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Assessment of Standard Compliance in Pediatric Operating Room of Tehran's Educational Medical Centers in 2021: Across-Sectional Study

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Abstract

Setting clear standards for assessing healthcare services in healthcare organizations at a global level is essential for promoting health in hospitals. So, the present research was conducted to investigate the adherence to structural, equipment, and functional standards of operating rooms in pediatric medical educational centers in 2021.

This study utilized a descriptive cross-sectional method. The research community included all educational and therapeutic centers for children in Tehran, selected through a census method. The data collection tool was a checklist created by the researcher focusing on three dimensions of structural, equipment, and functional standards. The data were analyzed using SPSS software, version 26.

Establishing and monitoring adherence to structural, equipment, and functional standards in operating rooms is essential for pediatric patient safety and hospital efficiency. This study aimed to assess the level of compliance with such standards in pediatric operating rooms of educational medical centers in Tehran. A descriptive cross-sectional study was conducted in all pediatric educational and therapeutic centers in Tehran through a census approach. Data were collected using a researcher-designed questionnaire addressing structural, equipment, and functional dimensions. Descriptive statistics, including the average compliance with structural standards, were 71%, with equipment standards 75%, and functional standards 75.77%, indicating a generally high level of adherence across centers.

While compliance was relatively strong in all three domains, structural improvements could benefit from updated design guidelines and increased funding. Equipment standards may be enhanced through targeted training and budgeting. Further efforts to standardize and monitor staff performance are also recommended.

Keywords: Standards, Pediatric Operating Room, Pediatric Nursing, Safety

Introduction

The operating room is a critical, stressful, hazardous, sterile, and organized environment in a hospital (1, 2), where anesthesia, surgical, diagnostic, and therapeutic procedures are performed in both elective and emergency (3). Due to advancements in the field of anesthesia and surgery, fundamental changes have been made in the structure and management of the operating room. However, these changes have not resulted in a consistent global consensus on the design of operating rooms, and various patterns and standards have been introduced for implementation (4). The use of standards as a method for improving the quality of healthcare facilities has long been recognized (5), where a standard refers to the conditions that determine the achievement of expectations in the performance of a structure or processes within an organization, capable of enhancing service quality (6).

The aim of adhering to standards in the operating room is to ensure the safety of both the healthcare workers and the patients undergoing surgical procedures. Meeting these standards leads to better performance of the hospital and the staff, and prioritizes patient safety as an essential aspect (7). Therefore, standards play a valuable role in indicating minimum requirements and expected performance, accurately assessing the current status of a hospital, and ultimately evaluating, monitoring, and directing organizational activities. Assessing adherence to standardization can greatly assist hospitals (8).

Structural standards (human resources, physical environment, and medical equipment and facilities) have the greatest impact on the quality of nursing care for critically patients. The facilities, physical environment, and medical equipment significantly influence the quality of healthcare personnel's work and play a crucial role in outcomes. For example, in 1952, during the polio epidemic, the use of positive-pressure ventilation instead of negative-pressure ventilation led to a reduction in patient mortality from 87% to 25% (9). Brownlee (2019) also mentioned in a study that the quality of operating room design affects outcomes and determines the quality of experience for various stakeholders, including patients, providers, and hospital staff. They directly benefit from efforts to improve the physical environment. By adopting previously established frameworks, measurement, evaluation, and improvement of operating room design are possible (10).

Operating rooms are considered high-risk healthcare settings for medical errors. Identifying the values, opinions, and perspectives of staff regarding safety can be useful in reducing medical errors (11). Surgical site infections are also major complications and impose an economic burden on hospitals worldwide (12). Therefore, identifying and implementing evidence-based strategies to minimize surgical site infections are essential clinical objectives. The rate of surgical wound infections is heavily influenced by the quality of the operating room. The operating room is an extremely complex system that involves multiple risk factors, including not only its structural characteristics and equipment but also the management and behavior of healthcare personnel (13, 14). Adherence to the necessary standards is essential for maintaining patient safety. Standards are explicit statements of expected quality in the performance of healthcare activities (15).

The quality of care in the operating room is dependent on compliance with standards in three areas: physical environment, equipment, and human resources (16). In 2008, the World Health Organization (WHO) published guidelines recommending several methods to ensure surgical patient safety worldwide (17). Haynez et al. subsequently found that the introduction of the WHO Surgical Safety Checklist in the operating rooms of eight hospitals was associated with significant improvements in surgical outcomes. The rate of postoperative complications decreased by an average of 36%, and the mortality rate also decreased to a similar extent (18). Significant advancements in operating room efficiency for improving outcomes and costs for the healthcare system and patients are observed through a focus on improving communication, standardizing

processes, and embracing a culture of learning and innovation (19).

