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Efficient Transfer of Patients with Critical Illnesses from General Wards to Intensive Care Units

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Abstract

Transferring patients with critical illnesses from general wards to intensive care units (ICUs) is a crucial and time-sensitive process. This article presents strategies for improving the efficiency of patient transfers, particularly in hospitals where intensive care units are located in buildings separate from general wards. Patient transfers comprise several steps: physicians issue orders, relatives are notified, equipment is prepared, and medical staff coordinate. We identified three factors that influence transfer time: preparation time for bed transfer, time required for shift handovers, and time required for between-ward patient movement. Unfamiliarity with transfer routes and long elevator wait times were factors that also influenced transfer time. The following strategies were proposed: develop a standardized material checklist, design key notes for patient transfers, and optimize transfer routes. These strategies reduced transfer times by 40% to 43%. This study demonstrates that by addressing logistical challenges and streamlining relevant procedures, hospitals can enhance safety and quality of care during patient transfers.

Keywords

Critical Illnesses, Intensive Care Unit (ICU), Patient Safety, Time Management, Transfer Process Optimization, Patient Transfer

1. Introduction

Patient-centered care has been a central focus of health-care systems worldwide since the 1960s [1]-[8], and patient safety has become a key aspect of health care.

The Joint Commission of Taiwan region established standard operating procedures for between-unit patient transfers. Patient safety guidelines are reviewed annually, highlighting the importance of addressing safety concerns during patient transfer. Robust safety measures must be implemented to mitigate risks during patient transfers [9]-[11].

Patient transfers comprise several steps [12] [13] and require coordination between multiple individuals, who must pay attention to detail. A crucial task in patient transfer is ensuring that all necessary equipment is available and fully operational. Staff involved in a patient transfer must be well-prepared and capable of handling unexpected situations. Focus must be maintained, and location-specific protocols must be developed. During a patient transfer, immediate medical needs must be addressed. Health-care providers must be able to anticipate and mitigate problems that may arise during the transfer process. Nurses are at the forefront of this process and are responsible for managing all transfer-related tasks [14]. An efficient protocol that enables seamless coordination between medical team members should be developed to prevent clinical catastrophes resulting from delay. Effective communication and team-work are essential for optimizing patient transfers, minimizing complication risks, and ensuring patient safety.

In large health-care facilities, such as hospitals, transferring patients between units can be challenging [15]. Transferring patients between different buildings can be particularly challenging. Before initiating a patient transfer, nurses must notify all staff involved in the transfer, coordinate with family members, and gather essential equipment and supplies. These pretransfer tasks are time-consuming, increasing the likelihood of delays or errors in care delivery. The complexity of managing patient transfers in complex environments underscores the need for efficient patient transfer protocols. Thus, concerted efforts have been made to streamline patient transfer protocols. Pathways have been optimized, and time spent on logistical tasks has been reduced. By eliminating unnecessary steps and improving communication protocols, hospitals can reduce burdens on nursing staff, enabling staff to focus on patient care. Enhancing the efficiency of patient transfer can alleviate stress among staff and can improve patient outcomes by reducing delays in care, preventing potential errors, and ensuring timely treatment. The drive for improvement in logistics reflects a growing recognition that nursing efficiency and quality of care are directly associated with the effectiveness of transfer process management.

In this study, we explored key factors that influence the efficiency of patient transfer from general wards to intensive care units (ICUs). In our hospital, specific measures were implemented in 2022 to reduce patient transfer time. We subsequently validated the effectiveness of the implemented measures. Our objective was to optimize the transfer of patients with critical illnesses from general wards to ICUs.

2. Methods

To effectively transfer patients with critical illnesses, a general standard operation

protocol is required. This study developed a protocol by reviewing evidence-based medical literature, analyzing patient charts, and gathering feedback from health-care professionals.

