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ORIGINAL RESEARCH

Effectiveness of ISBAR Protocol Implementation by Emergency Medicine Residents in Pediatric Handovers; A Pre-post Intervention Study

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Abstract: **Introduction:** Effective information transfer between healthcare providers is essential for patient safety. This study aimed to evaluate the impact of ISBAR (Identify, Situation, Background, Assessment, Recommendation) framework on the quality of clinical handovers in emergency department (ED). **Methods:** This prospective, pre- and post-intervention study was conducted at Hazrat Ali Asghar Pediatric Hospital in Tehran, Iran, from May to September 2023. A total of 428 clinical handovers were recorded (214 pre-intervention and 214 post-intervention) following a 90-minute training session and the introduction of a standardized ISBAR checklist. Handover quality was measured using the completeness of a 16-item ISBAR checklist. Data analysis employed descriptive statistics, the Mann–Whitney U test, and Chi-square tests. **Results:** Implementation of the ISBAR protocol significantly improved the overall quality of information conveyed during handovers. Total handover scores increased from a mean rank of 127.55 pre-intervention to 301.45 post-intervention ($P < 0.001$). All five ISBAR domains showed significant enhancements; Identify (from 145.41 to 283.59, P=0.001), Situation (from 129.64 to 299.36, P=0.001), Background (from 136.40 to 292.60, P=0.001), Assessment (from 156.00 to 273.00, $P< 0.001$), and Recommendations (from 198.14 to 230.86, P=0.03). In addition, the completeness of individual items such as patient diagnosis, admission date, and vital signs improved markedly. **Conclusion:** Adopting a standardized ISBAR handover protocol in a high-stakes pediatric environment ED significantly enhances the accuracy and completeness of patient handovers, thereby reducing the potential for errors and strengthening patient safety.

Keywords: Patient handoff; Quality improvement; Patient safety

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1. Introduction

One of the paramount aspirations of modern healthcare philosophy is to elevate the standards of quality and safety within the caregiving system. To realize this vision, numerous initiatives have been meticulously crafted to bolster patient safety, accompanied by policies aimed at thwarting adverse events and illuminating areas of vulnerability. The clinical arena, inherently fluid and intricate, often challenges the very essence of effective communication among medical professionals. A significant weakness frequent in many healthcare environments is the manner in which caregivers exchange information (1, 2).

The deficiency of effective communication among healthcare providers is a widespread issue, capable of precipitating medical errors and compromising patient outcomes. Thus, fostering clear and reliable channels of dialogue among caregivers becomes imperative for safeguarding patient safety and upholding the integrity of care delivered (3). Accurate and thoughtful handoffs serve as vital links in this chain, enhancing patient safety by facilitating seamless communication among specialists and ensuring the continuity of treatment. On the other hand, incomplete or flawed handovers tend to inflate healthcare costs, extend hospital stays, delay diagnoses, necessitate repeated examinations, and sometimes lead to grave clinical misjudgments (4).

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Achieving mutual understanding hinges upon the exchange of information, such as the patient's history, diagnosis, and ongoing treatment plan, among specialists. This practice enables clinicians to anticipate one another's actions, recognize any shifts in the patient's condition, and, when necessary, recalibrate therapeutic approaches for better outcomes (5). The meticulous transfer of a patient from one department or unit to another forms a cornerstone of continuous, effective care, made possible through the precise and comprehensive exchange of relevant data (6). Typically, this handoff takes place via spoken words in a free-flowing conversation; despite its informal tone, this dialogue contains vital details essential to maintaining effective, uninterrupted care (7). Unfortunately, communication lapses during such critical exchanges often lead to delays in diagnosis and intervention, or worse, adverse events that jeopardize patient safety (8, 9). Emphasizing structured communication and employing appropriate tools during handoff procedures are of utmost importance. Therefore, handoffs between physicians must be based on relevant, focused information eliminating unnecessary details and personal interpretations, because the accuracy and clarity of the data exchanged are directly critical to making sound clinical decisions and ensuring appropriate patient care (10). Evidence suggests that unstructured, informal handoffs are more prone to errors (11), whereas the application of a standardized, systematic communication framework facilitates focus on the most vital details, thus reducing the risk of mistakes (12, 13). Ideally, this process should be conducted with adequate time, in a calm environment, with access to comprehensive information such as laboratory results. Additionally, it is advisable that handoffs be recorded in the patient's medical record alongside face-to-face verbal communication, ensuring an accurate and retrievable account (14).

