ORIGINAL ARTICLE

# Validation of a Service Behavior Measurement According to Emergency Medical Standards of Health Personnel: Cross-Sectional Study

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**Background:** Emergency medical services are in pre-hospital health services. This is a critical time, important to the lives of emergency patients. Using a measure to assess the service behavior according to emergency medical standards (SB-EMS) will help medical personnel perform their work according to standards, resulting in emergency patients having more chances of survival and safety.

**Objective:** To validate the measurement tool of SB-EMS for evaluating quality, accuracy, and reliability.

**Materials and Methods:** The present study was a cross-sectional study executed between January and May 2024 designed by collecting data based on 205 health personnel, which consisted of professional nurses, paramedics, and emergency medical technicians working in the Bangkok emergency medical service system through stratified random sampling. The data were collected with a 6-rating scale questionnaire. An initial sampling from 30 participants gave a Cronbach's alpha of 0.77 to 0.84 and item-total correlations of 0.55 to 0.79. Data was analyzed by confirmatory factor analysis (CFA) using LISREL version 8.72.

**Results:** CFA confirmed the construct validity of measures with empirical data. The 16-item of service behavior according to the emergency medical standards scale achieved an overall Cronbach's alpha of 0.93 and factor loading between 0.59 to 0.87. There was a chi-square value of 166.35 at 85 degrees of freedom. The probability was 0.000, comparative fit index (CFI) was 0.99, root mean square error of approximation (RMSEA) was 0.06, and standardized root mean square residual (SRMR) was 0.04.

**Conclusion:** The developed scales serve as high-quality assessment tools for human resources specialists or academicians in screening or assessing SB-EMS of health personnel.

**Keywords:** Validation of measurement; Service behavior; Emergency medical standards; Health personnel

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Emergency medical services (EMS) are part of the pre-hospital health service, which is the transport of emergency patients to a hospital. This is a very important phase because it reduces the severity and death rate of emergency patients. At present, EMSs are well integrated into health services in most areas and normally consist of ambulances staffed by nurses or paramedics, and emergency medical technicians (EMT)[1,2]. From the research study, it was found that delayed EMS service and response are associated with increased mortality among emergency patients[3,4]. Similarly, if the EMS provider provided substandard care. poor outcomes also tend to increase emergency patient mortality[5]. All of these are related to efficient service behavior and emergency medical standards of EMS service providers that cover all dimensions[6].

Measuring service quality is therefore important. In the beginning, there were only a few studies conducted among customer service employees[7-9]. Later, measurement of service quality began to become more widespread, as well as the provision of health services with studies and development of service behavior and service quality measures increased[10,11]. A study of the behavior of health care providers in hospitals found that service behaviors affected the quality of patient care[12]. It was also found that adherence to the established medical protocols and standards is essential to providing high-quality patient care, as a comprehensive

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understanding of emergency medical procedures. Along with these effective decision-making skills, EMS providers must undergo regular assessment and intervention with specialized training courses and continuing education[13]. From a review of the literature and related documents, no research studies have been found in Thailand that developed and validated service behavior measure (SBM) according to emergency medical standards of EMS providers.

Therefore, the objective of the present research was to create and develop a SBM based on emergency medical standards to evaluate the service behavior of medical personnel working in the Bangkok emergency medical service system. The present research also studied a model of service behavior according to emergency medical standards (SB-EMS) so that the measure was consistent with empirical data and of reliable quality.

## Materials and Methods

### Setting and design

The present study was a cross-sectional exploratory study conducted between January and May 2024. The population and sample group were health personnel, which consisted of professional nurses, paramedics, and EMT, working in the Bangkok emergency medical service system, Thailand, based on the 2022 annual report of Bangkok Emergency Medical Service Center (Erawan Center)[14].

### Ethical approval

The present study received ethical approval by the Human Research Ethics Committee of Srinakharinwirot University (SWUEC-672042) and based on the Declaration of Helsinki[15], Belmont Report, International Conference on Harmonization in Good Clinical Practice (ICH-GCP), and International Guidelines for Human Research, along with laws and regulations of Thailand. The researchers asked for informed consent from participants and provided detailed information about the study, including the participant selection process.

