

# Survey on Satisfaction with Behavioral Intention Toward Emergency Point-of-Care Ultrasound and Medical Quality

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**Abstract** - This study aims to develop and conduct a survey using an emergency department (ED) patient satisfaction scale to measure patient satisfaction with ER services. Patient satisfaction scales for emergency care have been implemented in different healthcare systems worldwide. However, no scale has been specifically designed to evaluate patient satisfaction with ED medical quality in conjunction with point-of-care ultrasound (PoCUS) services. The study population consisted of 202 patients who visited a single ER between July and December 2024. The rating scale was provided to patients who visited the ED and consented to participate, and they were asked to respond accordingly. During the scale validation process, exploratory and confirmatory factor analyses were conducted to assess structural and criterion validity. The highest Spearman's rank correlation coefficient ( $\rho$ ) was observed between the service quality score and the PoCUS services behavioral intention score ( $P < 0.001$ ).

Notably, the dimensions of "Responsiveness" and "Assurance" demonstrated a strong correlation, with  $R$  values of 0.517 and 0.511, respectively. The results indicate that respondents perceive medical staff with PoCUS services as professional, knowledgeable, and courteous, offering timely assistance, effectively meeting patients' needs, and ensuring a safe and secure medical experience. A review of ED visits and the number of completed ultrasound examinations from January 2021 to December 2023 revealed a steady increase in both. This scale may help develop assessment and intervention measures to enhance patient satisfaction with ED service quality.

**Keywords** - Point-of-care ultrasound, patient satisfaction scale, guideline.

## 1. Introduction

Patient feedback on healthcare services is one of the most effective and insightful methods for evaluating and understanding the overall quality of care provided. It offers valuable perspectives on the efficiency, accessibility, and effectiveness of medical treatments, as well as the responsiveness and professionalism of healthcare providers. By analyzing patient experiences, healthcare institutions can identify strengths, address weaknesses, and implement targeted improvements to enhance service quality and patient satisfaction [1], [2]. Patient satisfaction serves as a crucial benchmark for assessing the quality of healthcare services and driving continuous improvement in patient care. It is widely recognized as a reliable, measurable, and insightful indicator that reflects the effectiveness, efficiency, and responsiveness of medical services [3], [4].

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Emergency nurse practitioners and physicians shoulder a wide range of demanding responsibilities, often working in high-pressure environments while managing diverse patient populations. They must provide care for stressed and anxious patients, support their concerned family members, and assist vulnerable groups such as the homeless and individuals with mental illness, as well as victims of trauma or violence. Additionally, emergency nurse practitioners take on multiple critical roles, including triage assessment, delivering urgent medical care, and swiftly identifying patients in critical condition to ensure timely and effective treatment [5], [6].

One of the most widely utilized tools for measuring patient satisfaction with nursing care in the emergency department (ED) is the Consumer Emergency Care Satisfaction Scale (CECSS), which has been validated and proven reliable in previous studies [7], [8], [9], [10], [11]. This study conducted an in-depth evaluation of patient satisfaction among adults who sought care in the ED using the CECSS framework. Additionally, the assessment was extended to include the ultrasound services behavioral intention score for a more targeted evaluation. This evaluation focused on multiple key dimensions, including the service quality score, which reflects overall perceptions of care, the behavioral intention score, which gauges patients' likelihood of future engagement with ED services, and the point-of-care ultrasound (PoCUS) services behavioral intention score, which specifically measures patient attitudes and willingness to utilize ultrasound services within the ED setting. Importantly, this study emphasizes the role of patient satisfaction in emergency care and outlines the study objectives, with a particular focus on behavioral intention toward PoCUS services.

## 2. Methodology

The study design, participant recruitment, data collection procedures, and statistical methods used to evaluate the reliability and validity of the Emergency Satisfaction Questionnaire are described. The methodology provides a systematic approach to assessing patient satisfaction and behavioral intention toward PoCUS services in the emergency department.

### 2.1. Data Collection

Details of the study design, participant recruitment, data collection period, and ethical approval are provided. All data collected between July 1, 2024 and December 31, 2024. This study was designed as a cross-sectional survey utilizing a digitized structured questionnaire. Participants were recruited based on the following inclusion criteria: individuals aged 18 to 60 years.

Exclusion criteria included: (1) Individuals with impaired consciousness. (2) Individuals with hearing disabilities. (3) Individuals with severe mental disorders. (4) Individuals unable to operate 3C (computer, communication, and consumer electronics) devices. This study was reviewed and approved by the Institutional Review Board of Show Chwan Memorial Hospital, Taiwan (Document No.: 1130502) [12].

### 2.2. Statistical Analysis

Construct validity and internal consistency of the Emergency Satisfaction Questionnaire were assessed using exploratory factor analysis (EFA) and reliability testing. EFA was performed on 35 evaluative items to identify underlying dimensions. Sampling adequacy was confirmed using the Kaiser–Meyer–Olkin (KMO) test, and item correlations were assessed with Bartlett's test of sphericity. Factors were extracted using principal component analysis with varimax rotation, and factors with eigenvalues  $> 1.0$  were retained. Internal consistency was evaluated using Cronbach's alpha coefficients for the overall scale and each dimension. A Cronbach's alpha value  $\geq 0.70$  was considered acceptable. The statistical methods applied for data analysis and the criteria for statistical significance are described. Spearman's rank correlation coefficient ( $\rho$ ) was used to assess the relationships among the extracted questionnaire dimensions, as the data were ordinal and not assumed to be normally distributed. Correlation coefficients were calculated between all dimensions and between service quality and behavioral intention variables. The SPSS software (Version 18.0 SPSS Inc., Chicago, IL, USA) was used to conduct all data. Differences with P values of  $< 0.05$  (\*),  $< 0.01$  (\*\*), and  $< 0.001$  (\*\*\*) were considered statistically significant.

