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Cross-Training Nurses in Karachi's Tertiary-Care Hospitals: Impact on Patient Boarding Times

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Abstract
The current study seeks to examine how cross-training of nurses affects the boarding times of patients in Karachi tertiary-care hospitals in Pakistan. With the support of cross-training, the research examines the current possibility to increase the operational efficiency and minimize delays in treating patients by diversifying the roles of the nurses. An assessment of the effect of cross training on boarding times of patients used a quasi-experimental pre post design. The most critical research question addressed is; does, or does not, cross training of the nurses at the tertiary-care hospitals in Karachi result in reduction in the boarding times of patients? The data was obtained in two tertiary-care hospitals in Karachi after a six months' time frame. The study used a sample of 100 nurses, 50 of whom are part of the experimental group (the cross-trained nurses) and 50 nurses in the control group. The amount of patient boarding time was measured, as well as the performance of professional tasks by nurses and the level of patient satisfaction. Regression analysis was also used to measure the effect of cross-training on boarding times that gave consideration to the size and workload intensity of the hospital. The practice of cross-training led to a 15 percent reduction in the times when patients board ($p<0.05$). Moreover, the efficiency of nurses in performing their duties rose by 12%, and the number of patient satisfaction marks rose to 10%. The strategy of cross-training of nurses alleviated the boarding time of patients and enhanced operational efficiency within the hospitals of Karachi. The study proposes cross-training as one of the viable methods in any hospital to enhance operations and patient outcomes. Data was taken in two hospitals, and 100 nurses took part in the study in six months. The cross-training method decreased the number of patient wait times in the boarding system by 15 percent and the patient satisfaction level went up markedly by 10 percent. The type of cross-training can make hospitals very efficient and eliminate the delay of patients. The study provides information about the impacts of cross-training in the Karachi healthcare system, the field that has never been researched before in the literature.

Keywords: *Cross-Training, Time of the Patients Boards, Efficiency of the Hospital, the Roles of Nurses, Patient Satisfaction, Karachi.*

Introduction

Optimizing the patient flow is the main issue of concern of healthcare systems globally, especially in tertiary-care hospitals which address large numbers of patients. Such hospitals play a key role in the delivery of specialized healthcare services whereas they are usually affected by inefficiency challenges in their operation because of slow turnaround time during boarding patients. In a city such as Karachi where the pressure on the hospitals is ever high with a collection of patients visiting the hospital, a hold up in boarding of patients may result into overcrowding, long queues and vested resources. The latter not only worsens the care given to patients but also leads to higher health expenditure and lower patient satisfaction (Masuda et al., 2022).

Patient boarding time, how long it takes patients to be assigned to a care unit once they have arrived in the facility, is one of the most important measures which has a direct influence on the level of efficiency in the hospital. In the tertiary-care hospitals in Karachi, excess transfer of patients to boarding wards has caused operational queues in most of these hospitals hence it is not easy to maximize the use of the available resources in the hospitals. Such determinants as poor staffing, poor distribution of work, and the insufficient number of beds contribute to these delays (Becker et al., 2023). As an antidote, the concept of cross-training as defined as the practice of teaching nurses and other medical care giving professionals to execute different roles in various units has been touted as a possible approach to make operation more efficient by enhancing the flexibility of work force operations.

Cross-training allows nurses to become more flexible in terms of changing patient demands and they can unite their efforts and rotate in various roles and different departments where the workload is the highest at that given moment. As an example, a cross-trained nurse (trained to work on an emergency unit and a general medical unit) may be redistributed between these departments as patient needs increase or decrease (at such points when patient volume in any of the emergency care or general medical departments rises or drops). As a result, bed wait and wait times can greatly decline, in turn improving the overall experience of patients. This strategy has the potential to result in better usage of hospital resources, fewer bottlenecks in the flow of patients, and eventually, better patient care outcomes (Liu & Zhang, 2021).

Even though cross-training has been widely researched in western medical facilities, not much research is done on how it is effected and implemented in the developing world: Pakistan. The available literature largely concentrates not on high-income countries but on the countries with the highest rates of income (Becker et al., 2023). The high-income countries are already enjoying the benefits of high-level technology and the presence of a well-developed healthcare infrastructure. Nevertheless, the situation in the hospitals of low- and middle-income countries is unique and may be challenged by the lack of resources, staff shortage, and excessive strain on healthcare systems, which demands special treatment. Cross-training and its influence on the time accorded to patients when boarding at tertiary-care hospitals has never been examined deeply in Pakistan and this is a big gap in the literature. This paper seeks to fill this gap by analyzing the possibility of reducing waiting time of patients and overall performance of hospitals in Karachi through cross-training of nurses in tertiary-care hospitals.

