

Study of factors affecting the productivity of nurses based on the ACHIEVE model and prioritizing them using analytic hierarchy process technique, 2012

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ABSTRACT

Objective: Improving productivity is one of the most important strategies for social-economic development. Human resources are known as the most important resources in the organizations' survival and success.

Aims: To determine the factors affecting the human resource productivity using the ACHIEVE^a model from the nurses' perspective and then prioritize them from the perspective of head nurses using Analytic Hierarchy Process (AHP) technique.

Settings and Design: Iran, Shiraz University of Medical Sciences teaching hospitals in 2012.

Materials and Methods: This was an applied, cross-sectional and analytical-descriptive study conducted in two phases. In the first phase, to determine the factors affecting the human resource productivity from nurses' perspective, 110 nurses were selected using a two-stage cluster sampling method. Required data were collected using the Persian version of Hersey and Goldsmith's Human Resource Productivity Questionnaire. In the second phase, in order to prioritize the factors affecting human resource productivity based on the ACHIEVE model using AHP technique, pairwise comparisons matrices were given to the 19 randomly selected head nurses to express their opinions about those factors relative priorities or importance.

Statistical Analysis Used: Collected data and matrices in two mentioned phases were analyzed using SPSS 15.0 and some statistical tests including Independent-Samples T-Test and Pearson Correlation coefficient, as well as, Super Decisions software (Latest Beta).

Results: The human resource productivity had significant relationships with nurses' sex ($P = 0.008$), marital status ($P < 0.001$), education level ($P < 0.001$), and all questionnaire factors ($P < 0.05$). Nurses' productivity from their perspective was below average (44.97 ± 7.43). Also, the priorities of factors affecting the productivity of nurses based on the ACHIEVE model from the head nurses' perspective using AHP technique, from the highest priority to the lowest one, respectively, were: Clarity, Ability, Incentive, Evaluation, Help, Environment and Validity.

Conclusions: According to the results and the priorities expressed by the head nurses in order to improve the productivity of nurses, providing the orientation, training and retraining courses for nurses, developing performance-based management systems

and fair systems of reward and punishment, holding continuous performance evaluation and review meetings between individual nurses and their heads, increasing funding and improving organizational facilities, delegating authority to staff based on their abilities and capabilities, providing more welfare and recreational services and facilities such as nursery schools, transportation services, etc., for the nurses, esp. women nurses, are suggested.

Key words: Analytic hierarchy process, nursing staff, productivity, teaching hospital, the ACHIEVE model

Access this article online	
Quick Response Code: 	Website: www.archivepp.com
	DOI: 10.4103/2045-080X.112986

^a Ability, Clarity, Help, Incentive, Evaluation, Validity, and Environment

INTRODUCTION

Today, enhancing productivity in organizations is one of the main challenges which the executives and decision-makers are faced with in each country and many countries have based their development programs on increasing productivity. During the last fifteen years, increase in productivity has been about 45 times around the world. This increase has mainly been the result of great improvements in the management systems and scientific research and economic policies of organizations in developed countries. The low level of productivity, that is a characteristic of the majority of less developed countries, is due to the various factors affecting productivity. Therefore, today, all countries are seeking to make improvements in their productivity in order to consume fewer resources to achieve greater national products.^[1] Improving productivity is one of the most important strategies for the social-economic developments.

Improved productivity can improve processes, working relationships, individual and group behaviour and increase work motivation, quality of life, welfare, employment status and salary levels (due to the improvements in the organization production and profits).^[2] However, increasing productivity is not possible without its understanding and analysis.^[3] Productivity includes all organizational issues related to the effective functioning of an organization such as efficiency, effectiveness, quality, customer satisfaction, etc.^[4] Thus, it can be said that the main factors for increasing productivity are the improved quality of management, workforce and working conditions, as well as, continuous improvement in the quality of production.^[5]

In recent years, several definitions of productivity have been presented. The word of "productivity" means the power of production and fertility.^[3] In general terms, productivity is the relationship between the outputs including goods and services produced by a manufacturing or service system and the inputs used to produce them.^[6] In other words, productivity is the effective and efficient use of inputs or resources (including manpower, money, machines, materials, time, etc.) to produce outputs.^[7]