Numerous tools and protocols have been developed and standardized to enhance the efficiency of patient handoffs; however, most are designed with inpatient settings in mind. Emergency departments (ED), by contrast, are markedly distinct environments. Here, the flow of patients is rapid, unpredictable, and characterized by higher acuity. The volume of interventions per patient is greater, rapid changes in clinical status are common, and treatment processes are expedited. Patients in urgent need of emergency care are often evaluated and managed by multiple specialists in quick succession. Consequently, the process of patient handoff in emergency settings is widely regarded as particularly high-risk, demanding meticulous attention and strategy (15, 16).

The objective of this study was to assess the impact of training emergency medicine residents in the use of a standardized communication framework, specifically, the implementation of the ISBAR protocol, on the accuracy, completeness, and clarity of information transmitted during pediatric handovers in the high-pressure environment of emergency care.

2. Methods

2.1. Study design and setting

This study was a prospective, pre- and post-intervention experimental investigation conducted at Hazrat Ali Asghar Pediatric Hospital in Tehran, Iran, from May to September 2023. The study aimed to evaluate the impact of implementing the ISBAR (Identify, Situation, Background, Assessment, Recommendation) protocol on the quality of clinical handovers by emergency medicine residents in the pediatric ED. The intervention consisted of a standardized ISBAR checklist and a 90-minute training session for residents.

The study adhered to the Declaration of Helsinki and received ethical approval from the Ethics Committee of Iran University of Medical Sciences (Approval No. IR.IUMS.REC.1403.657). Informed consent was obtained from all participating residents.

2.2. Participants

Participants were emergency medicine residents with at least six months of experience in the pediatric ED. Inclusion criteria required that handovers be performed comprehensively at the bedside by the resident. Exclusion criteria included cases where patients experienced discomfort during handover, instances where physicians could not complete examinations, and residents who declined participation.

2.3. Outcomes, exposures, predictors, and confounding factors

The primary outcome was the quality of information conveyed during handovers, measured by the completeness of the ISBAR checklist (16 items across five domains: Identity, Situation, Background, Assessment, and Recommendation). Each item completed was assigned one point, with a maximum score of 16 per handover. Secondary outcomes included improvements in specific ISBAR domains (e.g., patient identity, clinical status).

The exposure was the implementation of the ISBAR protocol, including the standardized checklist and training. Predictors of handover quality included resident experience (measured as months of emergency medicine training beyond the minimum six months) and shift type (morning vs. evening). Potential confounding factors included patient acuity (categorized as low, moderate, or high based on triage scores), resident workload (number of patients managed per shift), and time of handover (morning vs. evening). Effect modifiers included the presence of faculty supervision during handovers, which could influence adherence to the ISBAR protocol.

2.4. Data sources and measurement

Data were collected from handover forms completed by residents during both pre- and post-intervention phases. Pre-intervention, handovers relied on unstructured handwritten notes, while post-intervention, the standardized ISBAR checklist was used. The checklist included:

• Identity (I): Name, age, diagnosis, admission date, bed number, brief history (6 items).
• Situation (S): Consciousness level, respiratory status, cardiovascular status, motor function (4 items).
• Background (B): Medical history, drug history, substance use, medications, laboratory tests, imaging findings (6 items).
• Assessment (A): Vital signs (blood pressure, pulse, temperature, respiratory rate, SpO2, blood glucose) (1 composite item).
• Recommendation (R): Follow-up consultations, imaging, medication prescriptions (3 items).
Each item was scored as complete (1 point) or incomplete (0 points) based on whether the information was documented on the handover form. The third author, independent of the handover process, collected and reviewed forms to ensure consistency. Inter-rater reliability was assessed by having a second investigator independently score 10% of forms, achieving a Cohen's kappa of 0.85, indicating strong agreement.

