

COMPLIANCE TO SURVIVING SEPSIS CAMPAIGN HOUR-1 BUNDLE-A CROSS-SECTIONAL STUDY AMONG PHYSICIANS INVOLVED IN CRITICAL CARE IN PAKISTAN

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ABSTRACT

Objective: To determine physician's compliance to surviving sepsis campaign updated Hour-one bundle in critically ill patients in Pakistan.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Anaesthesiology, Combined Military Hospital Lahore Medical College, from Jun to Aug 2019.

Methodology: This study was carried out among physicians managing critical patients in intensive care units. Participants were asked to fill out a 16-questions survey (work experience, qualification and individual components of surviving sepsis campaign hour-1 bundle. Data was collected using online access to survey and by sending hard copies.

Results: Questionnaire was sent to 230 physicians while only 63 responses were received (response rate 27%). Only 45 (71%) respondents were aware of the updated Hour-1 bundle. There was no institutional protocol for compliance to sepsis bundles in thirty three (55%) responses. 52% respondents used Systemic inflammatory response syndrome (SIRS) criteria to diagnose sepsis while quick Sequential Organ Failure Assessment (qSOFA) was used by 36% respondents. Overall compliance to hour-1 bundle components was only 60%. Lactate levels was not measured by 35 (55%) respondents while 24 (38%) did not obtain blood cultures before administering antibiotics. Crystalloid and nor epinephrine was used by all respondents. Overall compliance with all the components of sepsis bundle had strong correlation with post-graduate qualification (p -value 0.001-0.049).

Conclusion: Poor compliance to updated sepsis guidelines was one of the major reasons of high sepsis related mortality in Pakistan.

Keywords: Hour-one bundle sepsis/septic shock, Physician's compliance, Surviving sepsis campaign.

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INTRODUCTION

Sepsis is the leading cause of mortality especially in low to middle-income countries and the actual facts and figures being documented is scarce. Almost 5 million deaths occur annually secondary to sepsis and majority of them occur in low and middle income countries¹. According to a mortality analysis, sepsis related conditions were the cause of death in >60% of patients in medical intensive care unit in our country². Another study has shown ICU (Intensive Care Unit) mortality of 32% where sepsis-group had mortality of 51% as compared to the non-sepsis group which had mortality of 17.7%³. Contrary to this,

one analysis has shown that developed countries had a sepsis mortality rates ranging between 11.9% and 19.3%⁴.

The major cause of higher mortality rates in low and middle-income countries is lack of adequate resources and health care systems which may be due to regional, political and economic differences⁵. Burden of this disease is different in our part of the world which might be due to difference in individual practice. Presence of multi-drug resistant (MDR) organisms in ICU make sepsis management very challenging. Globally gram-positive infections are common in ICUs of developed countries. However, MDR gram negative bacteria (MDR-GNB) are major culprits in the Asia-Pacific region⁶. Apart from resources, another big reason for high sepsis rates in low

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resource countries including Pakistan is the non-compliance of health-care professionals to the recommended guidelines. Bundles are a structured set of interventions that have consistently been shown to improve patient outcomes when performed collectively. When it comes to sepsis, several care bundles have been released by Surviving sepsis campaign (SSC)⁷.

Controversial results exist regarding effect of bundle compliance and their outcomes in term of mortality and length of hospital stay. Three independent, multicenter, randomized controlled trials evaluated early goal-directed therapy (EGDT) in severe sepsis and septic shock including proCess (Protocolized Care for Early Septic Shock), ARISE (Australian Resuscitation in Sepsis Evaluation), ProMISe (Protocolized Management in Sepsis) trials. All of them failed to show any survival benefit of early goal directed therapy compared to usual resuscitation⁸. Contrary to this, in a large multi-center study conducted in US, South America and Europe including 29,470 patients, it was evident that mortality was lower in areas with strict compliance to sepsis bundles⁹. The importance of timing is very crucial in improving outcome of septic patients. This has been confirmed by a meta-analysis in which following the resuscitation bundles within first 6 hours was the main determinant of survival¹⁰.