According to the studies carried out by Becker et al. (2023) and Liu & Zhang (2021), cross-training increases the flexibility of the workforce, the efficiency of nurse tasks, and leads to superior performance of the hospital. When cross-trained teams exist, they are capable of better responding to unforeseeable surges in the number of patients, i.e., patient demand during business hours or a potential health emergency. Also, the cross-training will enable the healthcare providers to cover gaps left by the shortage of personnel which helps in alleviating workloads and preventing delays in healthcare delivery (Masuda et al., 2022). Results of this research highlight the advantages of cross- training in enhancing efficiency with which a hospital operates therefore cross- training is an appealing strategy to Karachi hospitals.

In this paper, two major theoretical theories including behavioral operations theory and resources orchestration theory have informed the study. The theory of behavioral operations is proposed by Becker et al. (2023), according to which cross-training has a positive effect on enhancing the functioning of the team, decision-making process and how healthcare workers communicate,

collaborate, as well as changes adaptability. The talent of nurses to operate under multi-roles sets the efficiency of their task such that the positive result is the enhanced coordination and speed in which decisions are made during the care of a patient by the nurses. Resource orchestration theory, which was formulated by Sirmon et al. (2011) on the other hand points out the fact that effective management of human resources is very essential. The theory continues to state that most nurses, who have been cross-trained, are more flexible and can perform various duties, and they are in a better position to respond to the variation in workloads and eventually achieve better use of resources and minimal operational delays.

Since previous literature has shown serious lack in detail on the effect of cross-training in the hospitals in Karachi, this study aims at finding out whether cross-training can help in decreasing patient boarding time and enhance efficiency of the hospitals in the setting. Hypotheses of the study are the following ones:

H 1: Cross-training of nurses leads to a decrease in the boarding time of patients in tertiary-care hospitals.
H2: Cross-training helps in improving the efficiency of nurses in their tasks as well as patient satisfaction.

The study seeks to test these hypotheses through the exploration of how nurse cross-training is likely to impact on the operational performance and patient outcomes and this will be a welcome addition to the growing pool of research literature on management of healthcare workforce especially in a developing country.

Literature Review
Cross-Training: In healthcare, the form of cross-training involves training employees (especially nurses) to do several jobs in the organization. This will make the work force more versatile and improve the overall performance of a team. Cross-trained personnel can change their priorities regarding different tasks and divisions in compliance with the needs of the patients, and combine the overall flexibility and responsiveness of the healthcare system (Patel & Gupta, 2019). Cross-training enables hospitals to solve the problem of sudden change in workload and this is indeed important in an area such as tertiary-care hospital which deals with so many patients.

Cross-training in nursing can benefit the respective individual nurse competencies as well as the performance of the team. Staffing is no longer a problem as nurses who have been trained in various departments can easily take up the place of the vacant department or position in the department that is highly demanded. This may result in a higher level of nurse satisfaction, due to the more versatile set of skills a nurse will possess, as well as overall higher levels of efficiency in their care of the patients (Nguyen et al., 2020). Also, cross training minimizes the number of specialized workers through which a bottleneck is likely to occur when few nurses have been trained in certain tasks. According to O Neil and Williams, cross-training among nurses results in a quality patient care environment since the cross-trained nurses can reduce the number of patients affected by wait times and a lack of coordination between various units in a hospital (O Neil & Williams, 2018).

Studies show that the application of cross-training may be quite useful during emergencies, or when large volumes of patients are expected, like in health crises, or flu seasons. Cross-trained nurses in hospitals lead to fewer delays in care delivery due to the ability of the staff to frequently

switch to roles, when necessary, thereby enhancing patient throughput (Masuda et al., 2022). Cross-training also help to present a more flexible and agile work force and this has become very important in ensuring quality care in high-stress and fast-paced units like emergency care or intensive care areas.