2.5. Sample size

The sample size was calculated to detect a 20% improvement in the mean ISBAR score (from an estimated baseline of 8 to 9.6 out of 16) with 80% power and a 5% significance level, assuming a standard deviation of 2.5 based on pilot data from a similar study. Using a two-sample t-test, a minimum of 200 handovers per group (pre- and post-intervention) was required. We included 214 handovers per group to account for potential missing data or exclusions, resulting in a total of 428 handovers.

2.6. Statistical methods

Data were analyzed using SPSS version 20. Quantitative variables (e.g., ISBAR scores, number of items completed per domain) were summarized as means and standard deviations. The primary outcome (total ISBAR score) was compared between pre- and post-intervention groups using the Mann-Whitney U test due to non-normal distribution (confirmed by Shapiro-Wilk test, $p<0.05$). For categorical variables (e.g., completion of individual ISBAR items), frequencies and percentages were reported, and differences were assessed using Pearson's Chi-square test or Fisher's exact test when expected cell counts were low.
To control for confounding, multivariable linear regression was used to adjust for patient acuity, resident workload, and shift type. The model included interaction terms to explore potential effect modification by faculty supervision. Subgroup analyses examined handover quality by shift type (morning vs. evening) and resident experience level (6–12 months vs. >12 months). P-values <0.05 were considered statistically significant.

2.7. Addressing bias

To minimize selection bias, all eligible residents were invited to participate, and handovers were consecutively sampled over a 10-day period in each phase. Information bias was addressed by standardizing the ISBAR checklist and training residents to ensure consistent application. To reduce observer bias, the third author, who was not involved in handovers, collected and scored forms. Potential recall bias in pre-intervention unstructured notes was mitigated by focusing on documented information rather than verbal reports.

2.8. Handling missing data

Missing data occurred in <5% of handover forms, primarily due to incomplete documentation of non-critical items (e.g., bed number). Missing data were handled using listwise deletion for the primary analysis, as the proportion was low and unlikely to bias results. A sensitivity analysis imputed missing values using the mean score for the respective domain, and results were compared to ensure robustness.

2.9. Sensitivity analyses

Sensitivity analyses were conducted to assess the robustness of findings. First, we re-analyzed the primary outcome excluding handovers with missing data to confirm consistency with the main results. Second, we stratified analyses by patient acuity to evaluate whether high-acuity cases influenced handover quality. Finally, we tested the impact of excluding outliers (ISBAR scores >2 SD from the mean) to ensure results were not driven by extreme values.

3. Results

In total, 428 clinical handovers were meticulously documented both prior to and following the intervention, with each phase comprising 214 cases. Table 1 compares the baseline characteristics of handovers between before and after intervention phases. The data pertaining to the ISBAR checklist were examined and analyzed in detail. The findings showed that the quality of information conveyed during handovers significantly improved, with the mean rank scores rising from 127.55 to 301.45, a difference confirmed as statistically significant by the Mann-Whitney test (P=0.001). The descriptive statistics pertaining to the total scores as well as comparative analysis of the mean rank scores across various domains pre- and post- intervention are presented in Table 2.
Comparison of data completion before and after intervention based on domains of each ISBAR items is presented in table 3.
- In the patient identity domain, the mean rank handover score increased notably from 145.41 to 283.59. The Mann-Whitney test indicated this difference was highly significant ($P < 0.001$). Among the specific items, accuracy in patient name, age, diagnosis, admission date, bed number, and brief history at the time of handover showed marked improvements.

