Original Research

Assessment of Adherence to Functional, Structural, and Equipment Standards in Post-Anesthesia Care Units at Educational Medical Centers of Mazandaran University of Medical Sciences in the Year 2023

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Abstract

Background: The post-anesthesia care unit (PACU) is an integral component adjacent to the operating room, designed to cater to patients in the process of recovery from the effects of anesthesia and surgery. Patients transferred to this unit are exposed to potential risks and non-negligible complications, necessitating meticulous evaluation and adherence to standardized protocols. Therefore, the aim of this study is to determine the status of adherence to standards within PACUs at educational medical centers affiliated with Mazandaran University of Medical Sciences.

Method: The present study adopts a descriptive-analytical cross-sectional design and was conducted through a census approach within the post-anesthesia care units of educational medical centers affiliated with Mazandaran University of Medical Sciences. Data collection tools encompassed a standardized checklist developed across three dimensions: performance, structural, and equipment standards.

Results: The findings of this study revealed that among the five post-anesthesia care units examined at the educational medical centers affiliated with Mazandaran University of Medical Sciences, two units met the standard criteria in the equipment dimension, one unit was closely approaching the standard, and two units deviated significantly from the standard. In terms of structural aspects, three units adhered to the standard, while two units diverged substantially. Notably, all units met the standard requirements in the performance dimension. The study did not ascertain any statistically significant relationships between age, marital status, work experience, and performance dimension. However, gender and educational background demonstrated a meaningful association with the performance dimension.

Conclusion: The structural condition of the post-anesthesia care units within the studied medical centers necessitates revisitation in light of the evolving standards. Additionally, there is an imperative to incorporate advanced and modern equipment to elevate the quality of care provided to patients.

Keywords: Post-Anesthesia Care Unit, Recovery, Standards.

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Introduction

Recovery, commonly referred to as the post-anesthesia care unit (PACU), is a specialized unit situated in close proximity to the operating room. It is designed and equipped to cater to patients in the process of recuperating from the effects of anesthesia and surgery. (1)Direct and meticulous supervision is undertaken by anesthesia specialists, along with a nurse or anesthesia technician.(2) The unit is strategically located to provide easy and immediate access to specialized units, radiology, blood banks, and laboratories. An emergency alert system is also installed within the unit to facilitate rapid assistance from the operating room, if necessary.(3) Given its critical role, the PACU stands as one of the most vital segments within any healthcare facility .(4)

The inception and development of the recovery unit has been closely tied to advancements in the field of anesthesia. As surgical methods have evolved and become more intricate, the need for immediate post-operative care has transitioned from passive observation to a more intensive and active phase of monitoring and intervention, encapsulated under the term "post-anesthesia care." The nature of care required for each patient is contingent upon the surgical procedure performed. This has led to the expansion and augmentation of recovery units, with increasing emphasis on these units irrespective of the anesthesia technique used. Consequently, in 2013, the Association of Anaesthetists of Great Britain and Ireland replaced the term "recovery room" with "post-anesthesia care unit" (PACU)(5).

Historically, the recovery unit was primarily designed for the care of post-operative patients until they were stable enough to be transferred back to the surgical ward. However, in many developed countries today, the scope of PACUs has expanded. Patients are transferred to the PACU regardless of the anesthesia technique used, highlighting the unit's growing importance.(6) Hence, the expansion of the unit's role necessitates a structured operation in line with established standards. The safety and health outcomes of patients are intrinsically tied to the performance of this unit(7). Patients admitted to the PACU are susceptible to unpredictable and irreversible risks, which can lead to critical incidents. To mitigate such incidents, activities aligned with standards are deemed essential, and the establishment of definitive, evidence-based checklists for monitoring standards is highly valuable(8).This is because critical incidents result in increased patient duration within the healthcare system and escalated costs (9). Studies have also indicated that around 10% of post-operative complications occur during the recovery phase. Furthermore, the highest post-operative mortality rates are attributed to acute respiratory and cardiovascular events, as well as fluid imbalance. Effective evaluation of patients in this unit can contribute to timely interventions and subsequently reduce patient morbidity and mortality. In this regard, a study conducted in 1974 by the Philadelphia Recovery Room Committee emphasized that half of the deaths occurring within the first 24 hours post-surgery and anesthesia are preventable, underscoring the importance of well-functioning recovery units(10) . Overall, the quality of care provided in the PACU is dependent on adhering to standards in three key areas: personnel, equipment and facilities, and the necessary environment. Thus, for the delivery of optimal services, the unit must be equipped, structured, and staffed in accordance with up-to-date standards (11). Accordingly, we aimed to develop a checklist based on current global standards to assess the extent of adherence to functional, structural, and equipment standards in post-anesthesia care units at educational medical centers affiliated with Mazandaran University of Medical Sciences.

