

SYSTEMATIC REVIEW PERFORMANCE EVALUATION SYSTEM IN EMERGENCY MEDICAL SERVICES (EMS)

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ABSTRACT--To find out the indicators that influence the performance evaluation in Emergency Medical Services (EMS). Systematic Review through several stages of making inquiries, identification, eligibility, screening, and assessment / appraisal. Selection process contained in the framework systematically review and the results 5 articles and then each article was summarized and rated with JBI. Data from review and analysis of the five articles in this systematic review, the authors take three indicators that influence the performance evaluation in EMS that is the structure, process, and outcome. Based on a review and analysis from the authors, these indicators include performance index (such as knowledge, skill, medical protocol, out-of-hospital cardiac arrest survival, etc.), that may have different definitions in every institution or country. These indicators are metric that reflects on the performance of a system or process. As the indicator, value rises or falls, it suggests that the system or process is operating better or worse. The indicators that influence the performance evaluation in EMS are the structure, process, and outcomes.

Keyword--Emergency Medical Services, performance, structure, process, and outcomes

I. INTRODUCTION

Performance measurement is the process where data are regularly collected and analyzed to determine efficacy of program activities or interventions (Hatry, 2007). EMS is defined as the system that organizes all aspects of medical care provided to patients in the pre-hospital or out-of-hospital environment. Assessing EMS performance may be a simple task if it is carried out within a local health care system, but things can get complicated if the comparison is made between states or countries. Different states or countries may deliver EMS differently (Silber et al., 2014).

Measuring quality in EMS systems is challenging. Measuring quality in EMS is important since EMS is the practice of medicine in the pre-hospital setting. The goal of EMS Performance Measurement (EMSPM) is to apply knowledge, data, and experience to evaluate and improve EMS service delivery, personnel performance, and clinical care. The need for increased coordination in patient care and higher quality care at lower costs has made it essential for EMS agencies to have in-place quality control or quality improvement programs that rely on key performance indicators to continuously monitor the system's overall performance and the effectiveness of the different pre-hospital interventions (MacFarlane and Benn, 2003).

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The Institute of Medicine (IOM), in a report entitled “Emergency Medical Services at the Crossroads” and published in 2006, recommended the development of “evidence based performance indicators that can be nationally standardized so that statewide and national comparisons can be made” (Berger, 2006).

The development and implementation of these indicators would enhance accountability in EMS and provide EMS agencies with data to measure their system’s overall performance and to develop sound strategic quality improvement planning. Therefore, through this systematic review, we could find out what are the indicators that influence the performance evaluation in Emergency Medical Services (EMS).

II. METHOD

The method in this study is a systematic review. Preparation of systematic review is divided in several stages of making a research question PICO according to the rules, and then conduct a literature review using diagrams. The chart includes the identification, eligibility, screening and appraisal. In the final stage, we review the articles with systematically using tables and counting the value of JBI on each articles.

III. RESEARCH QUESTION

The research question is, "what kind of indicators that influence the performance evaluation in Emergency Medical Services (EMS)?"

IV. IDENTIFICATION OF RELEVANT JOURNAL ARTICLES AND ABSTRACTS OF TITLE

A search was undertaken using the electronic medical databases, Proquest and Science Direct. The author used the option from database to filter the article, those are: the articles published between the 2013-2018 year, the type of reference is the original articles, and the language used is English. The search strategy used the following keywords: “performance EMS system”, “performance measure”, "Emergency Medical Services", “evaluate EMS system”, and “measurement EMS system”. From these keywords the author review the articles used systematic review method. After found the articles on each keyword, author merge or combine these keywords with the conjunctions "and" and "or". In the identification phase, the total number of articles on the Proquest database are 17 articles and 12 articles on the Science Direct database.