### Sampling criteria

The sample size was determined following Hair et al. (2010), which has proposed that confirmatory factor analysis (CFA) sample group should be large, with at least 200 people[16]. The research employed stratified sampling, randomly selecting 200 participants from different healthcare facilities. The sample size was increased by 10% to prevent data loss, resulting in 220 samples. Of these, 205 complete questionnaires were returned, representing 93.18%. The study's inclusion criteria were 1) work in the Bangkok emergency medical service system, 2) aged between 18 and 60 years, 3) have experience working in emergency medicine for not less than one year, 4) ability to read, write, speak, and communicate in Thai very well, and 5) willing to participate in research studies. The exclusion criteria encompassed 1) reluctance or hesitation to provide information, 2) inability to complete the measurement, and 3) withdrawal from the study.

### Data collection

The researchers collaborated with health personnel in the healthcare facilities to gather information about the population and they were supplied with thorough information regarding confidentiality methods, including the use of pseudonyms, the secure management of data, and a thorough informed consent process. These measures were designed to protect the privacy of the participants and maintain the ethical standards of the present study. It emphasized the commitment to ensuring adherence to ethical guidelines throughout the study. During questionnaire administration, participants had the right to withdraw from the research if they felt stressed or anxious. The questionnaires took approximately 20 minutes to complete per subject. The researchers checked each questionnaire for completeness before data analyses.

### Instrument and quality assessment

The present study measurement gathered data on gender, age, job positions, organization, and work experience. The 16-Item of SBM assessed four components, 1) service responsiveness (SR), 2) service potential (SP), 3) service for need (SN), and 4) reliability of service. A six-point Likert rating scale with 1 for not true at all to 6 for absolutely true, assessed questionnaire items, based on operational definitions from conceptual models. Measuring tools included SBM, adapted from Parasuraman et al., 1991[8] and Komari & Djafar, 2023[17], covering knowledge in service behavior based on emergency medical standards and Bangkok emergency medical service system context in Thailand[18], encompassed three perspectives. Seven experts reviewed the content validity of the scale, and the scale achieved an index of item objective congruence (IOC) ranging between 0.60 and 1.00. Testing with 30 participants similar to the study group yielded a Cronbach's alpha

**Table 1.** Descriptive statistics: means, standard deviations, and mean comparison of SB-EMS

| General characteristic | Frequency | Percentage | SB-EMS | | Std. difference | p-value |
|---|---|---|---|---|---|---|
| | | | Mean | SD | | |
| Age | | | | | 0.13 | 0.37 |
| 18 to 40 years | 132 | 64.39 | 5.41 | 0.49 | | |
| 41 to 60 years | 73 | 35.61 | 5.35 | 0.43 | | |
| Work experience | | | | | 0.04 | 0.67 |
| Less than 10 years | 95 | 46.30 | 5.40 | 0.51 | | |
| More than 10 years | 110 | 53.70 | 5.38 | 0.43 | | |
| Work position | | | | | 0.10 | 0.48 |
| Professional group (nurse, paramedic) | 107 | 52.20 | 5.41 | 0.50 | | |
| Support staff (EMT) | 98 | 47.80 | 5.36 | 0.43 | | |

EMT=emergency medical technicians; SB-EMS=service behavior according to emergency medical standards; SD=standard deviation
Significant at 0.05

of 0.77 to 0.84 and item-total correlations of 0.55 to 0.79[19].

### Statistical analysis

Descriptive statistics were utilized to analyze basic data of variables, such as mean and standard deviation. The data were analyzed using IBM SPSS Statistics, version 26.0 (IBM Corp., Armonk, NY, USA). CFA was employed to evaluate the alignment of the measurement model with the empirical data, assessing the degree to which observed data corresponds with the anticipated relationships among variables within a theoretical framework. The data analyses were conducted using LISREL version 8.72. Model fit was evaluated using benchmarks including a statistically significant chi-square, chi-square/df ratio less than 5, root mean square error of approximation (RMSEA) of 0.08 or lower, standardized root mean square residual (SRMR) less than 1.00, comparative fit index (CFI) greater than 0.90, goodness of fit index (GFI) greater than 0.90, and normed fit index (NFI) greater than 0.90, as outlined in reference[16,20].