Method

The present study is a descriptive-analytical cross-sectional investigation that focuses on assessing the adherence to functional, structural, and equipment standards in post-anesthesia care units (PACUs) within the educational medical centers affiliated with Mazandaran University of Medical

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Sciences during the year 1402 (Gregorian calendar equivalent: 2023-2024). In this study, the data collection instrument is a standardized questionnaire developed by Hanani and colleagues in 2018 (correlation coefficient: 0.88) (13). This checklist comprises three sections: equipment and facility standards, structural standards, and performance standards. Equipment standards are designed across five dimensions, encompassing respiratory-related equipment and facilities, blood circulation-related equipment and facilities, drug-related equipment and facilities, peripheral equipment, and equipment evaluation and safety. Furthermore, structural standards are structured in a single dimension, while performance standards are categorized into five dimensions: care management, transfer to the unit, admission care, in-unit care, and post-discharge care. Notably, scoring is binary, with "Yes" assigned a value of 1 and "No" a value of 0. In this study, scores falling between 0 and 45 are considered substandard, scores between 50 and 74 are deemed near-standard, and scores between 75 and 100 are regarded as meeting the standard.

Since the items related to the structural and equipment dimensions are assessable through a single observation by the investigator, after obtaining permission from the relevant authorities and acquiring ethical clearance, the investigator visited the PACUs of the medical centers and completed the relevant checklists. However, due to the nature of performance standards, which require multiple observations over time to be accurately evaluated, the performance-related checklist was completed in three separate instances. To prevent potential bias in staff behavior due to the researcher's presence, the investigator personally completed the checklist during the first visit. Subsequent visits were carried out by a research collaborator who was familiar with all aspects of the performance dimensions and data were collected. Data analysis was performed using SPSS version 20 software.

Results

In this study, five educational medical centers affiliated with Mazandaran University of Medical Sciences were evaluated. These centers included Imam Khomeini Hospital, Bu Ali Sina Hospital, Sookhtegi Zareh Burn Center, Fatemeh Zahra Cardiac Center in Sari, and Razi Hospital in Ghaemshahr. According to the data analysis, the mean age of the PACU staff was 36.43 years, and the average work experience of the personnel was 8.76 years. Furthermore, based on Table 1, it was observed that 67.8% of the individuals were married, and 84.2% had a background in nursing as their educational discipline (Table 1). Therefore, the results of this study indicate that out of the 5 educational and therapeutic centers studied, the following equipment and facilities: 2 centers, namely Fatemeh Zahra (SA) and Imam (RA) educational and therapeutic centers, were at standard level; 1 center, the Burn Center near Zahra's standard; and 2 centers, namely Bu Ali Sina in Sari and Razi in Qaemshahr, were below the standard. Additionally, in terms of structural aspect, 3 centers, namely Fatemeh Zahra (SA), Imam (RA), and the Burn Center met the standard criteria, while 2 educational and therapeutic centers, Bu Ali Sina in Sari and Razi in Qaemshahr, fell below the standard. This is while, in terms of performance aspect, all of the studied units, except for Bu Ali Sina Educational and Therapeutic Center in Sari, which had an average of 48% below the standard in the Management component and an average of 50% close to the standard in the Care-Acceptance component, were at a standard level across all components. Thus, there was a significant correlation between gender and field of study with the performance aspect, but no meaningful correlation was observed between age, marital status, work experience, and the performance aspect. Table 2 displays the level of equipment and facilities related to sections such as (Respiration, Blood Circulation, Medications and Injections, Ancillary Equipment, Evaluation, and Equipment Safety). Observing the results, for instance, the Imam Khomeini (RA) Educational