V. ELIGIBILITY

Eligibility means the process of compliance. At a stage the fulfillment of the conditions there are two, namely adjustments based on title of the article with the abstract and the fulfillment of articles based on inclusion criteria and Exclusion. Inclusion and exclusion criteria specified writer. Inclusion criteria include: English-language articles, article <5 years, and assessment of EMS performance in both the developed and developing countries. Exclusion criteria are the type of document commentary, editorial, or systematic review and EMS systems that focus on disaster and emergency department. At this stage, the article needs to be read in its entirety or the full

text. Results of the phase adjustments based on inclusion and exclusion criteria are two articles on the database Proquest and three articles in Science Direct database.

VI. SCREENING AND APPRAISAL

Screening is the stage to see if the same article between two existing databases. From a total of articles that have been through the previous stages of the article 5, no article of the same (no duplicates), so that at the screening stage is the number of articles remaining five articles.

Appraisal stage is to assess the existing article 5. At this stage, the authors summarize the article and assess JBI (Joanna Brigg Institution) checklist on each article according to the method possessed the article. Related schemes systematic review methods described by the author in figure 1.

(Moher et al., 2009; Suryanto et al., 2017)

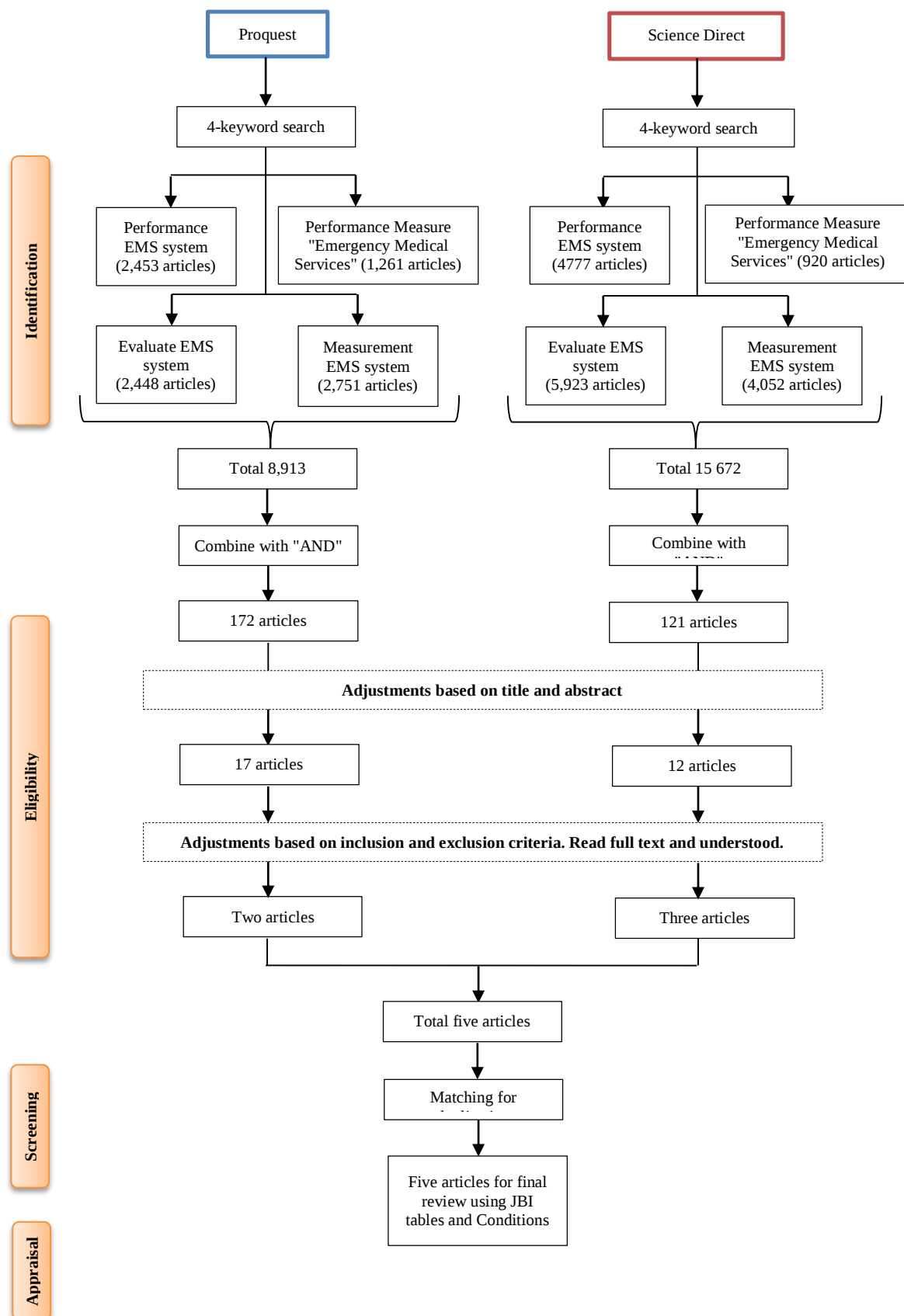


Figure1: Framework Search Systematic Review

VII. RESULTS AND DISCUSSION

Based on a review and analysis of five articles, there are three indicators that influence the performance evaluation in Emergency Medical Services (EMS), those are the structure, process, and outcome. In the first article, the study examines seven Asian cities (Seoul, Tokyo, Osaka, Taipei, Singapore, Bangkok, and Kuala Lumpur), where the study was to compare the performance of EMS based on a report by the Pan-Asian Group Resuscitation Outcome Study (PAROS). A survey form was created and sent via email to all the representatives of the EMS agencies or the medical directors of the PAROS group. Some of the data was obtained from the previous publications within the PAROS group that is adopted from cardiac arrest registry to enhance survival (CARES) study