## 3. Results

The following results present the findings of the study, including participant characteristics, the validity and reliability of the Emergency Satisfaction Questionnaire, correlations among questionnaire dimensions, subgroup analyses, and trends in emergency department visits and PoCUS examinations over the past three years.

### 3.1. Characteristics of Study Subjects

An overview of the demographic and clinical characteristics of the study participants is provided. Table 1 summarizes the demographic characteristics of the study participants and their reasons for choosing the hospital. A total of 202 participants were recruited for the validation survey and completed the interview with a response rate of 100%.

The highest age range of the 202 participants was 41-50 years old (58%) (Table 1). The occupation with the largest proportion is manufacturing up to 64 (31.7%) (Table 1). The education level with the largest proportion is high school 76 (37.6%) (Table 1).

The identity that accounts for the largest proportion is return patients 145 (71.8%), which 78 (53.8%) had undergone ultrasound examination (Table 1). Most people choose to come to the hospital for medical treatment because of close to home 115 (56.9%), followed by treatment has been effective in the past 88 (43.6%) (Table 1).

Table 1. Distribution of basic information of respondents and reasons for choosing hospitals

|                          | Frequency (N) | Percentage (%) |                                                                    | Frequency (N) | Percentage (%) |
|--------------------------|---------------|----------------|--------------------------------------------------------------------|---------------|----------------|
| <b>Sex</b>               |               |                | <b>Transportation options to the Hospital</b>                      |               |                |
| Male                     | 121           | 59.9           | Driving/cycling on your own                                        | 68            | 33.7           |
| Female                   | 81            | 40.1           | Transported by relatives and friends                               | 117           | 57.9           |
| <b>Age range (years)</b> |               |                | Ambulance                                                          | 14            | 6.9            |
| ≤20                      | 2             | 1.0            | Public transport                                                   | 2             | 1.0            |
| 21-30                    | 34            | 16.8           | Walk                                                               | 1             | 0.5            |
| 31-40                    | 57            | 28.2           | <b>Medical unit</b>                                                |               |                |
| 41-50                    | 58            | 28.7           | Emergency                                                          | 202           | 100.0          |
| 51-60                    | 51            | 25.2           | <b>Have you had an ultrasound done this time?</b>                  |               |                |
| <b>Occupation</b>        |               |                | No                                                                 | 1             | 0.5            |
| Housekeeping             | 23            | 11.4           | Yes                                                                | 201           | 99.5           |
| Student                  | 4             | 2.0            | <b>Number of visits within three months</b>                        |               |                |
| Civil servant            | 2             | 1.0            | <3                                                                 | 100           | 69.0           |
| Service industry         | 56            | 27.7           | 3-7                                                                | 32            | 22.1           |
| Manufacturing            | 64            | 31.7           | 8-12                                                               | 5             | 3.4            |
| Agriculture              | 18            | 8.9            | >12                                                                | 8             | 5.5            |
| Construction industry    | 15            | 7.4            | <b>Did you have an ultrasound done last time?</b>                  |               |                |
| Financial industry       | 13            | 6.4            | No                                                                 | 67            | 46.2           |
| Other                    | 7             | 3.5            | Yes                                                                | 78            | 53.8           |
| <b>Educational level</b> |               |                | <b>The reason why you chose to come to this hospital this time</b> |               |                |
| Elementary school        | 13            | 6.4            | Close to home                                                      | 115           | 56.9           |
| Junior high school       | 39            | 19.3           | Convenient transportation                                          | 79            | 39.1           |
| High school              | 76            | 37.6           | Short waiting time                                                 | 10            | 5.0            |
| University               | 70            | 34.7           | Extra services                                                     | 18            | 8.9            |
| Institute                | 4             | 2.0            | Recommendation                                                     | 21            | 10.4           |
| <b>Residential area</b>  |               |                | Reputation                                                         | 10            | 5.0            |
| Changhua                 | 188           | 93.1           | Familiar with the environment                                      | 61            | 30.2           |
| Taichung                 | 7             | 3.5            | Treatment has been effective in the past                           | 88            | 43.6           |
| Nantou                   | 1             | 0.5            | Good service attitude                                              | 25            | 12.4           |
| Yunlin                   | 1             | 0.5            | Hygienic and comfortable environment                               | 23            | 11.4           |
| Other                    | 5             | 2.5            | Patients are friendly and helpful to each other                    | 1             | 0.5            |
| <b>Identity</b>          |               |                | Complete equipment                                                 | 72            | 35.6           |
| First patients           | 56            | 27.7           | Referral                                                           | 1             | 0.5            |
| Return patients          | 145           | 71.8           | Staff                                                              | 1             | 0.5            |
| Companions               | 1             | 0.5            | Have traveled through                                              | 1             | 0.5            |
|                          |               |                | Other                                                              | 4             | 2.0            |

### 3.2. Validity and Reliability

An assessment of the questionnaire's construct validity and internal consistency is presented. Tables 2 and 3 present the results of the hospital service quality and behavioral intention assessments, including general behavioral intention and word-of-mouth measures across multiple dimensions.

The extracted dimensions were named "service quality" (26 items), "behavioral intention" (7 items), and "ultrasound services behavioral intention" (2 items), representing the content and internal structure of the Emergency Satisfaction Questionnaire (Table 2 and Table 3).

The included questions in the three extracted dimensions with service quality, behavioral intention, and ultrasound services behavioral intention were shown in Table 2 and Table 3. Thirty-five items in the questionnaire were evaluative and included in the exploratory factor analysis.

