

# Cost effectiveness of nursing handover: an action research

## Abstract

**Objective:** This study aimed to improve nursing handover and assessed the cost effectiveness of the intervention.

**Background:** Nursing handover is a substantial part of nurse's duty that is time consuming and costing, these factors may serve as an incentive to focus attention on a more efficient means of nursing handover in the fiscally challenged world of health care.

**Method:** This study conducted using an action research design during 2012 to 2014 in Iran. We did an economic evaluation from the nursing service perspective.

**Result:** Result showed that Strategies after the intervention compared to pre-intervention strategies reduced costs to \$309,641 and increased the amount of effectiveness to 0.45.

**Conclusion:** This study showed that Strategy after the intervention is a dominant strategy compared to before. Also it resulted in deep understanding of participants about principles of handover in real world through action and reflection.

**Keywords:** handover, nursing, cost effectiveness, action research

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Raheleh Sabet Sarvestani,<sup>1</sup> Abdosaleh Jafari,<sup>2</sup> Marzieh Moattari,<sup>3</sup> Alireza Nikbakht Nasrabadi,<sup>4</sup> Marzieh Momennasab,<sup>3</sup> Shahrzad Yektatalab<sup>3</sup>

<sup>1</sup>Student Research Committee, Shiraz University of Medical Sciences, Iran

<sup>2</sup>Instructor of Health Human Resources Research Center, Shiraz University of Medical Sciences, Iran

<sup>3</sup>Department of Nursing, Shiraz University of Medical Sciences, Iran

<sup>4</sup>Department of Nursing, Tehran University of Medical Sciences, Iran

**Correspondence:** Raheleh Sabet Sarvestani, PhD of Nursing, Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran, Tel 09173122634, Email Rahelhsabet@yahoo.com

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## Introduction

Nursing handover is the transfer of responsibility and accountability for patients care between nurses that conducted three times a day in most nursing wards globally.<sup>1</sup> It has been described as having different functions such as transfer of information as an overt functions and socialization, cohesiveness and release of frustrations and emotions as covert functions.<sup>2,3</sup> Each ward vary in their method of sharing information during handover, range from face-to-face verbal reports in the station or at the patient's bedside to written and taped reports.<sup>4,5</sup>

It is a crucial part of a nurse's duty that each nurse should allocate 38% of his/her working hours to conduct this process.<sup>6</sup> Research showed that the total nursing hours devoted to nursing handover each day in 1995 is seven. Consequently, the cost of nursing handover estimated at averages US \$181.72 per day for one nursing unit. Considering a hospital with 10 wards, a nursing handover translates into a cost of US \$1,817.20 per day, US \$12,720.40 per week, US \$50,881.60 per month, and US \$610,570.20 per year, so nursing handover is too way time consuming and costing.<sup>7</sup> Also, researchers showed that communication failures at handover are as a major source of error in hospitals (65% of sentinel events)<sup>8,9</sup> and ineffective handover could lead to delayed in diagnosis and test ordering, decreased patient satisfaction and increased hospitals complications,<sup>10</sup> but when nursing handover is done in an ethnically based manner, the quality and safety of patient care is improved, relationships are strengthened, and team efficiency and functioning are enhanced.<sup>11</sup> So in the fiscally challenged world of health care, these problems may serve as an incentive to focus attention on a more efficient means of nursing handover. To date, a variety of interventions for improving nursing handover is applied,<sup>12-15</sup> but since nursing handover is a multidimensional process it should be considered in action research study to insure that accurate information is collected and communicated at each step of the change process.<sup>14</sup> Action

research is a useful method for developing innovation, improving healthcare, developing knowledge and understanding in practitioners, and involvement in users and staff.<sup>16-18</sup> The participatory process is educative and empowering, involving a dynamic approach in which problem identification; planning, action and evaluation are interlinked and Knowledge may be advanced through reflection and research.<sup>19-23</sup> A key consideration in determining whether an intervention should be provided in a given hospital setting is whether the effects of a program justify the costs of providing that program and the benefits.<sup>24,25</sup> The most frequently used techniques for economic evaluation in health care is cost-effectiveness. It aims to inform health policy makers about the best way to allocate limited health care resources in order to obtain maximal health outcomes.<sup>26</sup> So, this study aimed to improve nursing handover through an action research study and asses the cost effectiveness of the program.