## Results

### General characteristics of the sample

The data of the questionnaire collected from 205 health personnel, which consisted of professional groups of nurses and paramedics for 52.20%, and support groups (EMT) for 47.80% were complete. The majority of participants were male at 55.30%, and 64.39% were aged between 18 to 40 years while 35.61% were aged between 41 and 60 years. The majority (53.70%) had more than 10 years' experience, while 46.30% had less than 10 years. They were distributed across healthcare facilities with government hospitals for 54.40%, private hospitals for 20.40%, and rescue foundations for 25.20%.

**Table 2.** The goodness of fit indices for the confirmatory measurement model

| Indices | Recommended | Model fit indices |
|---|---|---|
| Chi-square/df | Less than 5 | 1.95 |
| GFI | More than 0.90 | 0.91 |
| CFI | More than 0.90 | 0.99 |
| NFI | More than 0.90 | 0.97 |
| RMSEA | Less than 0.08 | 0.06 |
| SRMR | Less than 1.00 | 0.04 |

GFI=goodness of fit index; CFI=comparative fit index; NFI=norm fit index; SRMR=standardized root means square residual; RMSEA=root mean square error of approximation

### Comparing the service behavior of the sample

The results of comparing SB-EMS among health personnel by using a t-test found that medical personnel with age, work experience, and work positions were different, as shown in Table 1.

### Quality assessment of the scale

The 16-item SBM assessed four components, 1) SR, 2) SP, 3) SN, and 4) reliability of service. The scale items showed discriminating power ranging from 0.55 to 0.79, and the reliability of the entire questionnaire was 0.93. The results of the construct validity analyses using CFA found that the constructed measurement model was in harmony with the empirical data (chi-square=166.35, df=85, p=0.00; chi-square/df=1.95; RMSEA=0.06; SRMR=0.04; GFI=0.91; CFI=0.99; NFI=0.97) (Table 2).

The result indicates that the measure had construct validity. When considering the standard

**Table 3.** Quality assessment of SB-EMS scale

| Items of SB-EMS | Item-total correlation | Factor loading |
|---|---|---|
| Component 1: service responsiveness (Cronbach's alpha=0.83) | | |
| 1. I am ready to provide full service to those with emergency illnesses. | 0.65 | 0.81 |
| 2. I am ready to help people with emergencies as soon as they see an incident or receive notification from the command center without hesitation. | 0.66 | 0.81 |
| 3. I check the equipment, tools, drugs, and medical supplies in the ambulance to be ready for use before going to work. | 0.67 | 0.73 |
| Component 2: service potential (Cronbach's alpha=0.84) | | |
| 4. I treat patients to the best of my knowledge and ability. | 0.65 | 0.67 |
| 5. I treat emergency patients and their relatives with kindness and humility, even if they are not accepted by their relatives. | 0.70 | 0.73 |
| 6. I always dress in my department's uniform while on duty. | 0.64 | 0.70 |
| 7. I avoid arguments when in stressful situations or while providing service. | 0.62 | 0.64 |
| 8. I advise on treatment procedures for emergency patient relatives to understand. | 0.79 | 0.83 |
| Component 3: service for need (Cronbach's alpha=0.77) | | |
| 9. I always care for those with emergencies who receive emergency services in a patient-centered manner. | 0.65 | 0.71 |
| 10. I transport emergency patients to the nearest hospital, meeting the needs of the patient and their relatives. | 0.64 | 0.68 |
| 11. I provide equal assistance to all emergency patients. | 0.75 | 0.81 |
| Component 4: reliability of service (Cronbach's alpha=0.84) | | |
| 12. When I see a mistake in helping someone with an emergency I will go in and help fix the mistake. | 0.79 | 0.87 |
| 13. I give advice or transfer work to others to be able to perform emergency tasks correctly according to standards. | 0.73 | 0.80 |
| 14. While providing service, I was able to transport emergency patients within the specified period. | 0.55 | 0.59 |
| 15. If I'm not sure about treating emergency patients I will coordinate with the command center to consult with the medical director. | 0.67 | 0.74 |
| 16. I filled out all emergency patient information without any errors. | 0.55 | 0.61 |

SB-EMS=service behavior according to emergency medical standards
Cronbach's alpha of total SBM=0.93

component coefficients, or factor loading, it was found that every question passed the standard criteria. The value was between 0.59 to 0.87, within Goodboy & Kline's acceptable level[21] as shown in Table 3.

