsis 'bundles' which can be called as sets of care elements include a software program and it can be downloaded from the Surviving Sepsis Campaign website (www.survivingsepsis.org) [17]. However, there are very few studies on knowledge of sepsis bundles of physicians. Ana mail group exist on sepsis by SCC (sepsisgroups@lists.sepsisgroups.org) and one of the members, had shared an unpublished study of hers: The study was about the assessment of the compliance to the sepsis bundles in ER, in Florida. In 2013; totally 600 patients were accepted to ER with severe sepsis and septic shock. Compliance to lactate measure, transfuse/infuse 30 mL/kg fluid bolus, starting antibiotic treatment within one hour and taking two blood cultures before antibiotic treatment elements was assessed and the rates were 55.2%, 30.2%, 69.5%, 76.8% respectively (unpublished data, with permission from Peggy Sienecki). The largest study on sepsis management was assessed recently by Ferrer et al., [17]. They made a retrospective analysis of a large dataset collected prospectively for the SSC. One hundred sixty-five ICUs in Europe, the United States, and South America were included and 28, 150 patients with severe sepsis and septic shock, from January 2005 through February 2010, were evaluated. In-hospital mortality was reported as 30%. There was a statically significant increase in the probability of death associated with the number of hours of delay for first antibiotic administration [18]. Ongoing data analysis by SSC is helping to refine improvement targets for treating patients with sepsis. The performance-improvement data for the first 15,022 patients entered into the SSC database revealed that the mortality rate for patients who were admitted to the intensive care unit (ICU) from hospital floors (46.8%) was significantly higher than the rate for those patients who were admitted from the emergency department (27.6%) [17]. In Turkey the sepsis patients were mostly seen in ED and other departments like anaesthesiology ICU, infectious diseases department and internal medicine. That is why we included those physicians from these clinics.

Fluid administration is extremely important for management of severe sepsis and septic shock treatment [10]. The question about fluid replacement on the survey was replied only by 40% of the participants correctly. Physicians from ER (56.5%) and anaesthesiology departments (55.4%) were more aware of the importance of this element of the bundle; still the rate is far below the expectant. Unfortunately the ID physicians, who routinely follow sepsis patients, were not aware of the fluid resuscitation (only 20% replied the element correctly) but almost all of them answered the question on early antibiotic use and blood culture. The knowledge of target CVP and MAP in severe sepsis were also below expectant among ID physicians. The overall knowledge of sepsis bundles of internal medicine physicians was very poor. Almost all of the ER physicians knew that they have to measure lactate level upon admission but they were not aware of the threshold of lactate level, so one cannot expect them to implement the other elements of the bundles if they are not aware of the severe sepsis.

LIMITATIONS OF OUR STUDY

We just made a survey on knowledge and approach of the physicians to sepsis and sepsis bundles but we did not check the compliance of the bundles in units of these physicians. Still, since the knowledge of the physicians about sepsis bundles were poor, the compliance can be expected to be poor as well, a further study is needed to establish this hypothesis. A multicenter study from

Japan evaluated the epidemiology of severe sepsis and examine the SSC guidelines-based standard quality of care related to severe sepsis in Japan and they found out that the compliance of the bundles were low among their centers. Fluid resuscitation and vasopressors (hypotension or lactate > 4 mmol/L) were used less than half of the patients properly (47%). Achievement of $ScvO_2$ > 70% (septic shock or lactate >4 mmol/L) was also very low with 10%. The report does not include the knowledge of the physicians on the subject but overall the compliance was seemed to be low in Japan [19]. Another study from China stated that overall compliance during 6 hour resuscitation and 24 hour management bundles were 5.5% and 17.4%, respectively, and 28 day mortality was 33.0% in their study on sepsis bundles. They also found out that compliance with protocols for blood cultures before antibiotics (42.2%), central venous pressure ≥ 8 mmHg (65.9%), central venous oxygen saturation ≥ 70% (25.0%), and optimized glucose control (82.1%), were significantly associated with decreased 28-day mortality ($p < 0.05$) [20].

CONCLUSION

Sepsis campaign awareness and adherence to the SSC bundles remain a challenge for many physicians, but hospitals are consistently reporting reduced sepsis-related mortality associated with adherence to the SSC guidelines. The overall knowledge of physicians was suboptimal in our study. The awareness of sepsis and SSC guidelines should be improved to get better results in sepsis and severe sepsis.

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