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and Therapeutic Center in Sari has equipment and facilities related to sections such as (Blood Circulation, Medications and Injections, Ancillary Equipment, Evaluation, and Equipment Safety) at a standard level (between 75 to 100), but equipment and facilities related to the Respiration section are close to the standard with an average of 76.62% (50 to 74). Likewise, in the Fatemeh Zahra (Heart Center) Educational and Therapeutic Center, equipment and facilities related to all sections are at a standard level.

"Table Number 3 illustrates the level of performance standards related to various dimensions (Care Management, Transfer Care, Admission Care, Stay Care, Discharge Care) within post-anesthesia care units. Based on the observed results, it is evident that for instance, at the educational and medical center of Bu-Ali Sina in Sari, the performance standards for dimensions such as Transfer Care, Discharge Care, and Stay Care are at the standard level. However, the performance standard for the Admission Care dimension (with an average of 50%) is close to the standard, and the managerial-care component (with an average of 48%) falls below the standard.

Discussion

Undoubtedly, adherence to established standards and protocols holds paramount importance in the context of healthcare settings. In the pursuit of maintaining a satisfactory milieu for both diagnosis and treatment, the adherence to these standards becomes pivotal. This is particularly true in cases involving the diagnosis and treatment of diseases that manifest rarely, posing challenges in terms of recognition and management. The implementation of proper standards not only ensures the smooth functioning of medical units but also fosters an environment where the diagnostic journey is navigated with precision, and treatments are administered effectively(12).

However, the scope of this adherence extends beyond routine medical scenarios. In instances where surgical interventions are warranted for such rare conditions, the significance of adhering to standards is magnified. Surgical procedures, by their nature, introduce an added layer of complexity and risk. Consequently, the adherence to established protocols becomes an even larger concern(13).

The statistical data analysis in this study ultimately revealed that approximately half of the post-anesthesia care units in affiliated educational and medical centers of Mazandaran University of Medical Sciences (2 centers out of 5) were below the standard level in terms of structural aspects and equipment facilities. However, the overall average performance of personnel in all 4 educational and medical centers met the standard requirements, except for the admission-Care and Management-Care components, which were close to standard (50%) and below standard (48%), respectively, at the Bu-Ali Sina educational and medical center in Sari.

In a similar study,reported that on average, the educational and medical centers of Iranian universities met the standard requirements in terms of functional, structural, and equipment aspects. However, when analyzed separately, they found that in one of the educational and medical centers, the respiratory care facilities were close to standard (63.64%) (13).

Furthermore, the other study stated that only 1.75% of nursing care provided to patients was of average quality, with only 2.45% of cases meeting good care standards. The researchers reported that 70.2% of respiratory care and 43.67% of safety-related observations were at a moderate level. Additionally, 64% of cardiovascular care, 51.8% of urinary system care, and 64% of neurological system care were of poor quality .

In another study by Abdollahi and colleagues, which examined teaching hospitals of Yazd University of Medical Sciences, they found that the quality of recovery unit care was generally acceptable due to the number of staff and adequate equipment available (14).

The current study's results indicated that approximately 40% of the studied educational and medical centers had substandard structural facilities. A similar study by Abdollahi and

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colleagues arrived at the conclusion that the condition of most recovery units did not conform to standard criteria, necessitating a revision and provision of resources to prevent post-anesthesia complications (14).