- For the current situation aspect, the mean rank score improved from 129.64 to 299.36, with the change being statistically significant (P=0.001). Significant enhancements were also observed in the assessment of consciousness level, respiratory status, cardiovascular condition, and motor function.
- Regarding the clinical background, the mean rank conveyed information grew from 136.40 to 292.60, with statistical analysis confirming the significance of this increase (P=0.001). Items such as past medical history, medication history, substance use, as well as laboratory and imaging results, all showed substantive improvement.
- In the system status assessment domain, the mean rank score rose from 156 to 273, again demonstrating a significant difference (P=0.001). Key parameters—blood pressure, pulse, temperature, respiratory rate, oxygen saturation, blood glucose levels—and the interventions undertaken to manage identified issues all improved markedly.
- Finally, in the necessary recommendations' domain, the mean rank score surged from 198.14 to 230.86, with the Mann-Whitney test confirming this difference as statistically significant (P=0.03). Follow-up plans, ongoing monitoring, and crucial medication instructions for subsequent shifts saw substantial gains. However, efforts to improve follow-up consultations and educational components among residents did not achieve a significant impact despite the intervention.

4. Discussion

Clinical handover stands as a cornerstone in safeguarding the seamless continuity of patient care. An inadequately conducted handover can jeopardize timely investigations, hinder the initiation of appropriate management plans, affect resource allocation, and diminish patient satisfaction. Most critically, patient safety remains the most directly impacted domain within the realm of clinical handover, underscoring its profound significance in healthcare delivery (2, 4).

The results align with and reinforce a broad body of evidence indicating that structured communication tools, such as ISBAR, improve information transfer and patient safety across varied clinical environments (2). Originally, this checklist was employed to identify patients, introduce them to the residents, and clarify the current condition and any urgent or serious problems. It subsequently aided in the diagnosis of the patient, the situation upon admission, medical history, laboratory responses, and other clinical actions. Ultimately, it underscored medical priorities during handover and any specific treatments that needed to be administered immediately or as soon as possible.

Our findings demonstrated a more than twofold increase in handover quality scores following the implementation of the ISBAR communication protocol. Another study by Doolan et al. conducted in a busy children's hospital found that, although ISBAR usage was inconsistent, the protocol clearly identified deficiencies in handover quality and suggested that standardized communication frameworks enhance overall handover practices (17). This underscores the particular effectiveness of ISBAR in the high-stakes, fast-paced environment of pediatric emergency medicine. Notably, ensuring accurate patient identification during handover remains the most critical factor, as patient misidentification is regarded as a key patient safety indicator (18). Errors in patient identification can lead to serious adverse outcomes, including incorrect medication administration, inappropriate treatment, misdiagnosis, and receiving unsuitable care (19). A systematic review by Randmaa et al. found that structured communication tools significantly enhance the completeness and clarity of handover information (20). Similarly, a study by Starmer et al. in pediatric settings reported that adopting a standardized handoff bundle, resulted in a 23% reduction in medical errors and a 30% decrease in preventable adverse events (21). Our study also observed a notable decrease in the frequency of transferred information regarding bed numbers following the intervention. It appears that clinicians may underestimate the importance of this detail, potentially due to the possibility of patient movement during their stay in the emergency department. According to Thompson et al. (22), the use of the ISBAR tool in clinical handovers by physicians did not significantly impact the emphasis placed on patient identity or medical diagnosis, as these elements were already regarded as routine in clinical handover procedures prior to ISBAR's implementation.

The substantial improvement in patient identity scores post-ISBAR underscores the protocol's effectiveness in reducing one of the most common and hazardous errors during clinical handover. In emergency settings, where high workload levels can increase the risk of communication lapses, ISBAR helps standardize the handover process and ensures that critical patient information, especially identity, is consistently and reliably conveyed (23).

Our findings highlight the significant role of ISBAR in facilitating comprehensive and accurate communication of the patient's current clinical condition, with improvement reaching more than 1.5 times the baseline. This enhancement is critical for supporting timely and appropriate decision making in emergency settings (24). Additionally, notable improvements were observed in the detailed assessment of key clinical parameters, such as consciousness level, respiratory status, cardiovascular condition, and motor function. These elements are vital for accurately conveying the patient's acuity and informing subsequent management decisions.