These dimensions demonstrate the questionnaire's comprehensive coverage of key aspects of emergency department satisfaction and provide a basis for assessing the reliability of the instrument.

Table 2. Distribution of hospital service quality assessment results

| <b>Hospital service quality</b>                                                                                | Mean | SD   | Median | Min. | Max. |
|----------------------------------------------------------------------------------------------------------------|------|------|--------|------|------|
| <b>Tangibility</b>                                                                                             |      |      |        |      |      |
| Medical device meets expectations.                                                                             | 6.29 | 0.70 | 6.0    | 3    | 7    |
| Satisfied with accessible space.                                                                               | 6.20 | 0.83 | 6.0    | 2    | 7    |
| Satisfied with clean and comfortable environment.                                                              | 6.33 | 0.66 | 6.0    | 3    | 7    |
| The medical staff gave me a professional feeling.                                                              | 6.35 | 0.61 | 6.0    | 4    | 7    |
| Mean                                                                                                           | 6.29 | 0.60 | 6.0    | 4    | 7    |
| <b>Reliability</b>                                                                                             |      |      |        |      |      |
| The doctor explains the condition and diagnosis and treatment methods in detail.                               | 6.60 | 0.50 | 7.0    | 5    | 7    |
| Medical staff provide skilled and professional services.                                                       | 6.58 | 0.52 | 7.0    | 5    | 7    |
| Medical staff can provide perfect medical services.                                                            | 6.58 | 0.52 | 7.0    | 5    | 7    |
| The doctor accurately determines the patient's discomfort and treats it.                                       | 6.60 | 0.50 | 7.0    | 5    | 7    |
| Mean                                                                                                           | 6.59 | 0.51 | 7.0    | 5    | 7    |
| <b>Responsiveness</b>                                                                                          |      |      |        |      |      |
| The medical staff were very happy to help me.                                                                  | 6.57 | 0.60 | 7.0    | 3    | 7    |
| Medical staff quickly deal with patients' problems.                                                            | 6.57 | 0.61 | 7.0    | 2    | 7    |
| Medical staff can meet my needs.                                                                               | 6.83 | 0.44 | 7.0    | 4    | 7    |
| Medical staff provide timely and appropriate medical consultation.                                             | 6.52 | 0.57 | 7.0    | 5    | 7    |
| Mean                                                                                                           | 6.62 | 0.44 | 6.8    | 4.25 | 7    |
| <b>Assurance</b>                                                                                               |      |      |        |      |      |
| The professionalism of medical staff makes me feel confident.                                                  | 6.56 | 0.54 | 7.0    | 5    | 7    |
| Medical staff have good service attitude and courtesy.                                                         | 6.57 | 0.64 | 7.0    | 3    | 7    |
| Medical staff have the professional knowledge to answer patients' questions.                                   | 6.56 | 0.55 | 7.0    | 4    | 7    |
| Hospitals can make patients feel safe about visiting hospitals.                                                | 6.55 | 0.53 | 7.0    | 5    | 7    |
| Mean                                                                                                           | 6.56 | 0.53 | 7.0    | 4.25 | 7    |
| <b>Empathy</b>                                                                                                 |      |      |        |      |      |
| Physician listens to patient's concerns about disease and treatment options.                                   | 6.54 | 0.53 | 7.0    | 5    | 7    |
| Before treatment, the doctor has discussed and confirmed the treatment plan with the patient.                  | 6.53 | 0.54 | 7.0    | 5    | 7    |
| The doctor asked the patient for his opinion on subsequent treatment.                                          | 6.52 | 0.54 | 7.0    | 5    | 7    |
| During medical treatment, medical staff accompany the patient in a timely manner to make him or her feel warm. | 6.48 | 0.61 | 7.0    | 4    | 7    |
| Mean                                                                                                           | 6.52 | 0.52 | 6.8    | 5    | 7    |
| <b>Social influence</b>                                                                                        |      |      |        |      |      |
| Feedback from friends and family gave me a sense of trust in the hospital.                                     | 6.39 | 0.75 | 7.0    | 3    | 7    |
| The actions of my friends and family make me feel good and have good experiences.                              | 6.39 | 0.70 | 6.0    | 4    | 7    |
| The attitude of my relatives and friends gave me a good overall impression of the hospital.                    | 6.45 | 0.61 | 6.0    | 3    | 7    |
| Mean                                                                                                           | 6.41 | 0.62 | 6.3    | 4.33 | 7    |
| <b>Patient safety</b>                                                                                          |      |      |        |      |      |
| Medical staff provide clear instructions to patients on how to use medications.                                | 6.59 | 0.56 | 7.0    | 3    | 7    |
| The label on the medicine bag clearly indicates the use and dosage of the medicine.                            | 6.61 | 0.56 | 7.0    | 3    | 7    |
| Medical staff in the clinic are aware of surrounding conditions and are ready to respond to emergencies.       | 6.55 | 0.53 | 7.0    | 5    | 7    |
| Mean                                                                                                           | 6.58 | 0.51 | 7.0    | 4.33 | 7    |
| Overall average service quality                                                                                | 6.51 | 0.43 | 6.6    | 5.35 | 7    |