Children and adolescents hospitalized for surgery are exposed to potentially traumatizing situations such as separation from parents, unfamiliar surroundings with frightening equipment and surreal technology, pain from invasive procedures, and mental dizziness due to shock or anesthesia(20). Additionally, children are at the center of healthcare, and even for adults, surgery can be terrifying. Unlike in high-income countries, many children in hospitals are not adequately anesthetized when entering the operating room, and they hear frightening sounds from the devices and see unfamiliar surgeons in scrubs. Therefore, the pediatric operating room requires special considerations and needs more precise care (21). Furthermore, it allows their country to increase its gross domestic product by an average of $35,970 USD in the future (22). Hence, this study was designed and conducted to investigate the compliance with structural, equipment, and performance standards in the pediatric operating room.

Method

This descriptive cross-sectional study was conducted in 2021 to evaluate compliance with structural, equipment, and functional standards in the pediatric operating rooms of selected medical training centers in Tehran. The study population included all pediatric medical training centers in Tehran, namely Mofid, Bahrami, Hazrat Ali Asghar (AS), and Tehran Children's Medical Center. All eligible operating rooms and surgical technologists in these centers were selected using a census sampling method.

Data were collected using a researcher-designed checklist containing 107 items across three domains: structure (52 items), equipment (29 items), and staff performance (26 items). Items were based on standards from the Association of PeriOperative Registered Nurses (AORN), the American Society of Anesthesiologists (ASA), and the World Health Organization (WHO), specifically adapted to pediatric operating room contexts. Each item was scored as "Yes = 1" and "No = 0." The scores were then converted to percentages, and compliance levels were categorized as weak (≤33%), moderate (34–66%), and strong (≥67%) for all three domains. The researcher assessed the structural and equipment conditions on-site using the checklist. Staff performance was observed three times to minimize observer bias, and participants were informed in advance. The best observed performance was recorded, though this approach may introduce observer bias.

Content validity was established by obtaining feedback from 10 faculty members from operating room departments at medical universities across Iran. Revisions were made based on expert suggestions. Inter-rater reliability was evaluated by comparing scores from the researcher and a trained colleague on two operating rooms, resulting in Kappa coefficients of 0.92 for structure, 0.90 for equipment, and 0.91 for performance.

Data Analysis

In order to analyze demographic data, structure, equipment, and performance, frequency, percentage, mean, and standard deviation, graphs were used. The data were analyzed using SPSS software, version 26.

Results

The findings revealed that out of 68 research samples, 47% were within the age range of 20-30. The majority of the research samples (80.9%) were female. Furthermore, 49% of the research samples were married. Additionally, 66.2% of the samples were in formal employment. The majority of the research samples (98.53%) held a bachelor's degree. Most of them (36.8%) had work experience of less than 5 years (Table 1).

The results showed that the average level of compliance with the structural standards of the operating rooms of educational-therapeutic centers in Tehran was strong. Also, the children's medical center had the highest (76 percent) and Hazrat Ali Asghar and Bahrami educational-therapeutic centers the lowest (68 percent) compliance with the

structural standards of operating rooms (Table 2). Also, the average level of compliance with the operating room equipment standards of these centers was strong; the Children's Medical Center had the highest (83%), and the Bahrami educational-therapeutic center had the lowest (62%) level of compliance with the operating room equipment standards (Table 3). Also, the average level of compliance with the performance standards of the operating room staff of these centers was strong; The highest rate of compliance with performance standards by operating room staff in Hazrat Ali Asghar educational and therapeutic center was the highest (84%), and Mofid educational-therapeutic center was the lowest (65%) (Table 4).

Table 1. Demographic Characteristics of operating room Staff (n=68)

Variable	categories	N (%)
Age (Year)	20-30	32(47.00)
	31-40	26(38.20)
	41-50	9(13.20)
	≥50	1(1.47)
Gender	female	55(80/90)
	male	38(19.10)
Marital Status	Single	19(27.90)
	Married	49(72.10)
Employment status	Official	45(66.20)
	Contractual	9(13.20)
	Corporate	3(4.40)
	Project-based	10(14.70)
	Contractual	1(1.50)
Education Level	Bachelor's degree	67(98.53)
	Associate's degree	1(1.47)
Work Experience	≤ 5/00	25(36.80)
	10/00 -5/01	14(20.60)
	15/00 -10/01	6(8.80)
	20/00 -15/01	13(19.10)
	20/01≥	10(14.70)