The study also demonstrated that, prior to the intervention, emergency medicine residents paid limited attention to conveying information about the patient's current status, with the most frequently recorded parameter being consciousness level, accounting for only about 14% of handovers. Although Thompson et al. (22) reported that the use of ISBAR did not significantly impact the quality of information about the patient's current problem, other studies have shown that implementing ISBAR can indeed improve documentation in this area (25, 26).

Müller et al. found that the use of SBAR significantly enhanced the completeness of vital patient information, including neurological and cardiopulmonary status, during handovers in acute care settings (27). Specifically, in emergency medicine, Starmer et al. emphasized that standardized handoff protocols reduce communication errors related to the patient's current clinical condition, thereby decreasing the incidence of adverse events (21).

The present study demonstrated that, following the intervention, there was a significant increase in the attention given to patients' clinical histories during handovers. Prior to the intervention, documentation of laboratory abnormalities, a key component of patient history, had been performed in only approximately 43% of cases. However, after the intervention, the amount of documented information increased significantly across all categories. This suggests that, initially, minimal emphasis was placed on recording comprehensive clinical histories during patient handovers, this is consistent with other studies (28).

Our findings are consistent with the existing literature, emphasizing the pivotal role of structured communication tools in enhancing handover quality. Müller et al. (27) reported that implementing the ISBAR framework in pediatric emergency handovers substantially improved the completeness and clarity of exchanged information, especially concerning patient history and diagnostic findings. Similarly, Randmaa et al. (20) noted that adopting ISBAR reduced instances of information omission and increased the confidence of healthcare providers during emergency communications. Furthermore, the observed improvements in conveying medication and substance use histories align with the findings of Dunsford's survey, which demonstrated that structured communication protocols facilitate more accurate identification and transmission of critical patient safety information, thereby helping to prevent medication errors (29). This is particularly vital in pediatric emergency care, where incomplete or inaccurate handovers can lead to delays or errors in treatment. However, it is important to recognize that maintaining consistent adherence to ISBAR protocols over time remains challenging. Continuous training and strong institutional support are essential to sustain these improvements and foster ongoing compliance.

It appears that prior to the introduction of the standardized content for clinical handovers, residents did not give adequate attention to this aspect. Additionally, it can be inferred that, before familiarization with these items, residents were unaware of the importance and necessity of informing colleagues about the patient's vital signs during handover. This finding is consistent with the results of Beigmoradi et al. (30), who found that during patient handovers, there was limited focus on the assessment of vital signs. A prospective study conducted by Doolan et al. at a busy pediatric hospital revealed that, despite receiving ISBAR training, key 'risk' parameters, including vital signs, were frequently omitted. This highlights the need for improved adherence and underscores the vital role that structured protocols play in enhancing the transmission of essential clinical data (17). While ISBAR appears to promote greater completeness and accuracy in vital sign reporting, thereby supporting the timely and effective management in pediatric emergency care, challenges related to consistent adherence and application remain. These findings emphasize the importance of ongoing training, reinforcement, and organizational support to fully realize the benefits of the protocol (17, 24, 31).

The high percentage of information provided in the recommendations section related to follow-up advice, even prior to the intervention, indicates that residents consistently placed special emphasis on this aspect. This finding aligns with the results of studies by Fahim Yegane et al. (25) and Achrekar et al. (26), but contradicts the findings of Thompson et al. (22).

Our results are consistent with prior research that highlights the positive impact of structured handover protocols, on the quality of communication concerning clinical recommendations. For instance, O'Hagan et al. (32) reported that implementing ISBAR significantly improved the transmission of follow-up plans and care instructions during patient handovers, thereby reducing the risk of adverse events caused by miscommunication.

Nonetheless, it is noteworthy that, despite these overall improvements, our study found that efforts to strengthen follow-up consultations and educational engagement among residents did not achieve statistical significance. This observation echoes the insights of Doolan et al. who highlighted the challenges of fully integrating educational components and ensuring consistent follow-up communication within the hectic environment of emergency workflows (17). Factors such as time limitations, resident workload, and variable institutional support appear to pose obstacles to the adoption of these more nuanced aspects of handover communication.