Table 3. Distribution of behavioral intention assessment outcomes

|                                                                                                                    | Mean | SD   | Median | Min. | Max. |
|--------------------------------------------------------------------------------------------------------------------|------|------|--------|------|------|
| <b>Behavioral intention</b>                                                                                        |      |      |        |      |      |
| Choose this hospital again for medical treatment.                                                                  | 6.54 | 0.62 | 7.0    | 3    | 7    |
| Continue to use the tracking and care services provided by this hospital.                                          | 6.50 | 0.67 | 7.0    | 3    | 7    |
| This hospital is the first choice among all hospitals in the area.                                                 | 6.28 | 0.77 | 6.0    | 3    | 7    |
| Mean                                                                                                               | 6.44 | 0.63 | 6.7    | 3    | 7    |
| <b>Word-of-mouth</b>                                                                                               |      |      |        |      |      |
| I will recommend this hospital to my friends and family when they need it.                                         | 6.15 | 1.03 | 6.0    | 1    | 7    |
| I am willing to share my medical experience in this hospital on social media.                                      | 5.27 | 1.74 | 6.0    | 1    | 7    |
| I will like and comment on this hospital's posts on online platforms.                                              | 5.50 | 1.55 | 6.0    | 1    | 7    |
| I will share information about this hospital on the online platform.                                               | 5.27 | 1.74 | 6.0    | 1    | 7    |
| Mean                                                                                                               | 5.55 | 1.32 | 6.0    | 1    | 7    |
| Overall average behavioral intention                                                                               | 5.93 | 0.88 | 6.0    | 3.14 | 7    |
| <b>Emergency PoCUS services behavioral intention</b>                                                               |      |      |        |      |      |
| Since the hospital provides PoCUS examinations, I will choose this hospital again when necessary.                  | 6.61 | 0.60 | 7.0    | 4    | 7    |
| Introduce other patients to seek medical treatment because the hospital provides PoCUS testing and other services. | 6.37 | 0.99 | 7.0    | 1    | 7    |

Table 4 provides the reliability analysis results for service quality, behavioral intention, and Emergency PoCUS services behavioral intention dimensions. The Cronbach's alpha coefficient ( $\alpha$ ) of the overall scale was 0.942 and that of the three dimensions ranged from 0.577 to 0.992 (Table 4).

The value of the Kaiser–Meyer–Olkin (KMO) test was 0.901, which indicated some underlying common factors in the matrix. Bartlett's test of sphericity ( $P < 0.001$ , Table 4) showed that the matrix was significantly correlated.

Table 4. Reliability analysis results of Service quality, behavioral intention, and PoCUS services behavioral intention

|                                               | Number of items | Cronbach's Alpha |
|-----------------------------------------------|-----------------|------------------|
| <b>Service quality</b>                        |                 |                  |
| Tangibility                                   | 4               | 0.879            |
| Reliability                                   | 4               | 0.992            |
| Responsiveness                                | 4               | 0.786            |
| Assurance                                     | 4               | 0.952            |
| Empathy                                       | 4               | 0.947            |
| Social influence                              | 3               | 0.870            |
| Patient safety                                | 3               | 0.915            |
| Total service quality                         | 26              | 0.964            |
| <b>Behavioral intention</b>                   |                 |                  |
| Intention to seek medical treatment again     | 3               | 0.894            |
| Word-of-mouth                                 | 4               | 0.881            |
| Total behavioral intention                    | 7               | 0.827            |
| <b>PoCUS services behavioral intention</b>    |                 |                  |
| Emergency PoCUS services behavioral intention | 2               | 0.577            |

### 3.3. Correlation

An analysis of the relationships among the extracted questionnaire dimensions is presented. Table 5 presents Spearman's rank correlation coefficients among the questionnaire dimensions, assessing relationships between service quality and behavioral intention measures.

Spearman's rank correlation coefficient ( $\rho$ ) for that of the seven extracted dimensions ranged from 0.308 to 0.760 with statistical significance ( $P < 0.001$ ) (Table 5) and the overall scale was 0.529 and 0.531 in behavioral intention and emergency PoCUS services behavioral intention with statistical significance ( $P < 0.001$ ) (Table 5). ( $P < 0.001$ ) (Figure 1A and Figure 1B), and Spearman's rank correlation coefficient ( $\rho$ ) were 0.529 and 0.531, respectively (all  $P < 0.001$ ) (Table 5).

Table 5. Spearman's correlation coefficient between the average values of hospital service quality and behavioral intention items

|                                           | Reliability | Responsiveness | Assurance | Empathy | Social influence | Patient safety | Intention to seek medical treatment again | Word-of-mouth | Emergency PoCUS services behavioral intention |
|-------------------------------------------|-------------|----------------|-----------|---------|------------------|----------------|-------------------------------------------|---------------|-----------------------------------------------|
| Tangibility                               | 0.545       | 0.554          | 0.565     | 0.542   | 0.551            | 0.557          | 0.519                                     | 0.351         | 0.395                                         |
| Reliability                               |             | 0.646          | 0.677     | 0.601   | 0.435            | 0.597          | 0.481                                     | 0.308         | 0.350                                         |
| Responsive ness                           |             |                | 0.750     | 0.651   | 0.609            | 0.679          | 0.586                                     | 0.320         | 0.517                                         |
| Assurance                                 |             |                |           | 0.740   | 0.629            | 0.760          | 0.565                                     | 0.328         | 0.511                                         |
| Empathy                                   |             |                |           |         | 0.649            | 0.723          | 0.541                                     | 0.378         | 0.475                                         |
| Social influence                          |             |                |           |         |                  | 0.608          | 0.595                                     | 0.378         | 0.489                                         |
| Patient safety                            |             |                |           |         |                  |                | 0.546                                     | 0.334         | 0.397                                         |
| Intention to seek medical treatment again |             |                |           |         |                  |                |                                           | 0.400         | 0.666                                         |
| Word-of-mouth                             |             |                |           |         |                  |                |                                           |               | 0.390                                         |
| All                                       |             |                |           |         |                  |                |                                           |               |                                               |
| P<0.001                                   |             |                |           |         |                  |                |                                           |               |                                               |

Figure 1 illustrates the Spearman correlation analysis among service quality, behavioral intention, and Emergency PoCUS services behavioral intention scores.