2.1. Factors Influencing Transfer Efficiency

Our hospital has two buildings (Buildings A and B). The ICU is located in Building A. Patients are moved into the ICU via a sky bridge. When a patient needs to be moved to the ICU, nurses inform the patient's family about the reason for the move and ask the patient's family to sign some paperwork. For patients who require oxygen therapy, nurses prepare the necessary equipment. Respiratory therapists are responsible for setting up ventilators and oxygen cylinders. Nurses prepare equipment, notify relevant medical staff, and document the following in their nursing records: patient vital signs, awareness level, and current medication. These tasks can be stressful.

Table 1. Respondent demographic characteristics.

		Number	Percentage (%)
Gender	Male	15	11
	Female	120	89
Education	Vocational high school	2	1.5
	College	58	43
	Bachelor	67	49.6
	Master	8	5.9
	Doctorate	0	0
Seniority	0 - 1	19	14.1
	1 - 3	27	20.0
	3 - 5	38	28.1
	5 - 10	31	23.0
	10 - 15	15	11.1
	15 - 20	5	3.7
Level of Training	N	31	23.0
	N1	45	33.3
	N2	44	32.6
	N3	8	5.9
	N4	7	5.2

Between May 15 and 30, 2021, a survey was conducted in our hospital to gather feed-back from colleagues on the transfer process. A total of 140 survey questionnaires were distributed, and 135 completed questionnaires were returned (recovery rate: 96.4%). The survey questions are listed in Table A1 (Appendix), and the distribution of respondents is summarized in Table 1. On the basis of the survey

results, factors that influence patient transfer were identified and divided into the following three categories:

1) Preparation time for bed transfer: Failure to prepare a list of required items resulted in incomplete preparation. Furthermore, staff unfamiliarity with the transfer process and slowness in bed preparation increased transfer times.

2) Time required for shift handover: The protocol for transfers varied across nursing units, extending the time required for procedure completion.

3) Time required for between-ward patient movement: Between-unit movement of patients required a long time because of the following reasons: the long distance between the ICU and other wards, the lack of a single transfer route, nurse unfamiliarity with transfer routes, and long elevator wait times.

Another survey on patient transfer time was conducted between June 1 and 30, 2021, on these three factors. Each transfer step was timed using a stopwatch. Transfer times are listed in Table 2. Total transfer times were 2810 s for Building A and 3512 s for Building B. Nurse seniority and training level affected transfer time. In general, senior nurses were better able to transfer patients than were inexperienced nurses. Nurses should follow the same procedure to maintain the proper transfer of patients. Respondents completed the questionnaire (Table A1) every month for further enhancement on the procedure.

Table 2. Time required for patient transfer to ICU.

Item	Task	Average time (s)	
		Building A	Building B
1	Preparation time for bed transfer	774	854
2	Time required for shift handover	1067	1252
3	Time required for between-ward patient movement	969	1406
	Total time required for ICU transfer	2810	3512

2.2. Development and Implementation of Transfer Strategies

The following factors extended transfer time: unfamiliarity with transfer processes, unpreparedness, variations in transfer protocols across wards, unfamiliarity with transfer routes, and prolonged elevator wait times. The following strategies were developed and implemented to optimize the patient transfer process:

1) A standard material checklist was developed for patient transfer (Appendix Figure A1). The checklist covered every step of the transfer process and contained information on relevant contacts, material preparation, bed confirmation, and patient lists in the computer system. All staff were required to use the checklist to avoid the use of incorrect materials and delays due to unpreparedness.

2) A reminder card was designed for bed-turning processes and attached to the shift schedule. On the basis of the actual bed-turning process and after discussions with colleagues, the entire process of bed transfer was described on a small card. This card improved familiarity among colleagues and described the process in an

easy-to-follow way.

3) A standard ICU transfer protocol was established on the basis of insights from a meeting with a nursing supervisor (Appendix **Figure A2**). The protocol was introduced during a morning ward meeting and then implemented.

4) Optimal transfer routes were identified. Site visits were conducted to examine routes. Optimal routes between Buildings A and B were identified and communicated to staff members (Appendix **Figure A3**).