## Methods

**Design:** This study was an economic evaluation (cost-effectiveness analysis) conducted in parallel with an action research study from the nursing service perspective.

**Participants and setting:** The participants including 12 nurses, 2 diplomas, the head nurse and academic researchers as facilitators started the research in a pediatric ward during 20 month in Shiraz in the South of Iran during 2012 to 2014.

**Intervention:** The participants worked through two cycles of reflection and action for change. In the first phase, the facilitators and participants discovered the challenges of nursing handover. After that the participants reflected on their experiences and designed an operational plan and prioritized them. In this phase they participated in two workshops for empowerment in nursing handover. Third phase resulted in implementing action plan and immersing in action for change for about four months. At the end of the first cycle evaluation

was done. On the basis of the lessons learned from action and reflection in the previous cycle, second cycle started as participants reflected in group sessions. After that another operational plans designed and implemented. Finally the facilitators and participants evaluated the results.

**Measurement of costs:** The cost of the nursing handover was calculated by combining the number of nurses with the amount of time each has spent for the report process. We calculated the cost before and after the program. In this study, in order to facilitate international comparison we used US Dollar (USD). Based on Central Bank of Iran report, 12260 Rials (IRR) was considered as exchange rate in year 2012 (1 USD~12260 IRR) Furthermore Tree age pro 2011 software (Tree Age Software Inc., Williamstown, Mass.) was used for data analysis. Since this study lasted for about 1 year, we didn't consider discount rate anymore.<sup>27</sup>

**Measurement of effectiveness:** In this study, patient satisfaction was considered as effectiveness indicator and it was measured before intervention as well as after that. So, twenty-eight in-depth interviews (14 before and 14 after the intervention) were conducted with the families, who were selected through a purposeful sampling. The inclusion criteria were availability and willingness to complete the interview. A guide was prepared for covering key questions which were general with prompt to encourage responses during the interviews.

**Ethical considerations:** The ethics committee of University approved the project. Before study, the participants were informed of the aims and method of the study and that their participation was voluntary. Confidentiality was ensured so that no names were mentioned.

## Result

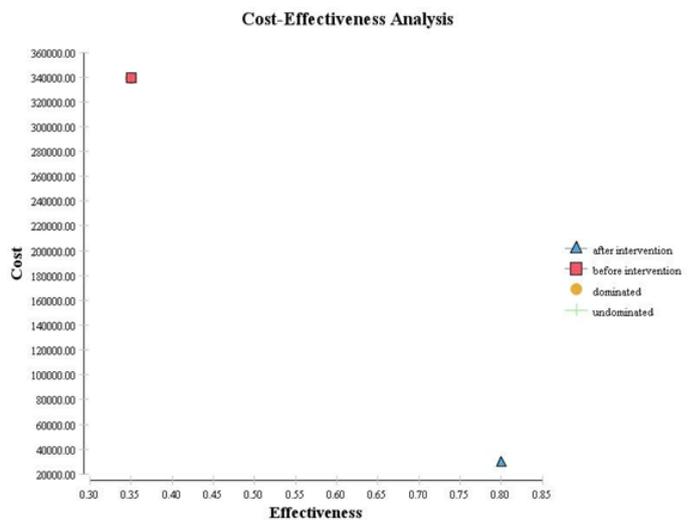
The analysis and comparison of interview with patients and families before and after the intervention showed a statistically significant increase in patient satisfaction from 35% to 80%. The results of cost and effectiveness before and after intervention are in Table 1. As it is shows, Strategies after the intervention compared to pre intervention strategies reduced costs to \$ 309,641 and increased the amount of effectiveness to 0.45. As a result it can be concluded that Strategy after the intervention is a dominant strategy compared to before intervention, i.e. less costly (309641\$ cost saving) and more effective (0.45) (Figure 1).