Behavioral intention and the behavioral intention toward emergency PoCUS services showed a positive correlation with service quality.

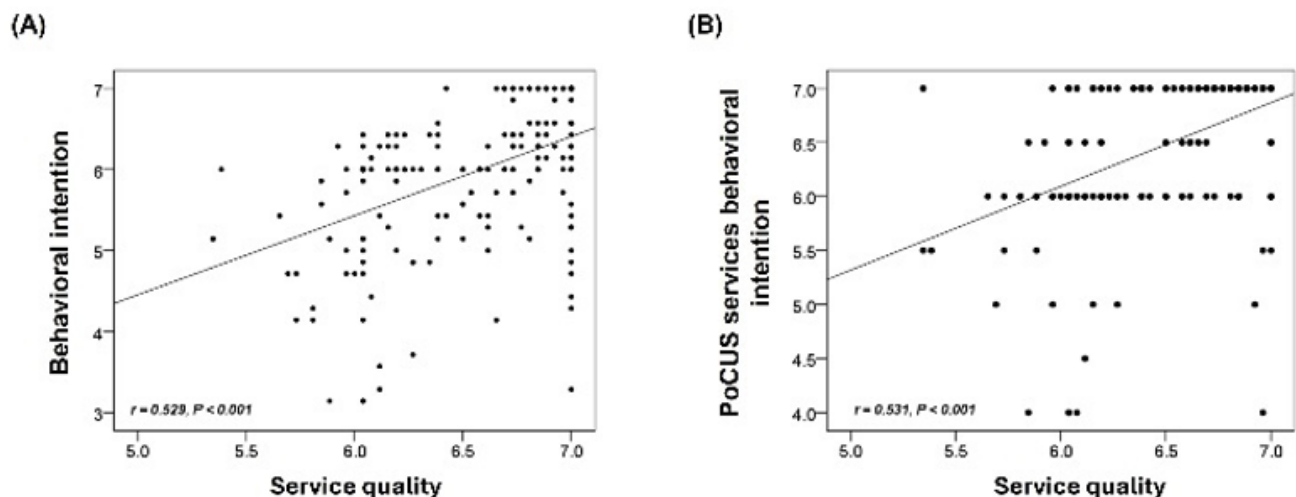


Figure 1. Spearman correlation analysis was conducted to examine the relationships among the service quality score, behavioral intention score, and PoCUS services behavioral intention score

### 3.4. Stratified Analysis

An evaluation of subgroup differences according to demographic characteristics and prior PoCUS experience is presented. Table 6 shows the differences in hospital service quality and behavioral intention scores by gender, analyzed using the Mann–Whitney U test. In the emergency department satisfaction survey, Female reported higher levels of satisfaction with behavioral intention compared to men ( $P=0.011$ , Table 6).

This suggests that female generally exhibit a greater inclination toward engaging in behaviors related to emergency department services, reflecting a more positive perception and experience. In addition, female patients showed significantly higher satisfaction with behavioral intention compared to male patients (Table 6).

Table 6. The difference in overall averages of hospital service quality and behavioral intention by gender using the Mann-Whitney U test

|                                                               | Male (N=121) |      | Female (N=81) |      | P            |
|---------------------------------------------------------------|--------------|------|---------------|------|--------------|
|                                                               | Mean         | SD   | Mean          | SD   |              |
| <b>Hospital service quality</b>                               |              |      |               |      |              |
| Tangibility                                                   | 6.24         | 0.61 | 6.37          | 0.58 | 0.128        |
| Reliability                                                   | 6.59         | 0.50 | 6.59          | 0.53 | 0.834        |
| Responsiveness                                                | 6.60         | 0.41 | 6.66          | 0.48 | 0.237        |
| Assurance                                                     | 6.53         | 0.54 | 6.61          | 0.52 | 0.381        |
| Empathy                                                       | 6.49         | 0.50 | 6.56          | 0.53 | 0.351        |
| Social influence                                              | 6.36         | 0.62 | 6.47          | 0.60 | 0.186        |
| Patient safety                                                | 6.54         | 0.52 | 6.65          | 0.49 | 0.115        |
| Overall average service quality                               | 6.48         | 0.43 | 6.56          | 0.43 | 0.142        |
| <b>Behavioral intention</b>                                   |              |      |               |      |              |
| Intention to seek medical treatment again                     | 6.36         | 0.68 | 6.55          | 0.54 | 0.062        |
| Word-of-mouth                                                 | 5.36         | 1.46 | 5.84          | 1.02 | <b>0.029</b> |
| Overall average intention to seek medical treatment again     | 5.79         | 0.96 | 6.14          | 0.69 | <b>0.011</b> |
| <b>Emergency PoCUS services behavioral intention</b>          |              |      |               |      |              |
| Overall average emergency PoCUS services behavioral intention | 6.44         | 0.69 | 6.56          | 0.68 | 0.093        |

Table 7 compares service quality and behavioral intention scores between first-time and returning patients. First-time patients exhibited significantly higher satisfaction with the word-of-mouth aspect of behavioral intention compared to returning patients (Table 7).

Conversely, returning patients showed significantly higher satisfaction with the intention to seek medical treatment again compared to first-time patients (Table 7).