5) A practical training session on elevator operation was conducted by the general division of our hospital. Nurses were shown how to correctly operate an elevator and were given an opportunity to ask questions.

The checklist helped nurses ensure that all essential items had been prepared. The reminder card served as an accessible guide. The ICU transfer protocol was developed in discussions with relevant personnel. Consequently, the protocol was highly applicable and reduced disputes between units. Disputes between units were not reported between July 1 and September 30, 2021. After the identification of efficient transfer routes, the transfer time decreased considerably. A survey was conducted among 31 staff members, 29 of whom were fully familiar with the revised procedures.

To further optimize the procedure, we arranged a seasonal check of the procedure based on the following:

1) Doctors are responsible for determining how urgently a patient requires transfer to the ICU. Doctors consider the following information when determining urgency: patient status, case background (patient issues, whether a body check has been performed), case assessment (evaluation based on situation and background), surgery, and other notes.

2) Staff performing a transfer must be trained in both basic life support and advanced cardiac life support. Being qualified in this way ensures that staff can overcome critical issues that may arise during a transfer. Additional training regarding dealing with potential issues may also be necessary [16].

3) The ICU is required to check the completeness of data provided by the ward. A checklist is used for this purpose [17].

On the basis of the aforementioned core concepts and potential changes in the layout and resources of the hospital, further optimizations to the patient transfer process can be made in the future.

2.3. Strategy Implementation in Different Hospitals

The proposed strategies can be adopted in any hospital, regardless of layout. The strategies are as follows. First, the patient's condition must be assessed to determine how urgently the patient requires transfer to the ICU. Second, a standard material checklist should be used to ensure essential materials and equipment have been prepared. Examples of items on the checklist are pump settings, medicine details, monitoring details, and life support details. Third, distance to the ICU should be considered. To minimize transfer time, elevators must be efficiently operated, and the hospital must be effectively controlled. Clinicians should keep the

following in mind to ensure transfer efficiency.

1) Pretransfer evaluation of patient condition is essential.

2) Staff must be familiar with the patient transfer procedure.

3) Recording of the transfer procedure and handover mechanism are needed to ensure the robustness of general procedure. These are required to be kept in the form of hard-copy to ease the process.

4) Long-term monitoring indices need to be recorded and discussed regularly to enhance quality and effectiveness.

By following the procedure for building the transfer plan and checklist, the morbidity or mortality of the patients can be effectively reduced.

The major challenges of implementing the proposed strategy are proper training of the participants, arrangement of the standard route, and building the checklist of required materials. These can be solved by following the information discussed in this section.

3. Results

The effectiveness of the implemented strategies was evaluated between October 1 and October 31, 2021. For this, changes in the three identified factors were assessed: preparation time for bed transfer, time required for shift handover, and time required for between-ward patient movement. We recorded the time taken for patient transfer in each ward; the results are presented in Table 3. In Building A, the total time required for ICU transfer decreased from 2810 to 1686 s (40% reduction). In Building B, the total time required for ICU transfer decreased from 3512 to 1996 s (43% reduction). Overall, the total transfer time for each patient decreased from 3161 to 1832 s (42% reduction).

Table 3. Time required for bed transfer after the introduction of the checklist.

Item	Task	Before Usage		After Usage	
		Building A	Building B	Building A	Building B
1	Preparation time for bed transfer	774	854	356	446
2	Time required for shift handover	1067	1252	832	668
3	Time required for between-ward patient movement	969	1406	498	882
Total time taken for ICU transfer		2810	3512	1686	1996
	Reduction			40%	43%

We asked doctors and nurses involved in patient transfers to self-evaluate their knowledge about and ability to perform the following parts of the patient transfer process.

1) Evaluating the patient's condition.

2) Informing the receiving unit to prepare medicine.

3) Checking if the level of transfer is properly set.

4) Verifying that monitoring and life-supporting facilities have been checked by a doctor and have been properly set up.