**Table 1** Cost and effectiveness before and after intervention

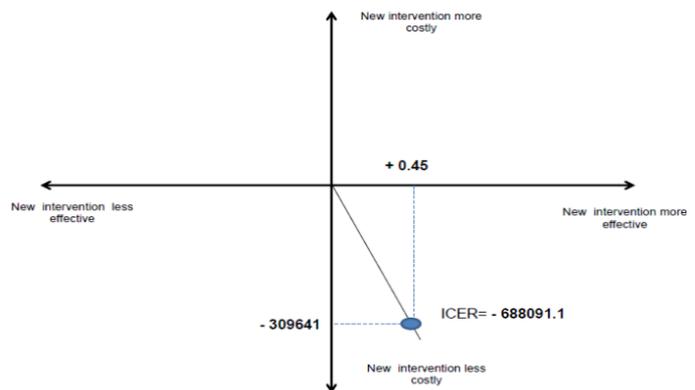
Program	Cost (USD)	Effectiveness	ICER
Before intervention	339152	0.35	
After intervention	29511	0.80	-688091.1
Difference	-309641	0.45	

The results of Cost effectiveness plane, before and after intervention shows in Figure 2. In this chart, the horizontal axis represents the change in effectiveness and the vertical axis represents the change in the cost. This chart has four square. Square in the North - East, new intervention is more effective but also more costly. Square in North–West and South–East, older and new intervention, respectively, are more effective and dominant and in South- West square new intervention is less effective and at the same time less costly. The radial gradient that extends from the origin to any point

of the graph is equal to the incremental cost-effectiveness ratio and it means the ratio of change in costs of two programs or intervention in relation to changes in their consequences.<sup>25</sup>



**Figure 1** Cost effectiveness analysis before and after intervention



**Figure 2** Cost- effectiveness plane: After intervention compared to before intervention

In this study, Strategies after the intervention compared to pre intervention is more effective and less costly so the result is located in South- East of cost effectiveness plane and as it is shown in Figure 2, Strategy before intervention was dominated by Strategy after the intervention. In other words, after intervention program is the cost-effective. Incremental cost-effectiveness ratio is calculated as follows.

$$\text{Incremental cost - effectiveness ratio (ICER)} = \frac{\Delta C}{\Delta E}$$

$$(\text{ICER}) = \frac{\text{Cost after intervention} - \text{cost before intervention}}{\text{effectiveness after intervention} - \text{effectiveness before intervention}}$$

$$(\text{ICER}) = \frac{29511 - 339152}{0.80 - 0.35} = \frac{-309641}{0.45} = -688091.1$$

The Incremental cost-effectiveness ratios show that for each unit increase in effectiveness, the cost of after intervention program reduce to the amount of 688091.1\$. In order to handle uncertainty in the economic evaluation studies, in this study one way sensitive analysis was conducted and the value of each variable increased by 20% and Tornado diagram were prepared.<sup>28</sup> Figure 3 shows the percentage change in the incremental cost-effectiveness ratio of Strategies after

the intervention compared to pre intervention. E1 and E2 show effectiveness before intervention and after that respectively. C1 and C2 show cost of strategies before and after intervention. Incremental cost-effectiveness ratio is 688,091.1. The result of Tornado diagram shows that incremental cost-effectiveness ratio has the greatest sensitivity to increase effectiveness before intervention (E1) and the lowest sensitivity to increase cost after intervention (C2).