Patient Boarding Time: Patient boarding time is the amount of time taken between the point at which a patient reaches the hospital and when he or she is placed in an ideal care unit. It is a very important performance indicator in the work of a hospital because a delay in patient boarding may significantly carry repercussions to the outcomes of patients boarded and to the efficiency of the hospital. The association of such longer boarding times was related to different adverse effects, such as overcrowding, delayed treatment among others, and a decrease in patient satisfaction (O'Neill & Williams, 2018).

According to research by O Neill and Williams (2018), long boarding rates are related directly to the congestion of the hospital. Patients waiting too long before their assigning to a care unit result in inefficiencies, as patients are not getting the proper care when they need them, and all the hospital resources (beds and employees) are not being utilized to the fullest extent. Patient dissatisfaction due to such delays may cause a far-reaching impact on hospital rankings and can also cause poor patient outcomes, especially in cases of critically ill patients who have acute needs.

Increased boarding time also combines with other system weaknesses in hospital systems, thereby worsening system inefficiencies. As an illustration, when patients are poorly served and have to wait a long time, it can interfere with their processing through different care phases, delaying procedures in other units, i.e., diagnostic testing, surgery, or discharge planning (Nguyen et al., 2020). The length of time spent by patients waiting to board is, hence, a crucial part of streamlining the running of a hospital.

The significance of the reduction of patient boarding time within hospitals has motivated a number of research studies regarding the ways to increase the efficiency of the operations. One of these strategies that have been seen as the possible solution is cross-training. Not being able to process enough tasks on the one hand, and the lack of ability to collaborate with other members of staff on the other, slow down the flow of patients and let to delays in their boarding (Patel & Gupta, 2019).

Hypothesis Derivation

The paper will utilize the Resource Orchestration Theory to have the hypothesis that hospitals can improve the efficiency of their operations by cross-training and using the effect to decrease patient boarding time and in turn, improve the efficiency of the hospital. According to Sirmon et al. (2011), resource orchestration theory focuses on how to manage resources (especially the human resources) in the manner that leads to high performance of the organizations. The nurses who fulfill different roles in various departments will be the resources in the context of the hospitals. Cross-training of these nurses will enable hospitals to have greater flexibility in the resources, which will enable the change in demands to be fast. This means that the patient boarding will reduce since the nurses are able to change units based on the number of patients assigned per department at the moment.

Nurses that are cross trained can work in several places in the hospital, which removes the reliance on certain areas or experts. The result of such flexibility is accelerated decision-making, switched-on communication among departments, and, ultimately, speed of processing patients. Dynamic nurse allocation by the movement of nurses to align with the pace of patients in any given department e.g. in the emergency or intensively care unit is a major determining factor in delay reduction (Becker et al., 2023). It is therefore hypothesized that cross training the nurses will help decrease patient boarding time, in that they will be able to take up any important roles where their presence will be mostly required therefore enhancing efficient performance of the hospital.

Alternative Explanations

Workload Intensity: The other possible reason behind the delays in the time taken to board the patients in a hospital is the workload intensive nature of a hospital. The larger the patients in a hospital, whether it is the one that encourages cross-training or not, the longer are the boarding times because of the numbers alone. According to Shaw et al. (2020), the hospital that faces severe patient capacity may not be able to accounted down boarding time via cross-training alone since there can be a mass of patients that will confuse the system. When this happens, flexibility in staffing would not be enough to tackle the causes of boarding delays, on the one hand.

Technology Integration: The second possible reasoning is the significance of the technology integration used at decreasing patient boarding times. According to Poon et al. (2017), the efficiency of cross-training has a chance to be improved greatly once the advanced technological tools (patient tracking systems, real-time bed management, and electronic health records) are incorporated into cross-training. When there is advanced technology installed in a hospital that makes the process of patient admission, tracking and allocation easier then the impact of cross-training might not be so significant in short-boarding times as it would be the case with a hospital that does not have such advanced technology installed. The technology-cross training synngergies will probably play a significant role in the enhancement of the patient flow.

Control Variables: This study takes into account some of the control variables in order to investigate more about the effectiveness of cross-training. The size of the hospital, the number of patients served in the hospital and the ratio between nurses and patients may all play a role and affect the amount of time that patients spend in the boarding process regardless of the cross training intervention. According to Liu & Zhang (2021), busy hospitals with a great number of patients may have longer times at boarding regardless of cross-trained employees because of a lack of resources. On the same note, hospitals with low ratios of nurses to patients would be in a poor position to undertake the measures of cross-training due to lack of enough workers to train the nurses on various tasks.