5) Checking that pumps are properly operating and that enough medicine has been prepared.

6) Being ready to deal with unforeseen emergencies.

The participating clinicians scored close to 100% (no less than 96%) in their knowledge on the aforementioned items at every month for 2 years (Figure 1). This grasp of the process has helped reduce morbidity and mortality during patient transfers to 0% compared to the past.

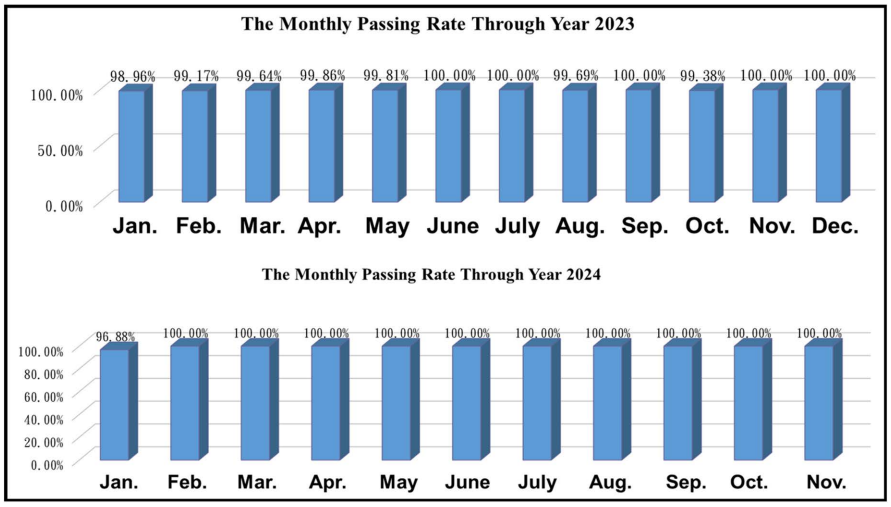

Figure 1. Passing rate of the survey information.

4. Conclusion

Our strategies can be implemented in any hospital to optimize patient transfers. This study may guide healthcare professionals in assessing current patient transfer protocols and evaluating the effectiveness of improvement measures. The proposed strategies can help reduce nurse workloads and minimize errors during patient transfers, such as missing of materials or deceleration of transfer due to the wrong arrangement of transfer route, thereby enabling nurses to focus on patient care and safety.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Questionnaire for the internal survey.

☐ Male/☐ Female	Level: ☐ N/☐ N1/☐ N2/☐ N3/☐ N4					
	Item/Grading	1	2	3	4	5
Determining patient condition	I can easily identify the level of illness of the patient to be transferred					
	I find the regulations for patient transfer clear and easy to follow					
Transferring unit	The checklist can help me to prepare all the materials efficiently prior to the transfer.					
	I am capable of using the record sheet of transfer sheet properly.					
	My colleagues can correctly coordinate a transfer.					
	My colleagues are completing the handover sheet correctly after implementing the new procedure.					
Receiving unit	I can efficiently check the handover information with the transferring unit.					
	The checklist and notes are clear and help me to prepare materials before transferring the patient.					
Average grading						
Signature/Date						
Suggestions of improvement						

Hospital Transfer of Critically Ill Patient's Confirmation

Date of enactment: 2021June

Year Month Day Patient Name: Chart number: Bed number:

Patients with severe conditions (check by a physician):
□ use of respirators by ≦ 80mmHg □SBP unstable □ mental confusion □ poor condition after surgery cases
□ ICU transferred out and in □ critically ill patients have been informed patient □ other:

Execution escorts (check by a physician):
□Physicians□Nurses□ respiratory therapist □nurse practitioner □ Other:

The transport department (check by a physician):
□ Ordinary ward →ICU □ Emergency room→ ward □ ICU→OR □ ICU→RCC □ ICU→inspection Unit
□ ICU→Ordinary ward □ Emergency room→ICU□ OR→ICU □ inspection unit→ICU □RCC→inspection Unit
□RCC→ICU □ Other:_____