Table 7. The difference in overall average hospital service quality and behavioral intention between first and return patients, analyzed using the Mann-Whitney U test

|                                                           | First patients (N=56) |      | Return patients (N=145) |      |          |
|-----------------------------------------------------------|-----------------------|------|-------------------------|------|----------|
|                                                           | Mean                  | SD   | Mean                    | SD   | <i>P</i> |
| <b>Hospital service quality</b>                           |                       |      |                         |      |          |
| Tangibility                                               | 6.26                  | 0.60 | 6.30                    | 0.60 | 0.592    |
| Reliability                                               | 6.58                  | 0.49 | 6.59                    | 0.51 | 0.709    |
| Responsiveness                                            | 6.62                  | 0.39 | 6.63                    | 0.46 | 0.722    |
| Assurance                                                 | 6.49                  | 0.59 | 6.59                    | 0.50 | 0.282    |
| Empathy                                                   | 6.45                  | 0.57 | 6.54                    | 0.50 | 0.335    |
| Social influence                                          | 6.32                  | 0.66 | 6.44                    | 0.60 | 0.258    |
| Patient safety                                            | 6.46                  | 0.57 | 6.63                    | 0.48 | 0.054    |
| Overall average service quality                           | 6.46                  | 0.47 | 6.53                    | 0.41 | 0.365    |
| <b>Behavioral intention</b>                               |                       |      |                         |      |          |
| Intention to seek medical treatment again                 | 6.21                  | 0.76 | 6.52                    | 0.55 | 0.008    |
| Word-of-mouth                                             | 5.92                  | 0.94 | 5.40                    | 1.42 | 0.030    |
| Overall average intention to seek medical treatment again | 6.04                  | 0.73 | 5.88                    | 0.92 | 0.434    |
| <b>Emergency PoCUS services behavioral intention</b>      | 6.36                  | 0.72 | 6.54                    | 0.67 | 0.053    |

Therefore, a further comparison was conducted to determine whether there are differences in emergency department (ED) satisfaction based on individuals' prior experience with PoCUS examinations (Table 8). The results indicate that individuals who had no previous experience with PoCUS examinations reported higher levels of satisfaction with medical quality assurance after undergoing a PoCUS examination.

However, individuals with prior experience undergoing PoCUS examinations reported higher satisfaction with behavioral intention after receiving a PoCUS examination compared to those without prior PoCUS experience (Table 8). This finding suggests that initial exposure to PoCUS services may lead to greater appreciation and perceived value of the medical care provided. The level of satisfaction with behavioral intention toward emergency PoCUS services does not appear to differ based on individuals' prior experience with PoCUS examinations (Table 8).

Table 8. The difference in overall averages of hospital service quality and behavioral intention based on whether a previous PoCUS was done, analyzed using the Mann-Whitney U test

|                                                               | No (N=67) |      | Yes (N=78) |      |              |
|---------------------------------------------------------------|-----------|------|------------|------|--------------|
|                                                               | Mean      | SD   | Mean       | SD   | <i>P</i>     |
| <b>Hospital service quality</b>                               |           |      |            |      |              |
| Tangibility                                                   | 6.35      | 0.59 | 6.26       | 0.62 | 0.545        |
| Reliability                                                   | 6.65      | 0.49 | 6.54       | 0.54 | 0.262        |
| Responsiveness                                                | 6.64      | 0.54 | 6.62       | 0.38 | 0.310        |
| Assurance                                                     | 6.69      | 0.47 | 6.51       | 0.52 | <b>0.047</b> |
| Empathy                                                       | 6.57      | 0.48 | 6.52       | 0.51 | 0.595        |
| Social influence                                              | 6.43      | 0.64 | 6.44       | 0.56 | 0.890        |
| Patient safety                                                | 6.72      | 0.42 | 6.56       | 0.51 | 0.079        |
| Overall average service quality                               | 6.58      | 0.39 | 6.49       | 0.43 | 0.307        |
| <b>Behavioral intention</b>                                   |           |      |            |      |              |
| Intention to seek medical treatment again                     | 6.55      | 0.58 | 6.50       | 0.52 | 0.358        |
| Word-of-mouth                                                 | 5.06      | 1.52 | 5.68       | 1.27 | <b>0.016</b> |
| Overall average intention to seek medical treatment again     | 5.70      | 0.98 | 6.03       | 0.84 | <b>0.037</b> |
| <b>Emergency PoCUS services behavioral intention</b>          |           |      |            |      |              |
| Overall average emergency PoCUS services behavioral intention | 6.49      | 0.77 | 6.58       | 0.57 | 0.830        |

Figure 2 presents paired-sample t-test results comparing satisfaction levels across service quality, general behavioral intention, and Emergency PoCUS services behavioral intention. A paired-sample t-test was conducted to assess each respondent's satisfaction levels across three key aspects: medical quality, behavioral intention, and behavioral intention toward emergency PoCUS services. The results of the analysis revealed that satisfaction with both medical quality and behavioral intention toward emergency PoCUS services was significantly higher than satisfaction with general behavioral intention (Figure 2).

This suggests that individuals perceived greater satisfaction in terms of overall medical quality and their specific behavioral intention toward emergency PoCUS services compared to their general behavioral intention. These findings highlight the stronger positive reception of emergency PoCUS services and overall medical quality in comparison to general behavioral intention.