As seen in the literature, cross training is capable of enhancing the flexibility of hospital personnel, making them more efficient and the process of boarding patients more optimistic and reducing the number of boarding patients in hospitals, and of course, patient satisfaction. The impact of cross-training in healthcare can be described in a holistic perspective using resource orchestration theory as well as other explanations of how workload intensity and technology integration help in explaining the effects of cross-training in healthcare. Future research however needs to get deeper into these variables to establish the best conditions under which cross-training can be used to ensure that there are no delays in the patients and that the hospitals are efficient as well.

Methodology

In this study, the two tertiary-care hospitals in Karachi, Pakistan were used because the facilities experience high patient numbers as well as different levels of nurse training. These hospitals are good environments to investigate the outcomes of cross-training on productivity in the hospital, both because they offer essential healthcare services to a huge population, and because critical care patients are common in the hospital. Since currently the demand of the healthcare services is very high and the problems that they have include poor resource distribution and shortage of specific personnel, the study looks into the potential of cross-training nurses to match tasks performed across departments to alleviate some of the current operational challenges and streamline the overall workload (Horwitz & Dufresne, 2021).

The information was gathered using archival data files of the hospitals; data entailed the times taken to board the patients, accomplish the tasks, and customer satisfaction with the nurses. The identification of patient boarding time, as the time spent by the patient between admission to hospital and placing the patient in care unit was found in the hospital admission archives. There was also the collection of efficiency of the nurses and evaluation of the supervisor on task completion. Even the questionnaires were distributed between nurses and patients: nurses were questioned about their efficiency when performing their tasks, how satisfied they are with the job and how the cross-training may affect their work, and the patients were interviewed about the satisfaction with their waiting time and experience in general in the hospital. The two surveys involved a 5-point Likert scale to reflect on the detailed perceptions (Smith et al., 2017).

There were 100 nurses comprising the sample with 50 being in the experimental group (and receiving cross-training between various departments of the hospital) and 50 in the control group (and assigned to their original departments). G*Power analysis established that 50 participant per group would be sufficient in terms of sample size to capture medium sized effects (Cohen d = 0.5) with statistical significance.

The performance in cross-training was determined by evaluating the efficiency of the task before and after cross-training by a scale constructed on the basis of the available literatures (Kaplan & Norton, 1996). The effect of cross-training on hospital operations was considered as the primary outcome variable, that is the time of patient boarding. The results of patient satisfaction were recorded on a Likert scale that included satisfaction regarding wait time, the whole experience, and quality of care.

The research study employed a difference-in-differences (DiD) model that was used to determine the effects of cross-training on the time taken in patient boarding. This was done by correlating variations in boarding time between the experimental and control groups pre and post the cross-training intervention, with confounding variables such as a change in hospital policy or a change in the patient volumes (Lee et al., 2019). Moreover, the placebo-tests and propensity score matching, which are robustness tests, were used to increase the validity of the results and address the possible bias in the selection (Rosen et al., 2020).

All the research was carried out with the approval of the hospital ethics committees and all subjects gave an informed consent. The answers given by the patients were anonymized and secret to provide privacy (Shaw et al., 2020).

Results

The study provides mainly evaluations of how cross-training affects patient wait times to be on board and the efficiency of the task completion by the nurse. The use of descriptive statistics provides a basic knowledge of the data prior to the cross-training intervention and after the implementation.

Pre-Training: The time taken in the non-use of the cross-training program was 120 min (SD = 15). The same baseline value correlates with other observations based on finding high waiting times of patients in tertiary-care hospitals where patient boarding is prone to delays (Owing to the high patient volume and the resource-use level demands of providing the care) (O'Neill & Williams, 2018). The standard deviation of boarding times (SD = 15) indicates the level of variability in efficiency and directs that disparity may have been especially prolonged in certain parts of the hospital.

Post-Training: The mean interventional of the cross-training had been incorporated to an average of 102 minutes (SD = 12). With the 18 minutes now lower, or a 15-percentage decrease, it can be howled that the efficiency of the hospital in its operations has been positively impacted due to the cross-training program. The standard deviation also reduced thus implying that after the intervention, the time taken in boarding patients became consistent throughout the hospital. The reduced variability after the training process is an indication that the workforce became more productive with the cross trained nurses, in a position to efficiently facilitate patient flow within distinct departments (Kaplan & Norton, 1996).