based in the USA. Twenty-four variables were assessed and compared, all of which were derived by consensus across the PAROS countries. The components were agreed upon after series of meeting and followed the Utstein template. The most common available denominators of measurement were taken into analysis and comparison. The other variables that were not available in all the participated countries would be excluded from analysis. The overall comparison of EMSPM is carried out based on the countries and cities where the EMS agencies originate. Overall, the study was able to collect performance measurement indicators EMS are 13 structural components, 9 components of the process, and 2 components of the outcome. There is no uniformity in the measurement of the performance of EMS in these Asian cities. This creates difficulties for comparison EMS performance index and the benchmark. Robust data systems and intelligent (agile), with the ability to report on clinical indicators and performance measures, is a key tool in the performance quality improvement activities EMS (Rahman et al., 2015).

Second article is discuss about the use of spatial regression method to evaluate the Emergency Medical Services (EMS) in rural South Dakota United States. This study aims to measure the scope of services and timely service, using spatial statistical methods to identify factors that significantly affect the performance of EMS. Multiple regression models were developed and compared to variable rate respond time: the linear regression model, spatial lag models, spatial error models, and models of GWR (Geographically Weighted Regression). Statistically, GWR models are performing better than the linear regression and spatial econometric models. GWR models using not only displays the description of the factors that were statistically significant affect EMS response times across the state, but also provide a good reference for local agents to find solutions to shorten the response time. GWR has the best performance in terms of statistical goodness-of-fit and selected to help understand how the factors (eg, weather, transport) have an impact on the provision of timely EMS in rural areas (He et al., 2019). Based on EMS systems performance index examples, response time is one of the characteristics of various system components which is the definition of a structural indicator (Maio et al., 2002).