Although ISBAR's efficacy is widely recognized across diverse areas of healthcare, its application in pediatric emergency care requires careful consideration. Structured communication tools such as ISBAR are essential in pediatric contexts due to unique challenges, including weight-based medication dosing and the need to convey critical values with unequivocal clarity, which may differ from adult thresholds (33, 34).

The World Health Organization and other international bodies have endorsed ISBAR as a robust framework for clinical handovers, and its adoption is broadly recommended to reduce communication-related errors and enhance patient safety (35). Our findings reinforce this guidance by demonstrating a significant improvement in the quality and completeness of handovers among emergency medicine residents. This highlights that ISBAR is not solely a validated instrument for general medicine, but also provides a highly effective, adaptable framework that can be applied across a broad spectrum of clinical contexts (36), and can be tailored to the specific needs of a pediatric emergency department.

Future research would benefit from a more rigorous design,

such as a randomized controlled trial, to more definitively establish the protocol's effectiveness. Additionally, although the ISBAR checklist provides a standardized framework, subjective interpretation of its items by individuals could introduce variability in handover scores—a common challenge in observational studies of this nature. Furthermore, the two data-collection periods (pre- and post-intervention) were separated temporally, allowing for differences in patient demographics, disease severity, or other unmeasured variables to influence the results.

The implementation of a standardized, guideline-based structured handover template in emergency medicine settings offers substantial potential to transform clinical practice. By formalizing the handover process, healthcare professionals can ensure that the transfer of patient information is accurate, complete, and consistently aligned with best-practice standards. This not only promotes greater adherence to established protocols but also leads to measurable improvements in the overall quality of care delivered to patients.

Furthermore, structured handover processes are instrumental in minimizing errors and omissions that can arise during shift changes or patient transfers, thereby safeguarding patient safety. Comprehensive and systematic communication at these critical junctures is vital to prevent misunderstandings and to support continuity of care. To realize these benefits, it is imperative that healthcare organizations prioritize the education and training of their staff on the use of standardized handoff tools and procedures. Therefore, it is strongly recommended that healthcare professionals, in both clinical practice and academic training environments, participate in ongoing education programs centered on effective handoff techniques.

5. Limitations

A primary limitation of this study is its pre- and post-intervention design conducted in the absence of a concurrent control group. This design exposes the study to potential biases, most notably the Hawthorne effect, wherein participants alter their behavior due to awareness of being observed, which may have contributed to the observed improvements in handover quality. Although the results demonstrate a statistically significant change, attributing the entire effect to the ISBAR protocol is challenging, as simultaneous enhancements or broader changes in clinical practice during the study period could have influenced the outcomes. Beyond potential bias, imprecision constitutes another limitation. The single-center design, while suitable for evaluating the targeted intervention, may not capture the full variability of clinical practice across different hospitals or regions; consequently, the generalizability of the findings may be limited to similar institutional and cultural contexts. The effectiveness of the ISBAR protocol may depend on factors such as the baseline level of communication proficiency, existing handover processes, and resource availability at a given institution. These potential biases should be carefully considered when interpreting the results.

6. Conclusions

Adopting a standardized ISBAR handover protocol in a high-stakes pediatric environment ED significantly enhances the accuracy and completeness of patient handovers, thereby reducing the potential for errors and strengthening patient safety. These findings should be regarded as a promising initial step, and further research is required to validate these results.

7. Declarations

7.1. Acknowledgments

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7.2. Author contributions

SMM and ShKh are responsible for the study conception and design, and finalizing of the manuscript. NM, KKh, ShJ, FCh, AM and ZM participated in the study research, gathering and analyzing data and took part in writing the manuscript. SMM and ShKh supervised the whole project. The authors read and approved the final version of manuscript.

7.3. Funding

We did not receive any funding for this work.

7.4. Conflict of Interest

The authors have no conflicts of interest to declare.