The following descriptive statistics give concise preliminary evidence that cross-training was positively influential in improving the times of boarding patients. It is followed by the confirmation of the statistical significance of this change.

Hypothesis Tests: Two principal hypotheses were tested to manage the effectiveness of the cross-training effect on the boarding of patients by the nurses and efficiency of their tasks. To conduct the statistical analysis of these hypotheses, a regression modeling was provided, in which a wide range of factors within the hospitals were controlled, and these can subsequently affect the outcomes.

H1: The initial hypothesis was that cross-training would decrease patient boarding time of tertiary-care hospitals. This is because results of the regression analysis indicated that cross-training took 15 percent less boarding time with patients ($p<0.05$, 0.18). This is a statistically significant finding ($p<0.05$), indicating that there is an impactful role of cross-train in terms of decreasing the delays in boarding patients. The results correlate with the existing literature, which indicates that the flexibility of the workforce that is considered to be the process of cross-training among its members can improve the efficiency of operations in a hospital and, therefore, reduce patient waiting time (Becker et al., 2023).

H2: The second hypothesis was the extent to which cross-training will result in a rise in the efficiency of tasks of nurses. The outcomes displayed an increase in the speed of the task completion by 12% (20, $p< 0.05$). Such a marked increment in the efficiency of the tasks ($p<0.05$) means that cross-training did not only give a shorter wait time to patients but also a better general performance of the nurses. Such cross-trained nurses could perform a broader scope of work faster and more efficiently, which is also part of the efficiency of the hospital and the improvement of patient care (Nguyen et al., 2020). This observation is in line with findings

that have established that the versatility of tasks has the potential of minimizing inefficiencies through improved utilization of the allocated human resources (Patel & Gupta, 2019).

To guarantee the solidity of such findings, a number of robustness tests were carried out. Among them was the use of alternative estimators in order to see whether the findings were the same despite the statistical procedures. Besides, there were placebo tests that ensured that effects were caused by cross-training events rather than other extraneous factors that could be associated with the shift of the hospital policies or other events (Rosen et al., 2020). The findings were consistent across all the editorial checks and it can be concluded that the observed reduction in boarding times of patients and increase in the overall efficiency of the tasks performed by nurses were likely the effects procedural intervention that involved cross-training, rather than other factors.
These robustness tests can exclude the fact that the results have been spurious and they are reliable as to the truth of the findings. The study enhances the argument that cross-training produced a real positive impact on the performance of the hospital through a combination of techniques used in data analysis.

These findings of the study substantiate that the cross- training can positively influence the reduction of boarding times and an increased efficiency of task performance by the nurses in the tertiary-care hospitals located in Karachi. The sharp reduction in the number of boarding time on patients and the increase in the performance capabilities associated with the task allude to the fact that cross-training is a valid approach to improving operations at a hospital. These results can be used in the body of literature that indicates the advantages of the flexibility of the workforce and are subjected to practical implications offered by the research to administrators of hospitals who will be interested in implementation to enhance the flow of patients and streamline the processes. The future studies must keep addressing the need of the long-term effects of cross-trained and perhaps treat adopting the technological solutions to enhance delivery of care to more patients as they come.

Discussion

This research will be relevant to the behavioral operations theory since it will show how the process of cross-training may be used to enrich team dynamics and to perfect the decision-making process within a hospital facility. According to the belief of behavioral operations theory, the efficiency of a team depends on how people can be trained to complete different tasks and cope with various roles (Becker et al., 2023). Applying to the scope of this research hypothesis, cross-training of nurses in this case allowed them to alternate between different functions in the hospital and resulted in greater efficiency in teamwork. The nurses became more versatile and could react faster to the increase or decrease of patients, which also helped to decrease the time that patients needed to spend on boarding. Cross-training served to easier the flow of work in the hospital by enhancing task division and communication among the various sections as well as lastly led to greater delivery of care to the patients.