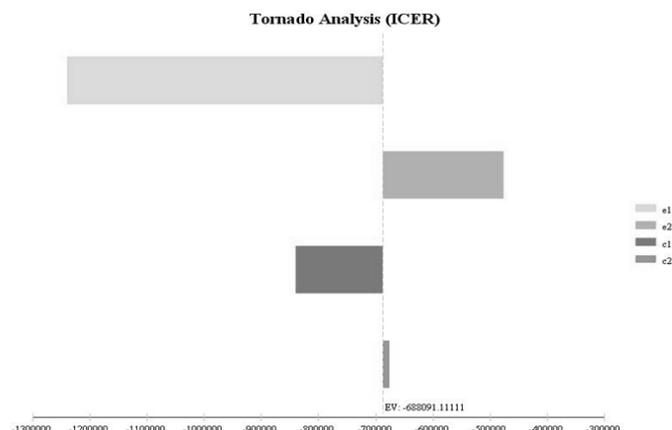


Figure 3 Tornado diagram

## Discussion

Researchers in this study explored the effects of improving nursing handover through action research study and examined the cost-effectiveness of the intervention. Finally our study contributed to two important findings. First, the patient satisfaction increased significantly. Second, the results of the present study showed that the strategies after the intervention compared to pre-intervention strategies reduced costs and increased the amount of effectiveness. Sand-Jecklin & Sherman<sup>29</sup> indicated that the implementation of bedside nursing report had significant effect on patient and nursing satisfaction. Their study was similar to the present study results.<sup>29</sup> Furthermore, Cairns et al.<sup>30</sup> showed that bedside shift report affected several indicators such as end-of-shift overtime, call light usage, nurse perceptions, and patient satisfaction. The result of the present study for patient satisfaction was consistent with Cairns<sup>30</sup> study.

Also a similar study was done in 2006. Cherri D Anderson<sup>31</sup> in an action research study showed a decrease in time over shift by over 100 hours in the first two pay periods after the implementation of bedside report which translated into financial savings.<sup>31</sup> Also, Athwal et al.<sup>4</sup> in a cooperative research in a hospital in San Diego in 2009 demonstrated that there was an \$8000 reduction directly associated with the decrease in time for shift report.<sup>4</sup> Complete, accurate, and timely patient information exchange is critical to the safe and effective care of patients in pediatric wards.<sup>32</sup> So, It appears necessary that hospital administrators provide nursing units with resources for handover and all members of the healthcare team co-operate together to analyze challenges of nursing handover and improve it based on their contextual capacities and capabilities and receive ongoing education.<sup>8,33</sup> Cost-effectiveness analyses inform health policy makers about the best way to allocate limited health care resources in order to obtain maximum health outcomes.<sup>34</sup> However, in Iran, decisions regarding medical technology, drug pricing and reimbursement rules are performed without considering of the economic evaluation and it seems that more decisions are based on expert opinion and past

experience and Policy makers and researchers have little familiarity with the methodology of economic evaluation.<sup>35</sup> So based on the result of our study it is recommended that challenges of nursing handover addresses through an action research study in which the identified problems addressed by including those who are part of the process in order to act on their own behalf to solve real world problems.<sup>19</sup>

A major strength of the current study is that this is the first study that examined the cost-effectiveness of improving nursing handover in Iran and other countries. Other studies separately examined cost or effectiveness in nursing handover; therefore, these studies were not conducted by considering full economic evaluation. On the other hand this study has some limitations. Firstly it lacks a comparison group and also the project was implemented on 1 unit with a relatively small number of nurses. So, additional studies with a large number of nurses are needed. Further work is still required to examine means for successfully incorporating this approach into clinical practice. It is worthwhile to investigate how these interventions decrease the cost in a precise clinical trial study.

## Conclusion

This study showed that Strategy after the intervention was a dominant strategy compared to before intervention (less costly and more effective). These findings offered a foundation for future research into development of a standardized handover and training. Also, this study resulted in deep understanding of participants about principles of handover in real world and applicable knowledge through action for change and reflection on it. Finally nurses could establish the foundation of sustainable nursing handover economically. This study encouraged other nurses to become more proactive in identifying areas for change in order to improve our health care system through the action research.

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## Conflicts of interest

Author declares that there is none of the conflicts.

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