The objective of study was to assess the compliance of physicians caring for critically ill patients to follow the Hour-1 bundle for sepsis. When it comes to patient management, adhering to protocols definitely effects outcome. Moreover, it is important to look into factors which are responsible for increase in sepsis associated mortality in Pakistan. We are facing sepsis caused by multi-drug resistant organisms in our ICUs and this is why we are unable to reduce mortality.

METHODOLOGY

This was a cross-sectional survey carried out among anaesthesiology trainees and consultants managing critical patients in intensive care units, from Jun to Aug 2019. Participants were asked to fill out a 16-questions survey after taking infor-

med consent. Data was collected both as hard copy of questionnaire and an online version of questionnaire. The study protocol was approved by Ethical Review Committee of CMH Lahore Medical College (ref no. 436/ERC/CMH/ LMC). Incomplete forms were excluded from study.

Assuming that 66% of the patients have compliance with resuscitation bundle ($p=0.66$), margin of error 1% and $\alpha = 0.10$, the calculated sample size was 149¹⁴. Study questionnaire was sent to more than 230 physicians, however we got only 63 responses in our study period. Thus constituting small sample size.

We used surviving sepsis campaign updated 2018 bundle as a template for formulating questions. This survey included questions on the work experience of doctor, post-graduate qualification, working in tertiary care center, knowledge about hour-1 bundle, institutional protocols and presence of ICU consultant cover. Regarding sepsis, respondents were asked about the criteria they used to diagnose sepsis (SIRS/qSOFA, or end-organ dysfunction), measurement of lactate levels, obtaining blood cultures prior to administration of antibiotics, evidence-based practice for giving empirical antibiotics, type of fluid used for initial resuscitation, volume of fluid for initial resuscitation (fixed 30 ml/kg or according to comorbidities of patient), vasopressor of choice for persistent hypotension, their ability to initiate and complete hour-1 bundle in one hour and their opinion regarding suitability of bundles either 3 and 6 hours or hour-1 bundle. The questionnaire did not solicit any personal information that could link the responses to specific persons.

Data was analyzed using SPSS-25. Compliance was defined as 100% adherence to bundle components used in this survey. Pearson's chi-squared test was used and p -value of ≤ 0.005 was considered statistically significant. Fisher's exact test was used where the individual cell counts were less than five.

RESULTS

Questionnaire was sent to almost 230 physicians providing care to critically ill patients,

however, 63 responses were received with an overall response rate of almost 27%.

Thirty three respondents (52%) had work experience of less than five years, 20 (31%) had five to ten years and 10 (16%) had 10-15 years of experience. Forty nine (78%) were having post-

respondents used SIRS criteria to diagnose septic patients, while twenty three respondents (36%) used qSOFA. Seven (11%) respondents used end organ dysfunction with infection to diagnose sepsis as suggested by 2016 surviving sepsis guidelines, without using any clinical criteria.

Table-I: Post-graduate qualification and measuring lactate levels.

		Do you Measure Lactate Levels in Patients with Sepsis/ Severe Sepsis/ Septic Shock?		Total
		Yes	No	
Are you having postgraduate qualification?	Yes	25	24	49
	No	3	11	14
Total		28	35	63

Table-II: Post-graduate qualification and obtaining blood cultures before starting antibiotics.

		Do You Obtain Blood Culture Before Starting Antibiotics?		Total
		Yes	No	
Are you having postgraduate qualification?	Yes	35	14	49
	No	4	10	14
Total		39	24	63

Table-III: Post-graduate qualification and giving empirical antibiotics based on hospital antibiogram.

		Is there Some Evidence Based Protocol for Giving Empirical antibiotics in septic patients based on your ICU / Hospital Antibiogram?		Total
		Yes	No	
Are you having post-graduate qualification?	Yes	28	21	49
	No	1	13	14
Total		29	34	63

Table-IV: Post-graduate qualification and volume of initial fluid bolus given.