Critically ill patients during transport equipment needed to carry: (Checked by a physician)	Nurses confirmed functioning "□"	Turn the unit personnel signature	Signature escorts
□Ambu	□tight fitting □joints without leakage □function well		
□Mask	□no damage □in close contact with patients on the cheek		
□ oxygen cylinders, and the balance is greater than **40** kg / cm ^{2}	□ oxygen flow meter function well		
□ oxygen concentration monitoring	□Power supply adequate □monitoring well		
□EKG monitor	□Power supply adequate □monitoring well		
□Defibrillator	□Power supply adequate □function well		
□ infusion pump systems and power	□Power supply adequate □correct infusion rate		
□ Ventilator	□Power supply adequate □correct parameters		
□ Other:			

Attending signature:

Figure A1. Standard material checklist.

Case Single Shift

Case shift Sheet	□Yes □No , constraints	□Yes □ No , isolation
	□left □right □No hand forbidden treat	□ at their own expense □ health insurance

Introduction

Attending physician		Diagnosis	Primary diagnosis: _____ Past history: □ DM □ HTN □ Other _____		
Admission date		Surgery Date: Surgery name:		Allergies	

Situation

High risk of invasive □ treatment □ Examination □ surgery	
High risk of invasive □ treatment □ Examination □ surgery	

Background

Indwelling catheter drainage tube &	Self-medication / high alert drugs / chemicals	□ Yes □ No, prepare transfusion consent	
*CVP: _____~_____ *PCA:_____~_____		Date	Blood products
*Port-A: _____~_____ *pump set: _____			
*NG: _____~_____ : _____Fr.			
*Tr : _____~_____ : _____Fr.			
*Endo: _____~_____ : _____Fr.			
*H/V: _____*JP:_____			
* Other:_____			

Assessment

Vital signs & other disposition of measuring time	Respiratory Therapy
TPR / RP: GCS / Pupil size: Muscle power:	Oxygen ways: Cannula: _____ l / min; Mask: _____: l / min Other: _____ Inhalation: _____ Ventilator:_____ / _____ / _____

Recommendation

Treatment and disposal project

Figure A2. Standard ICU transfer protocol.

Turn the bed moving lines, The shortest route tables turn the bed (to the highest floor, for example, 11 F)

Building A (No. 1 or 2 main elevators)

Bed turn route - the unit →the rear of Building A, No. 1 or 2 elevator→ via dedicated control keys take the elevator → to the ladder → out of the elevator by the promenade →Building A, 11th Floor, (290 seconds).

Return route -- Building A, 11F →through the gallery floor → Take the elevator → rear Building A, elevator, the No. 1 or 2, to the 3rd floor → the unit (293 seconds).

Building A (No. 3 or 4 main elevators)

Bed turn route - the unit → the front of building A, 3 or 4 lifts → take the elevator →via dedicated control keys take the elevator to the ladder → 11th Floor, Building A, (100 seconds).

Return route -- Building A, 11th Floor → take the elevator →front of building , NO. 3 or 4 elevator, to the 3rd floor → units (105 seconds).

Building B (No. 1 or 2 main elevators)

Bed turn route - the unit → through the air corridor →Building B, No. 1 or 2 rear elevator → via dedicated control keys → take the elevator to the ladder →out of the elevator by the promenade →11th Floor, Building B (330 seconds).

Return route -- Building B, 11th Floor→ Corridor through →Building B, No. 1 or 2 rear elevator → through the air corridor → unit (350 seconds).

Building B (3rd or 4th main elevators)

Bed turn route - the unit → through the air corridor → front of Building B, No. 3 or NO. 4 elevator → via dedicated control keys take the elevator to the ladder →Building B, 11th Floor, (300 seconds).

Return route -- Building B, 11th Floor →front of Building B, No. or NO. 4 elevator → through the air corridor→ units (259 seconds).

Figure A3. Planned transfer routes.