The results also correspond to the resource orchestration theory (Sirmon et al., 2011), according to which the strategic treatment of human resources plays a significant role in the performance of organizations. According to this theory, efficient and effective management of human resources as well as their deployment remains an important factor, particularly in high demand environments such as hospitals. Hospitals are lucky to have cross trained nurses since they have the capacity to provide most varieties of dispensations to customers, thereby allowing the hospital to adjust to the changing needs of the patients. As noted in this study, the better use of human

resource by way of cross-training does not only lead to an increase in efficiency but it also instigates the overall performance of hospitals, and it is observed as the 15 percent decreased patient boarding times. These facts confirm the assumption that cross-training may contribute to the management of resources more efficiently which, in turn, will help the hospital to achieve better performance and patient outlook.

The findings of this research present significant information to hospital administrators and healthcare managers who would like to improve their operational efficiency and improve the waiting times of their patients. The results indicate that cross-training is one of the effective organizational techniques that can be applied to enhance the efficiency of a certain hospital especially in a tertiary-care institution which is associated with high-pressure experiences. By being able to work in different departments and complete a range of tasks, nurses largely mitigate bottlenecks in the flow of patients, and patients are bumped to the board more quickly and experience higher satisfaction (Berg & Gable, 2021). The complexity of healthcare settings and the increase in volume of patients mean that cross training provides an elastic workforce able to respond to that which changes as a result of which there is a reduction in delays.

Additionally, hospitals ought to think of investing in cross-training in order to increase nurse versatility. Not only will this aid in delay reduction, but it will also promote better job satisfaction among nurses that will be considering more chances of developing competency and career growth (Masuda et al., 2022). Also, nurse job satisfaction and planning can be improved through the use of cross-training which involves increasing the skill sets of the nurses and this has a benefit of increasing job satisfaction and retention since the nurses feel that they are empowered and appreciated when they are capable of working in various roles at the hospital. The operational efficiency of hospitals and the morale of its staff are positively affecting by cross-training therefore the investment is both beneficial both financially and otherwise.

Although the findings of the study are encouraging, it is stated that there are some boundary conditions that one should take into consideration when generalizing findings. The research was based in Karachi in two big tertiary-care hospitals that might not reflect similar results in the smaller hospitals or under-resourced ones. Cross-training might not be as advantageous in the case of smaller hospitals, where the treatment does not involve very complex needs or where the number of patients and the range of services offered is minimal. Also, Cross-training programs are likely to not be conducted in all hospitals because first, smaller hospitals might not have the budget, and second, there might not be any employees willing or capable to engage in extra training (Shaw et al., 2020). Thus, cross-training can be an incredibly efficient strategy in big tertiary-care hospitals, yet the use of this practice in minor or less equipped healthcare facilities might be researched.

The possible extension of the study is to determine long-term outcomes of cross-training on nurse job, patient care consequences as well as hospital efficiency. Although this study has indicated how effective cross-training is in pushing down the length of time some patients spend on board and how efficient the nurses are enhanced in their performance, there is a need to look at the changes that linger on in the long run. The study of cross-trained nurses can study their role in terms of longitudinal studies, whether they work more efficiently over time and whether their job satisfaction does not deprive them of such benefits. Also, more studies can examine the impact of cross-training on the nurse retention rates and burnout because more job diversity can enhance job satisfaction or produce role overload.

Furthermore, the are decision that needs to be further researched is the role technology plays in facilitation of cross-training programs. The use of technological devices like electronic health records, patient tracking systems, and digital task management tools would even strengthen the potential of cross-training because the distribution of tasks would be structured faster, nurse performance would improve, and communication between different departments would rise. The study on the usage of technology in conjunction with cross-training as the means of streamlining the hospital operations and managing patient flow might also be the way forward in regards to the concept of managing the healthcare industry in the future (Kaplan & Norton, 1996). Also, future research must consider how the cross-training can be adjusted to work in a particular hospital setting, as well, researchers might take into account such factors like the size of a hospital, the age of patients, and the complexity of different departments.

Conclusion

The tertiary-care hospitals in Karachi have found cross-training nurses to be a successful method of decreasing the boarding hours of patients and enhance the quality of operations. Cross-training helps make the hospital flexible in terms of a multiplicity of duties performed in various departments by nurses, shortens wait time, and increases patient satisfaction. The results of the present study offer a good demonstration of the advantages of cross-training in large hospitals with high number of patients that implies the idea that this method could help to improve the hospital performance and patient care outcomes. Therefore, considering the positive outcomes, it is suggested that cross-training programs should be considered in the hospital; especially in the environment where the demand of the patients is quite variable on the one hand, and efficiency is an essential factor of the work, on the other hand.

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