The study's findings revealed that the equipment and facilities related to various dimensions (respiration, hemodynamic circulation, medications and injections, peripheral equipment, assessment and safety equipment) were only up to standard in 2 of the educational and medical centers. Ansari.et al. also indicated in a similar study that after implementing a checklist and providing appropriate solutions, compliance with safety standards improved from 3.33% to 100%, facilities and physical equipment from 16.6% to 83.3%, documentation from 64.6% to 89.6%, and continuous patient monitoring from 79% to 91.6% .(15)

Based on the results of the Spearman correlation test in the present study, no statistically significant relationship was found (P=0.984) between the performance standard components and the total performance standards with age, qualification, and work experience of individuals. The outbreak of Coronavirus Disease 2019 (COVID-19) has cast a spotlight on healthcare facilities and their ability to safeguard patients and personnel. This discussion delves into the convergence of COVID-19 realities with the assessment of adherence to functional, structural, and equipment standards in Post-Anesthesia Care Units at the Educational Medical Centers of Mazandaran University of Medical Sciences during the year 2023(16). As it evolved into a pandemic, economies and global systems faced unparalleled disruptions(17) Guided by lessons from the pandemic, preventive strategies assume a critical role in ensuring safety within healthcare environments. For Post-Anesthesia Care Units, a nexus between COVID-19 prevention and adherence to standards emerges:

1. **Personal Protective Equipment (PPE):** The global demand for appropriate PPE, including masks, gloves, gowns, and face shields or goggles, has underscored the need to shield healthcare workers from exposure risks.

2. **Hand Hygiene:** Vigilant hand hygiene practices—vigorous hand washing with soap and water for a minimum of 20 seconds or use of alcohol-based hand sanitizers—form an integral layer of defense.

3. **Disinfection:** Consistent disinfection routines encompassing high-touch surfaces and equipment act as a barrier against viral transmission.

4. **Social Distancing:** In a setting where patient proximity is inevitable, ensuring a physical distance of at least six feet between individuals can contribute to mitigating transmission risks.

5. **Screening:** Rigorous pre-entry screening of patients and visitors for COVID-19 symptoms aligns with the broader strategy of containment.

6. **Education:** Empowering healthcare workers with education encompassing COVID-19 prevention, including symptom recognition and adherence to hygienic practices, is pivotal(18).

Considering the study's context, the correlation between COVID-19 realities and adherence to standards is crucial. This juxtaposition resonates with the statistical data analysis, revealing deviations from standards within Post-Anesthesia Care Units. The findings echo the global sentiment of striving for improvement in healthcare services.

The interconnectedness of healthcare units with global health crises extends beyond COVID-19. A holistic approach, as indicated by similar studies, spotlights the need for robust standards to prevent complications. Leveraging insights from COVID-19, such as the significance of equipment and facilities, can enhance standards compliance and patient satisfaction. These lessons drive an imperative for global standard compliance, promoting quality healthcare delivery and reducing ancillary costs. COVID-19 has illuminated the exigency for stringent preventive measures within healthcare settings(19-21). This urgency dovetails with the assessment of standards adherence in Post-Anesthesia Care

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Units. Recognizing the resonance between these realms is instrumental in formulating strategies that enhance healthcare quality and preparedness for a future marked by both pandemics and progress. Therefore, the development of post-anesthesia care services, including structure, equipment, facilities, and primary performance standards, seems essential considering the complexity of surgical and anesthesia techniques worldwide (22).

Conclusion:

according to the findings of this study, all centers were standard-compliant in terms of performance; however, among the 5 studied educational and medical centers, 2 centers met the standard requirements for equipment and facilities, one was close to standard, and one was substandard. Moreover, three educational and medical centers were standard-compliant in terms of structure, while two were substandard. These findings could provide relevant managers and officials with insights to formulate effective strategies for improving global standard compliance, thus enhancing the quality of healthcare services, reducing additional costs, and improving patient satisfaction.

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Ethical standards statement

This study was approved by Mazandaran University Medical Science (The study was performed in accordance with the principles of the Declaration of Helsinki

Conflicts of interest

No potential conflict of interest relevant to this article was reported

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Authors' contributions

All authors participated in the design of the study and approved the final version of the manuscript.