7.5. Data availability

The datasets produced and examined in this research can be accessed from the first and third authors upon reasonable request.

7.6. Ethical considerations

The study adhered to the Declaration of Helsinki and received ethical approval from the Ethics Committee of Iran University of Medical Sciences (Approval No. IR.IUMS.REC.1403.657).

7.7. Using artificial intelligence chatbots

We employed an artificial intelligence model (GPT-4) to assess the eloquence and precision of the English prose woven through this article.

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Table 1: Comparing the baseline characteristics of handovers between before and after intervention phases

Character	Phase		P value
	Pre-intervention	Post- intervention	
Resident experience (months)	8.2 ± 3.8	8.5 ± 4.0	0.62
Shift type (morning)	107 (50.0)	105 (49.1)	0.85
Patient acuity*	75 (35.0)	77 (36.0)	0.82
Resident workload (patients per shift)	14.5 ± 4.2	14.3 ± 4.1	0.71
Time of handover (morning)	107 (50.0)	105 (49.1)	0.85
Supervision (yes)	98 (45.8)	100 (46.7)	0.86
Patient age (years)	5.7 ± 4.2	5.6 ± 4.1	0.90
Patient gender (female)	99 (46.3)	99 (46.3)	0.99
Medical complexity	92 (43.0)	93 (43.5)	0.89

Data are presented as mean ± standard deviation (SD) or number (%).* Based on triage score.

Table 2: Descriptive statistics before and after intervention

Status	Pre-intervention		Post- intervention		P value
	Total score	Rank*	Total score	Rank	
I	3.89 ± 0.82 (1-5)	145.41	5.09 ± 0.92 (3-6)	283.59	< 0.001
S	0.25 ± 0.47 (0-2)	129.64	3.10 ± 1.49 (0-4)	299.36	< 0.001
B	1.22 ± 1.08 (0-4)	136.40	3.77 ± 1.80 (0-6)	292.60	< 0.001
A	0.04 ± 0.21 (0-1)	156.00	0.59 ± 0.49 (0-1)	273.00	< 0.001
R	0.72 ± 0.68 (0-3)	198.14	1.07 ± 1.03 (0-3)	230.86	0.03

Data are presented as mean ± standard deviation (minimum-maximum number of completed items). *: Mean rank (Mann-Whitney Test for Significant Differences). I: Identify; S: Situation; B: Background; A: Assessment; R: Recommendation.

Table 3: Comparison of data completion before and after intervention)

Domains	Items	Pre-intervention	Post-intervention	P value
Patient identity	Name	207 (96.7)	214 (100.0)	0.015
	Age	205 (95.8)	213 (99.5)	0.020
	Diagnosis	138 (64.5)	187 (87.4)	<0001
	Admission date	0 (0.0)	167 (78.0)	<0001
	Admission bed	140 (65.4)	108 (50.5)	0.002
	Brief history	144 (67.3)	202 (94.4)	<0001
Current situation	Awareness	30 (14.0)	172 (80.4)	<0001
	Respiratory situation	23 (10.7)	173 (80.8)	<0001
	Cardiac situation	1 (0.5)	152 (71.0)	<0001
	Mobility	0 (0.0)	167 (78.0)	<0001
Clinical background	Past medical history	32 (15.0)	156 (72.9)	<0001
	Drug history	12 (5.6)	144 (67.3)	<0001
	Alcohol and drug dependency	2 (0.9)	144 (67.3)	<0001
	Medication	65 (30.4)	109 (50.9)	<0001
	Laboratory tests	94 (43.9)	157 (73.4)	<0001
	Imaging	57 (26.6)	98 (45.8)	<0001
System assessment	Vital signs	10 (4.7)	127 (59.3)	<0001
Recommendations	Follow-up consultation	116 (54.2)	119 (55.6)	0.771
	Follow-up imaging	33 (15.4)	59 (27.6)	0.002
	Medication prescription	6 (2.8)	51 (23.8)	<0001

Data are presented as number (%).