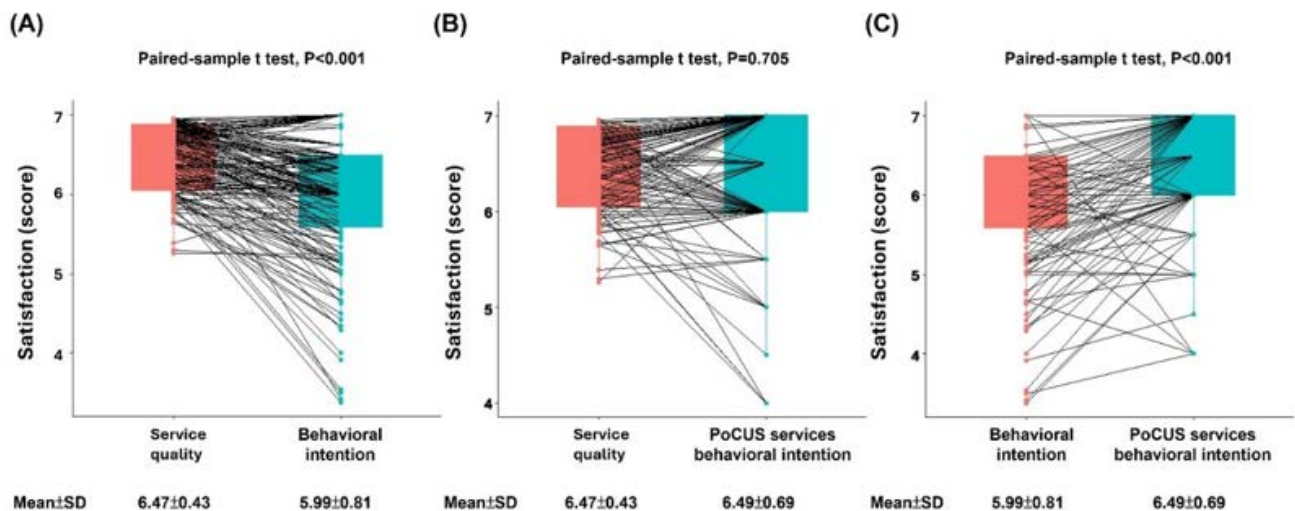


Figure 2. Paired-sample t test analysis was conducted to examine the relationships among the service quality score, behavioral intention score, and PoCUS services behavioral intention score

### 3.5. The Number of Emergency Department Visits and Completed PoCUS Examinations in 2021, 2022, and 2023

Figure 3 summarizes the number of emergency department visits and completed PoCUS examinations from 2021 to 2023. An overview of temporal trends in emergency department utilization and PoCUS examinations is provided. The number of emergency department visits in 2021, 2022, and 2023 is presented in Figure 3A, indicating a steady increase each year. Likewise, the number of completed PoCUS examinations during the same period, as shown in Figure 3B, also demonstrates a consistent upward trend.

This growing utilization of emergency PoCUS services aligns with the increasing satisfaction levels observed in behavioral intention toward emergency PoCUS services. As more patients undergo PoCUS examinations in the emergency department, their positive experiences and perceived benefits may contribute to a higher degree of acceptance and satisfaction with the service, reinforcing the overall trend of increasing behavioral intention toward emergency PoCUS utilization.

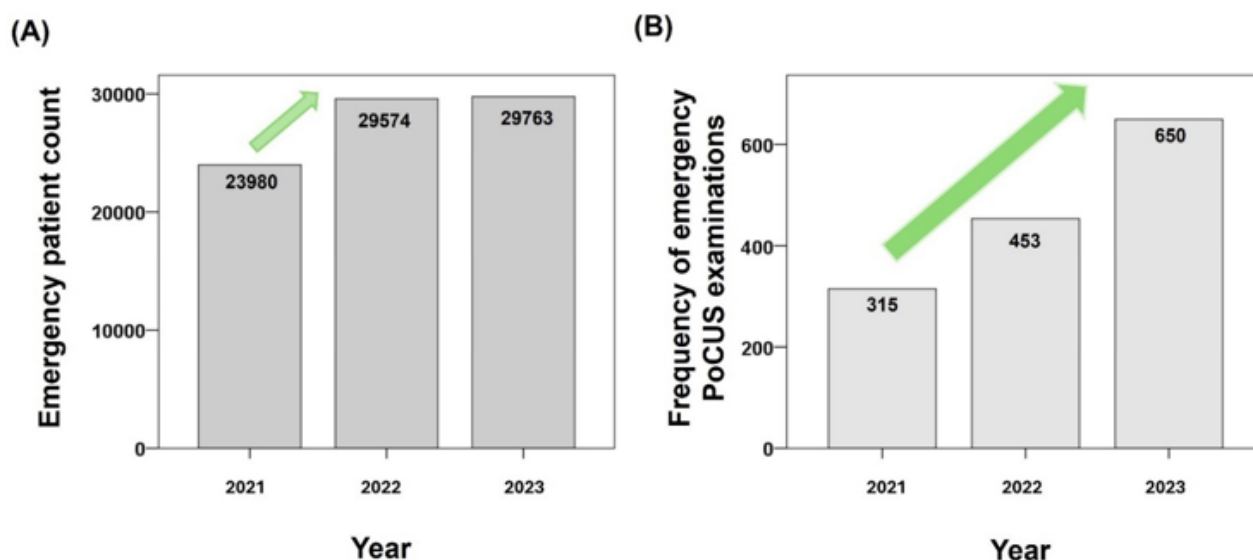


Figure 3. A summary of the total number of emergency department visits and the corresponding completed PoCUS examinations for the years 2021, 2022, and 2023

#### 4. Discussion

The CECSS has been demonstrated to be a reliable and valid tool for measuring patient satisfaction [13], [14], [15], [16]. However, research also highlights certain limitations, suggesting that the CECSS can be expanded to capture additional aspects of emergency care.

Satisfaction with humanistic care in the emergency department is essential, as many patients arrive in critical condition, often feeling physically weak and emotionally distressed. Support from family, caregivers, or staff plays a vital role in easing anxiety, uncertainty, and decision-making challenges [17].