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Table & Figure:

Table 1: Descriptive statistics of demographic characteristics.

Variable		No. of respondents
Sex	**Male**	**(17%)۵**
	Female	**23 (83%)**
Marital status	**Single**	**9 (32%)**
	Married	**19 (68%)**
Major	**anesthesia**	**24 (85%)**
	Nursing	**4 (15%)**

Table 2: Standardization of Equipment and Facilities in Post-Anesthesia Care Unit Based on Checklist Dimensions in Each Center

Hospitals	"Components of espiratory Care Unit Facilities and Equipment"	Mean	Max	Min
	Respiration	%63	%63	%63
	Hemodynamic Circulation	%100	%100	%100
Imam-Khomeini	Medications and Injections	%۱۰۰	%۱۰۰	%۱۰۰
	Peripheral Equipment	%۸۰	%۸۰	%۸۰
	Assessment and Safety of Equipment	%۸۸	%۸۸	%۸۸
	Respiration	%۴۹	%۴۹	%۴۹
	Hemodynamic Circulation	%۵۰	%۵۰	%۵۰
Boo-ali-sina	Medications and Injections	%۳۸	%۳۸	%۳۸
	Peripheral Equipment	%۴۴	%۴۴	%۴۴
	Assessment and Safety of Equipment	%۴۹	%۴۹	%۴۹
	Respiration	%۱۰۰	%۱۰۰	%۱۰۰
	Hemodynamic Circulation	%۱۰۰	%۱۰۰	%۱۰۰
Fatemehzahra	Medications and Injections	%۱۰۰	%۱۰۰	%۱۰۰
	Peripheral Equipment	%۸۸	%۸۸	%۸۸
	Assessment and Safety of Equipment	%۸۹	%۸۹	%۸۹
	Respiration	%۷۴	%۷۴	%۷۴

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	Hemodynamic Circulation	٪۸۰	٪۸۰	٪۸۰
Zareh	Medications and Injections	٪۵۷	٪۵۷	٪۵۷
	Peripheral Equipment	٪۷۱	٪۷۱	٪۷۱
	Assessment and Safety of Equipment	٪۷۴	٪۷۴	٪۷۴
	Respiration	٪۵۰	٪۵۰	٪۵۰
	Hemodynamic Circulation	٪۴۶	٪۴۶	٪۴۶
Razi	Medications and Injections	٪۵۰	٪۵۰	٪۵۰
	Peripheral Equipment	٪۳۴	٪۳۴	٪۳۴
	Assessment and Safety of Equipment	٪۳۸	٪۳۸	٪۳۸

Table Number 3: Performance Standards of the Post-Anesthesia Care Unit, segmented by checklist dimensions in each center."

Hospitals	Functional Components	Mean	Max	Min
	Care Management	%100	%100	%100
	are During Transfe	%100	%100	%100
Imam-Khomeini	Care During Admission	%100	%100	%100
	Care During Stay	%100	%100	%100
	Care During Discharge	%5/89	%100	%79
	Care Management	%48	%48	%48
	are During Transfe	%100	%100	%100
Boo-ali-sina	Care During Admission	%50	%50	%50
	Care During Stay	%100	%100	%100
	Care During Discharge	%88	%100	%76
	Care Management	%100	%100	%100
	Care During Transfer	%100	%100	%100
Fatemehzahra	Care During Admission	%100	%100	%100
	Care During Stay	%100	%100	%100
	Care During Discharge	%100	%100	%100
	Care Management	%100	%100	%100
	are During Transfe	%94	%100	%88

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Zareh	Care During Admission	%100	%100	%100
	Care During Stay	%100	%100	%100
	Care During Discharge	%97	%100	%94
	Care Management	%100	%100	%100
	are During Transfe	%93	%100	%86
Razi	Care During Admission	%91	%100	%82
	Care During Stay	%100	%100	%100
	Care During Discharge	%5/89	%100	%79

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