Table 2. Compliance Level of Pediatric Educational and Therapeutic Centers with Structural Standards

Hospital Name	Compliance Rate with Structural Standards	Evaluation
Hazrat Ali Asghar	68%	Strong
Mofid	72%	Strong
Bahrami	68%	Strong
Pediatric Medicine	76%	Strong

Table 3. Compliance Level of Pediatric Educational and Therapeutic Centers with Equipment Standards

Hospital Name	Compliance Rate with Equipment Standards	Evaluation
Hazrat Ali Asghar	72%	Strong
Mofid	83%	Strong
Bahrami	62%	Moderate
Pediatric Medicine	83%	Strong

Table 4. Compliance Level of Pediatric Educational and Therapeutic Centers with Functional Standards

Hospital Name	Compliance Rate with Functional Standards	Evaluation
Hazrat Ali Asghar	84%	Strong
Mofid	65%	Moderate
Bahrami	83%	Strong
Pediatric Medicine	79%	Strong

Discussion

The results showed that the average level of compliance with the structural standards of the studied children's training centers in Tehran was strong (71%). In a study by Sadati et al., the rate of adherence to structural standards of sterilization units in educational-teaching hospitals in Gilan province was 61% (23). Additionally, a study by Keyvanara et al. demonstrated that the level of adherence to physical standards in the pediatric wards of hospitals in Isfahan city was 26.3%, which was considered satisfactory (24). Furthermore, Yazdanparast et al. showed that the rate of adherence to structural standards in operating rooms of university-affiliated hospitals in Birjand was 82.71%(25). Moreover, the results of the study by Hannani et al. revealed that the level of adherence to structural standards in post-anesthesia care units in educational, research, and medical hospitals of Iran was close to the standard level in half of the mentioned centers (26). Additionally, the study by Amjadi Rad et al. (2019) indicated that the level of adherence to physical standards in Razi Hospital Birjand was 76%, which was considered satisfactory (27).

It seems that the average level of compliance with the structural standards of the studied children's training centers in Tehran was strong, which aligns with the studies conducted by Sadati et al. (23) and Hannani et al.(26), but differs from the studies by Amjadi Rad et al(27), Yazdanparast et al.(25), and Keyvanara et al.(24). Due to the age of the mentioned centers and their construction based on the standards of that time, they differ from the new structural standards. Additionally, these centers require updating and changes.

Furthermore, the results showed that the average level of compliance with equipment standards in the operating rooms of children's therapy centers in Tehran was strong (75%). The study by Amjadi Rad et al. (2019) demonstrated that the rate of adherence to equipment standards in Razi Hospital Birjand was 75.75%, which was considered satisfactory (27). Moreover, the study by Majidi et al. (2008) showed that the rate of adherence to equipment standards in the operating rooms of educational-medical centers in Rasht was 83.3%(28). Additionally, the study by Hannani et al. revealed that the level of adherence to equipment standards in post-anesthesia care units in educational, research, and medical hospitals of Iran was at the standard level in most centers (75 to 100%) (26). It appears that the average level of compliance with equipment standards in the operating rooms of children's therapy centers in Tehran was strong, which aligns with studies conducted by Majidi et al. (28), Hannani et al. (26), Amjadi Rad et al. (27), and Yazdanparast et al. (25). Because these medical centers were among the well-established centers in Tehran, affiliated with reputable medical universities, having

sufficient budget, highly educated staff, and being under extensive supervision and inspection, with significant technical assistance provided to these centers and generous contributions from benefactors. Therefore, due to the lack of a suitable checklist for pediatric operating rooms and the evaluation of equipment standards based on adult operating rooms at the time of accreditation, it is suggested to use the checklist designed by the researcher for accrediting educational medical centers for children.

Furthermore, the results showed that the average level of compliance with functional standards of surgical technologists in the operating rooms of educational and therapeutic centers in Tehran was strong (77.75%). A study by Janghorbanian et al. (2019) indicated that the compliance rate with performance standards among operating room technologists in selected hospitals affiliated with Isfahan University of Medical Sciences was 79.24% (29). Additionally, Safavi Bayat et al. (2016) showed that the compliance rate with performance standards among nurses in the special ward of educational and therapeutic centers affiliated with Qom University of Medical Sciences was 63.3% (30). It seems that the high level of performance standards among operating room employees in educational and therapeutic centers in Tehran is attributed to their high level of education, updated knowledge due to their presence in educational and therapeutic environments, participation in in-service training courses, and proper supervision of operating room management on their performance, which is consistent with the study by Janghorbanian et al. (29).

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Conflict of Interest

The authors hereby declare that there is no conflict of interest regarding the present study.

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