		How much fluid you give as bolus in septic patients with hypotension?		Total
		Fixed volume of 30ml/kg crystalloids to all patients	Adjust according to comorbidities from history of patient	
Are you having post-graduate qualification?	Yes	19	30	49
	No	10	4	14
Total		29	34	63

graduate qualification and 58 (92%) were working in tertiary care centers. Only 45 (71%) of respondents were aware that the previous 3 and 6-hour bundle has been replaced by updated Hour-1 bundle by surviving sepsis campaign in 2018. There were no institutional protocol for strict compliance to sepsis bundles in 35 (55%) responses. Majority (81%) of ICU/emergency had consultant cover for 24 hrs. Thirty three (52%)

Overall compliance with hour-1 bundle components was only 60%. Lactate levels was not measured by 35 (55%) due to non-availability in most of the cases. Twenty four (38%) respondents were not obtaining blood cultures before administering antibiotics. All respondents prescribed broad spectrum antibiotics, however, thirty four (54%) respondents prescribed broad spectrum

antibiotics without any evidence based protocol or antibiogram.

red Hour-1 bundle due to early administration of fluid and antibiotics.

Table-V: Post-graduate qualification and ability to initiate all task in Hour-1.

	Are you able to initiate all the tasks in hour-1?		Total
	Yes	No	
Are you having post-graduate qualification?	Yes	18	49
	No	12	14
Total	33	30	63

Crystalloid was used by all respondents for initial resuscitation of septic patients where 29 (46%) respondents practiced giving fixed 30 ml/kg of crystalloids to all patients, however 34 (54%) respondents adjusted crystalloid volume depending upon comorbid conditions. Nor-epinephrine was used as vasopressor of choice by all

Compliance to bundle components was significantly associated with postgraduate qualification, where *p*-value for measuring lactate level was 0.049 and for obtaining blood cultures before starting antibiotics in first hour was 0.004. There was no correlation between work experience of physicians and following sepsis bundles.

DISCUSSION

In this study the overall compliance of physicians to follow sepsis Hour-1 bundle was 60%. Due to lack of considerable number of ICU consultants/anaesthesiologist, mostly the patients were directly managed by resident doctor whose overall level of knowledge and practice adherence to sepsis bundle was low as evident from this study.

According to one study looking into factors for not following clinical practice guidelines, the major limitation was lack of awareness and agreement with the content¹¹. Likewise in this study only 71% of respondents were aware that 3 and 6-hour bundle has been replaced by updated Hour-1 bundle. Lactate level guided resuscitation was practiced by only 28 (45%) respondents. A study by Almeida *et al*, has been done to look into compliance of sepsis 6-hours bundle with respect to day and night shifts and has found better compliance at night shift due to less patient entry and increasing nurse to patient ratio¹². A survey done by Carlbon *et al*, has evaluated top three barriers that affect protocol based resuscitation and found the biggest one to be inadequate nursing staff to perform early goal directed therapy followed by monitoring of central venous pressure and lastly problem in identifying septic patients¹³. Another study which was similar to this was conducted involving physicians from lesser developed coun-

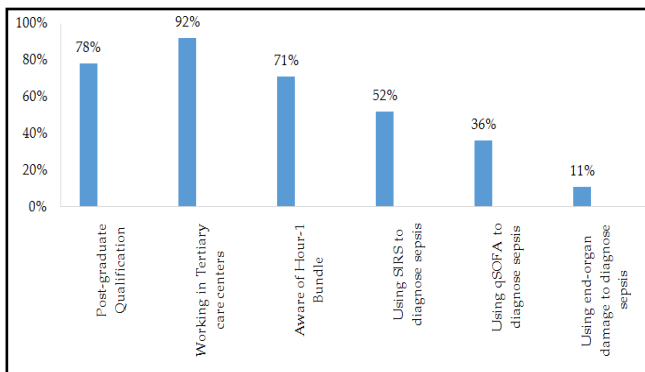


Figure-1: Awareness of Hour-1 Bundle and Criteria used to diagnose sepsis.