On the third article, response time characteristics examined in evaluating the value distribution *Response Time Interval* (RTI) and *Scene Time Interval* (STI) of cases of OHCA (Out-Of-Hospital Cardiac Arrest) in the four metropolitan cities of Asia, as well as the interactive effects of RTI and STI on the outcome of the case OHCA survival, 16,974 OHCA cases from 4 cities in Asia (Osaka, Seoul, Singapore, Taipei). The 27375 cases of OHCA originally entered into a database PAROS four participating sites. Then population screening was performed based on inclusion & exclusion criteria, until 16.974 cases were taken for multivariable logistic regression tests to evaluate the effects of STI according to different RTI categories on survival outcomes. Based on the test results,

the median RTI was 6.0 minutes (interquartile range [IQR] 5.0–8.0 minutes) and the STI median was 12.0 minutes (IQR 8.0-16.1). Long STI in OHCA with delayed response times have a devastating effect on survival outcomes in OHCA cases in four metropolitan cities in Asia using the EMS scoop-and-run model. Therefore, setting an optimal Scene Time Interval (STI) based on response time could be a material consideration (Kim et al., 2017).

In addition to the importance of response time in EMS performance, the knowledge and skills of EMS service providers, in this case paramedics or pre-hospital nurses are also important, because knowledge base of providers is the one of index that reflects the performance and characteristics of the structure of performance indicators EMS (Maio et al., 2002). The characteristics of this knowledge are listed in the fourth article, where the article discusses the quality of CPR by EMS staff in simulated setting. The research uses descriptive analysis method which prospectively compare demographic information, theoretical knowledge and psychomotor skills EMS personnel in the provinces of South Africa (Non-experimental, observational methods were used). The sample was selected randomly by using Ms. Excel, 20 participants from each district, amounting to seven districts, obtained a sample of 114 EMS personnel with high quality. Selected participants are invited to attend the continuous professional development of refresher course on CPR. In the study found Overall CPR competence among the participants (n = 114) bad: the median of knowledge by 50%; The median skill 33%. Only 25% of the items tested showed that participants apply relevant knowledge and skills equivalent to. In this research, proven knowledge has little effect on performance skills, while certain demographic factors seem to have a greater influence on the skills. The demographic factors that significantly affect both the knowledge and skills are job sector, the guidelines EMS personnel were trained to, age, experience, and training location (Veronese et al., 2018). This fourth article showed that the theoretical knowledge has a small but important role to play in some of the components of performance skills. Demographic variables that influence the knowledge and skills can be used to improve the quality of training and CPR from EMS personnel that can produce good outcomes indicators.

According to the fifth article discussed about optimization and simulation to minimize Response Time (RT), and several experiments are conducted to determine a better location for an ambulance base. The study analyzing EMS from Belo Horizonte, Brazil, using two modeling techniques: optimization and simulation. The system has 22 ambulance bases and 27 ambulances. The optimization model is implemented by placing an ambulance base and allocating an ambulance to the base. The location of new base incorporated into the model Discrete Event Simulation (DES) to observe the dynamic behavior of the system and the accuracy in estimating the response time. The results showed that the number of ambulances and the location of the base affects the performance of EMS. The balanced number of ambulances allocated at certain bases at certain times can improve the performance of the EMS system without increasing the total number of ambulances. In addition the study also shows how to combine two techniques of operational research (optimization and simulation), to analyze the dynamic behavior of the EMS rather than using *empirical rules* and procedures (Nogueira et al., 2016).

Performance indicators are measurement tools should be specific, measurable, action-oriented, relevant and on time. Indicator as a metric that reflects the performance of the system or process. When the indicator value goes up or down, it shows that the system or process to operate better or worse just like a thermometer performance (Pittet et al., 2014). Different agencies or countries may have different definitions for performance measurement such as response times, or data that may not be easily available in certain communities (such as pre-hospital defibrillation) (Cady, 2002). This would make standardizing EMSPM in all regions very difficult, but based on the

most common indicators might be the best method for implementing inter-agency EMS Performance Measurement (EMSPM). These general indicators are the structure, process and outcomes (Maio et al., 2002).

VIII. CONCLUSION

The indicators that influence the performance evaluation in Emergency Medical Services (EMS) are the structure, process, and outcomes. Where in these indicators are performance index (such as knowledge, skill, medical protocol, out-of-hospital cardiac arrest survival, ect.) that may have different definitions in every institution or country. However, These indicators are metric that reflects on the performance of a system.

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