On the other hand, experts focus on the importance of human resources in the development of countries.^[8] In other words, human resources are known as the most important and most valuable resources in the organizations' success, as well as, the major factor in

the organizational survival and prosperity. According to the important role of the human resources in achieving organizational goals and objectives, their productivity should be paid more attention by today's policymakers and managers.^[9]

Health care is one of the fundamental needs of each community. Hospitals are the key organizations in the health systems which play a prominent role in providing health care services.^[10] One of the key jobs in the hospitals is nursing job.^[11] Productivity of nurses, as the largest human resources in hospitals, is very important and can affect the productivity of the entire organization so that hospitals cannot succeed in achieving their goals without having efficient nursing staff.^[12,13] Today the productivity of nurses is one of the major concerns for health care managers.^[14]

One of the models that are used to evaluate employee performance is the ACHIEVE model that has been introduced by Hersey and Goldsmith.^[15] ACHIEVE stands for the following seven different variables used for effective performance management which are possible causes that play some role in human functioning: Ability (knowledge and skills), Clarity (understanding or role perception), Help (organizational support), Incentive (motivation or willingness), Evaluation (Performance feedback and coaching), Validity (legal and valid human resource practices) and Environment (outside factors and environmental adjustment).^[15-17]

Numerous studies have been conducted on the factors affecting human resource productivity because of its high importance in the development plans of the organizations and countries.

The results of some of these studies have shown that factors such as the organization leadership style^[6,18-21] and using participative leadership style,^[11] the type of organizational culture,^[4,19,22] establishing and maintaining good human relations in the organization,^[23,24] creating comfortable and ergonomic interior design in the work environment,^[25,26] the type of organization designs used, as well as establishing democracy,^[23,27-29] increasing delegation of tasks and improving needed skills in the workplace, implementing training and empowering programs,^[4,20-21,27-30] improving quality of work life^[31-33] and job satisfaction^[4,34] have effects on human resource productivity.

Also, other studies have been conducted in Iran on prioritizing factors affecting the productivity of human resources.

Yaghoubi and colleagues (2010) in their study using the ACHIEVE model concluded that Ability and Evaluation were respectively, the most influential and least influential factors in improving the human resource performance and productivity from the viewpoint of senior administrative and nursing managers of Isfahan teaching hospitals.^[35]

Nasiripour *et al.* (2010) in their study using a researcher-made questionnaire showed that from the studied faculty members as well as education and human resources experts' perspective, the following five main components had respectively, the greatest effects on human resource productivity: organizational culture, environmental conditions, motivational factors, human resource empowerment, and the leadership style.^[36] Nasiripour in his another study using the ACHIEVE model came to the conclusion that from the studied hospital employees' perspective, the most important factors in improving human resource productivity were respectively Clarity (with an average of 69.35), Ability (with an average of 57.68) and Evaluation (with an average of 57.03) and the least important one was Help (with an average of 41.31).^[22]

Also, Tabibi and colleagues (2003) in their study using the ACHIEVE model found that from the viewpoint of Iran, Shiraz University of Medical Sciences' administrative staff, among the studied factors, Incentive, Evaluation, and Help and organizational support had, respectively, the greatest effects on human resource productivity.^[37]

Although the productivity of nurses, as the largest human resources of the health system, has been one of the major concerns for Iranian health managers in recent years, nurses' perspective on productivity and its influential factors has rarely been studied while understanding their perspectives can help managers to make the right decisions in their planning. For this reason, the present study aimed to determine the factors affecting the human resource productivity using ACHIEVE model from the nurses' perspective and then prioritize them from the perspective of head nurses of Iran, Shiraz University of Medical Sciences teaching hospitals using AHP technique in 2012.