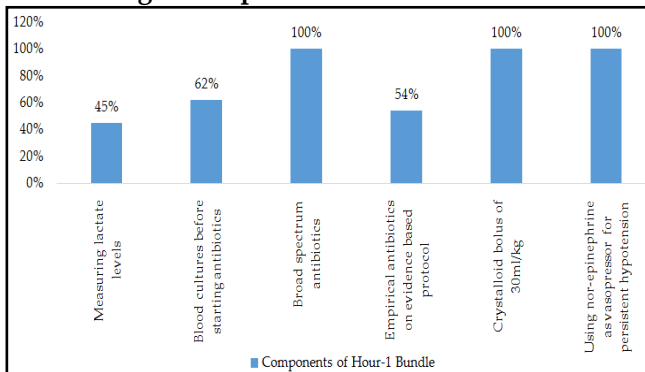


Figure-2: Compliance of respondent to Hour-1 Bundle.

respondents for persistent hypotension. Thirty three (52%) respondents were able to initiate Hour-1 bundle components in one hour while 23 (36%) were able to complete all component in first hour. Thirty seven (59%) respondents favo-

tries and concluded that poor compliance to surviving sepsis campaign guidelines may be responsible for continued high mortality¹⁴.

Study by Rhodes *et al*, has shown that lactate-guided resuscitation significantly decreased mortality as compared to resuscitation without lactate monitoring. (RR 0.67; 95% CI 0.53-0.84)¹⁵. In this study 38% respondents practiced giving first dose of antibiotic without taking samples for blood cultures which was mainly due to lack of good practice and lack of knowledge of its significance. In some cases first dose of antibiotic had already been given without taking blood cultures in emergency department. According to one study IV antibiotics dramatically reduced the likelihood of getting a positive blood culture after the first hour of administration¹⁶. Another recent study conducted over 2010 to 2017 by Scheer *et al*, has demonstrated antibiotic administration to be independent factor for less pathogen identification on blood culture where blood culture was positive in only 27.7% of cases who were already receiving antibiotics ($p < 0.001$)¹⁷.

Although broad spectrum antibiotics were given by all respondents but 55% respondents did not follow any evidence based protocols or antibiograms to prescribe antibiotics which may be major cause of MDR-sepsis in our intensive care units. In various studies conducted in 2000 and 2010, on empirical antibiotic therapy in sepsis and septic shock, inappropriate antimicrobial therapy for blood stream infections has been reported in 15-30% of patients admitted to ICU and is directly associated with increased hospital mortality¹⁸⁻²⁰. Moreover timely deescalation of broad spectrum antibiotics on basis of blood cultures report and clinical improvement is equally important to conserve the effectiveness of existing antimicrobials and prevent multi-drug resistant sepsis²¹.

In this study 52% respondents used SIRS criteria to diagnose patients with sepsis, 36% used qSOFA while 11% used end organ dysfunction criteria. According to Lembke *et al*²², sensitivity and specificity of SIRS criteria was 84.1% and

34.7% respectively while qSOFA had a sensitivity of 48.8% and specificity of 78.7%, hence discouraging SIRS criteria alone to diagnose sepsis which is widely used by respondents in this study (52%) and this might be contributing to over use of broad spectrum antibiotics and ultimately leading to antibiotic resistance. A study done by Harimtepathip *et al*, has shown qSOFA to be useful tool with prognostic value outside ICU and emergency as well as in patients who would eventually end up in ICU²³.

59% of respondents were in favour of Hour-1 bundle due to early administration of antibiotics despite the fact that 36% were not able to complete all components in one hour. It is imperative to note that surviving sepsis guidelines recommended all components of bundle should begin in first hour from sepsis recognition but may not necessarily be completed in the first hour. According to a quality improvement program (SEPSIS KILLS) which promoted resuscitation (taking of blood cultures, measuring serum lactate levels, administration of intravenous antibiotics and fluid) within 60 minutes of recognition of sepsis, there was linear decline in mortality from 19.3% to 14.1% from 2009 to 2013. Moreover, there was a significant decline of patient's length of stay in intensive care unit as well as total length of stay in hospital ($p < 0.0001$ for each)²⁴.

A major limitation of our study was very low response rate (27%) despite that the survey took hardly three minutes to complete. National journals in the United States and Canada recommend survey response rate of at least 60% to ensure that nonresponse bias does not threaten the validity of the findings²⁵. Moreover this study was conducted involving anaesthesiologist working in secondary and tertiary hospitals from Lahore only and therefore the results cannot be generalized to other doctors working in intensive care units. Study on a larger scale is needed to assess the factors for high sepsis related mortality.

CONCLUSION

Although we had much low response to this study but we have identified that poor comp-

liance to surviving sepsis campaign guidelines to be a major cause of high mortality due to sepsis in our country.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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