Given that the hospital has continuously updated and acquired various PoCUS sound application software and equipment in recent years, this study incorporated two positively worded items to assess the influence of ultrasound services on patient decision-making: (1) Choosing this hospital again when necessary due to the availability of ultrasound examinations. (2) Recommending this hospital to other patients because of its ultrasound testing and related services. When incorporating the scores from these two positively worded items, ultrasound services emerged as the highest-rated aspect compared to quality of care and behavioral intentions. Additionally, a steady increase was observed in both the number of emergency department visits and the completion of ultrasound examinations over recent years. These findings further support the need to validate this questionnaire as a comprehensive and widely applicable satisfaction survey, capable of assessing patient experiences across different service levels within the emergency care setting.

The intention to seek medical treatment again, a component of behavioral intention, exhibited a high correlation with service quality (R values from 0.481 and 0.595, all  $P < 0.001$ ) (Table 5), whereas word-of-mouth showed a moderate correlation (R values from 0.308 and 0.400) (Table 5). The satisfaction related to word-of-mouth is associated with the willingness to recommend this hospital through online platforms. Therefore, this result highlights that internet information is still not widely accessible among rural patients. It was suggested that the visit does not involve the use of 3C products. Among the service quality dimensions, Responsiveness and Assurance showed a high correlation with the PoCUS services behavioral intention score, with R values of 0.517 and 0.511, respectively (All  $P < 0.001$ , Table 5).

The results indicate that the Cronbach's alpha coefficient ( $\alpha$ ) for Emergency PoCUS services behavioral intention, measured by two items (1) "Since the hospital provides PoCUS examinations, I will choose this hospital again when necessary." and (2) "I would introduce other patients to seek medical treatment because the hospital provides PoCUS testing and other services." - was 0.577. According to true score theory, increasing the number of items generally enhances construct representation and reliability [15]. Therefore, to improve the reliability of this measure in the future, additional items should be considered. Table 4 shows that the high Cronbach's alpha values for the service quality and behavioral intention domains indicate strong internal consistency, supporting the reliability of the developed instrument for evaluating emergency department (ED) patient satisfaction.

The comparatively lower reliability of the PoCUS services behavioral intention domain reflects the limited number of items rather than a weakness of the construct itself, highlighting it as an emerging dimension of patient-centered evaluation related to bedside ultrasound integration. These results demonstrate that incorporating PoCUS into ED practice is not only a diagnostic advancement but also enhances patients' perceptions of professionalism, responsiveness, and safety, underscoring its broader role in healthcare quality assessment. Furthermore, the validated scale provides a practical tool for hospitals to assess patient experience alongside technological adoption in emergency care. Figure 2 illustrates patients' behavioral intention toward the hospital, showing that most patients are willing to choose this hospital again for medical treatment, continue using the tracking and care services provided, and consider it their first choice among all hospitals in the area. These findings highlight strong patient loyalty and satisfaction, reflecting the positive impact of both service quality and PoCUS integration on patients' willingness to engage with the hospital in the future. As shown in Table 7 and Table 8, further investigation into the reasons behind the emergency department satisfaction levels among male and first-time patients is necessary.

Findings from previous studies indicated that overall satisfaction ranged from moderate to high and was strongly associated with physician care, waiting time, communication quality, and meeting patient expectations, while service organization, empathy, and information delivery also played important roles [18], [19], [20]. Additionally, strategies to improve emergency department performance include triage optimization, dynamic staffing, technological integration, and strategic resource management. Evidence suggests that advanced triage systems, telemedicine, and flexible staffing models can reduce waiting times, enhance patient throughput, and improve operational efficiency. The combined use of organizational and technological innovations is essential for advancing quality of care and patient satisfaction in emergency healthcare settings [21], [22].

In this study, during ultrasound services, interactions with nurses or doctors provide not only medical care but also reassurance and emotional support, which may enhance overall patient satisfaction. Research suggests that improving communication, comfort, and emotional support in emergency care leads to better patient experiences, increased return visits, and improved recovery outcomes.

**Limitations:** This cross-sectional study limits causal inferences between patient satisfaction, behavioral intention, and PoCUS services. A longitudinal, multi-center approach would enhance validity. The selection process for the 202 participants was unclear, posing potential selection bias. Future studies should detail recruitment and address biases. While gender differences were analyzed, other confounders (e.g., illness severity, socioeconomic status) were not considered. Future research should include stratified analyses or regression adjustments. The link between PoCUS and medical quality assurance remains underexplored; qualitative insights could clarify its impact. Lastly, data collection status should be specified.

## 5. Conclusion

This study developed and validated an emergency department satisfaction questionnaire encompassing service quality, general behavioral intention, and PoCUS-related behavioral intention. Patients reported high satisfaction with medical care, particularly regarding PoCUS services, which enhanced appreciation and perceived value of care. Service quality and behavioral intention scores were positively correlated, with Responsiveness and Assurance showing strong associations with satisfaction toward PoCUS services. Female and first-time patients reported higher satisfaction in certain aspects. The PoCUS services behavioral intention scale demonstrated acceptable reliability, and expanding the number of items could further improve its validity. Overall, the results highlight that integrating point-of-care ultrasound (PoCUS) in the emergency department enhances patient confidence, satisfaction, and perceived quality of care, demonstrating both practical and evaluative benefits. A major strength of this study is the creation of a novel, integrated assessment framework tailored to ED settings with PoCUS. Limitations include the single-center, cross-sectional design and the limited number of PoCUS-specific items, which may affect generalizability. Future research should expand PoCUS-related items, validate the framework across multiple centers, adopt longitudinal designs to explore causal relationships, and investigate how PoCUS influences clinical workflow, decision-making, and patient trust.

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