## Discussion

From the results of data analyses comparing SB-EMS, it was found that health personnel with different characteristics of age, work experience, and work positions have no different SB-EMS because the emergency medicine service directly affects human life. Health personnel working in the Bangkok emergency medical service system are aware of the importance of service behavior following a standard that will ensure emergency patients' survival. This is consistent with a synthesis of studies that demonstrate the importance of emergency medical systems to patients' lives[22,23].

SBM according to emergency medical standards was developed by combining the concepts of Parasuraman et al.[8] and Komari & Djafar[17]. The researchers applied the four components of SB-EMS, which were adjusted to be compatible with the Bangkok emergency medical service system. This resulted in a reliable 16-item SBM with a high overall reliability of 0.93. This is similar to the health service quality scale of Komari & Djafar[17], which comprised 25 items based on the SERVQUAL scale of Parasuraman et al.[8] with reliability between 0.60 and 0.85 and divided into five indicators as tangible, reliability, responsiveness, assurance, and empathy, for assessing health service quality among health care workers in Malaysia. There was a difference from the measurement of Nilsson et al.[24], from the longer 43 items Ambulance Nurse Competence scale (ANC) with Cronbach's alpha of 0.71 and factor loadings ranged from 0.37 to 0.82, which measured competence of ambulance nurses and ambulance nurse students in Sweden. The service behavior exhibited by healthcare personnel has far-reaching effects on work efficiency. Positive service behavior, characterized by empathy, effective communication, and patient-centered care, correlates with higher levels of patient satisfaction, improved adherence to treatment plans, and better clinical outcomes[25-27]. Furthermore, healthcare teams characterized by strong interpersonal relationships and a culture of collaboration tend to exhibit higher levels of work

efficiency, as they can effectively coordinate care and share knowledge and resources. Conversely, negative service behavior, such as rudeness, indifference, or poor communication, can undermine work efficiency, lead to patient dissatisfaction, and contribute to medical errors and adverse events[28]. Therefore, the present study developed and validated the measurement of service behavior based on quality emergency medical standards, which are reliable and can be practically used.

## Limitation

While the researchers studied and developed the SBM measure using a sample group and context of the emergency medical personnel in the emergency medical service system of Bangkok, it was limited within the network of hospitals. Furthermore, the researchers studied and developed the measure for emergency medical service providers specifically for Bangkok. Therefore, when using this SBM measure, it should be tested to ensure the quality within a sample group and the context should be examined to confirm its validity and appropriateness for other locations.

## Conclusion

The focus of the present research study was to create and develop a measure for emergency medical service behavior. From a review of the literature and a synthesis of theoretical concepts, it was found that emergency medical service behavior consists of four different components. The CFA analysis confirmed that the measurement model was in good agreement with the empirical data.

In the future, research should be done on emergency medical professionals in different contexts and in all regions of Thailand, for the relevant measures and address all topics in line with the background of each field studied, including the application of mixed research techniques, such as focus groups, interviews, and qualitative research, to get more detailed data in conjunction with a sample group to create questionnaire in line with real-world operating circumstances by using the data. It will contribute to the measurement's increased accuracy.

## What is already known on this topic?

Delayed EMS service and response are associated with increased mortality among emergency patients. Similarly, if the EMS provider provided substandard care. poor outcomes also tend to increase emergency patient mortality. All of these are related to efficient service behavior and emergency medical standards of EMS service providers that cover all dimensions[6].

## What does this study add?

The researchers developed the SBM measure for the emergency medical personnel in the emergency medical service system of Bangkok. There were no differences in SB-EMS among health personnel with age, work experience, and work positions. Therefore, SBM according to emergency medical standards could screen or assess service behavior of all EMS provider groups.

## Conflicts of interest

The authors declare no conflict of interest.

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