MATERIALS AND METHODS

This was an applied, cross-sectional and analytical-descriptive study conducted in two phases in Iran, Shiraz University of Medical Sciences teaching hospitals in 2012. In the first phase, to determine the

factors affecting the human resource productivity from nurses' perspective, a two-stage cluster sampling method was used. Each of the studied hospitals was considered as a cluster among which six hospitals were randomly selected. Then, 110 nurses were randomly selected in the selected hospitals. This sample size was determined at 97 nurses using the following formula, assuming $\alpha = 0.05$, $S = 0.3$ and $d = 0.06$. However, for increasing the accuracy of this study, and according to the potential loss of data, 110 nurses were, finally, selected.

$$n = \left(\frac{Z_{1-\alpha/2} \times S}{d} \right)^2 = 97$$

Required data were collected using the Persian version of Hersey and Goldsmith's Human Resource Productivity Questionnaire.^[38] The validity and reliability of this questionnaire had been confirmed in previous Iranian studies.^[22,31,35] This questionnaire consisted of two parts. Its first part included the nurses' demographic data (such as age, sex, marital status, education level, experience, etc.) and the second one included 26 items to determine factors affecting human resource productivity including Ability (3 items), Clarity (4 items), Help (4 items), Incentive (4 items), Evaluation (4 items), Validity (4 items) and Environment (3 items) from the viewpoint of studied nurses. A five point Likert scale was used to assess their perspectives whereby 1 refers to "very much" and 5 as "very little". Informed consent was obtained from all nurses participating in this study. SPSS 15.0 and some statistical tests including Independent-Samples *T*-Test, as well as, Pearson Correlation coefficient were used to analyze the collected data in this phase. $P < 0.05$ was considered statistically significant.

In the second phase, in order to prioritize the factors affecting human resource productivity based on the ACHIEVE model from the head nurses' viewpoint using AHP, pairwise comparison matrices were constructed and given to the 19 randomly selected head nurses to express their opinions about those factors relative priorities or importance. Collected data and matrices in this phase were analyzed using Super Decisions software (Latest Beta).

AHP is a multi-criteria decision making technique introduced by Thomas L. Saaty (1980). AHP is an effective tool for making complex decisions which can help decision-makers and managers to set priorities and

make the best decisions. In Analytic Hierarchy Process, the term “analytic” means that in this technique, an issue or problem is decomposed into a hierarchy of its more easily comprehended sub-problems and basic elements. The word “hierarchy” means that the sub-problems and basic elements of the considered issue or problem are being ranked according to their importance with respect to the decision-maker and manager’s goal. The word “process” reflects the fact that the judgments made by the experts are used to achieve the end results.^[39]

AHP technique is composed of two main steps:

1. Designing and constructing a hierarchy.
2. Numerical evaluation of the hierarchy.

Designing and constructing the hierarchy starts with determining the main goal. Then, the criteria and sub-criteria of that goal are determined. This step ends with prioritizing those criteria and sub-criteria by experts. The second step, evaluation step, is carried out based on pairwise comparisons. All criteria which are in the same level of the hierarchy are compared reciprocally to identify their relative importance and ability to achieve the goal. This process helps to determine the weights of those criteria and sub-criteria, and prioritize them.^[40] The AHP hierarchy of this study has been shown in Figure 1.

RESULTS

The results showed that most studied nurses ($n = 70$, 63.6%) were female, 70% were married ($n = 77$), and 85.5% had a bachelor’s degree ($n = 94$). Their ages ranged from 25 to 53 years, with a mean age of 35.35 years and an SD of 9.01 years, and their job experience ranged from less than 1 year to 25 years, with a mean of 10.13 years and an SD of 8.97 years.

In this study, among the studied nurses’ demographic characteristics, only sex ($P = 0.008$), marital status ($P < 0.001$), and education level ($P < 0.001$) had statistically significant relationships with

their productivity so that the male nurses, married nurses and those who had a bachelor’s degree, had higher productivity. Overall, nurses’ productivity from their perspectives was below average (44.97 ± 7.43) [Table 1].

Also, the results showed that all factors of the ACHIEVE model had positive and significant correlations with the productivity of nurses ($P < 0.05$) [Table 2].

The complex judgment matrix, derived from calculating the geometric mean of reciprocal entries of the 19 pairwise comparison matrices completed by the studied head nurses, has been shown in Table 3.

The results of prioritizing factors affecting the productivity of nurses based on the ACHIEVE model from the head nurses’ perspective using AHP technique showed that those influential factors from the most important factor to the least important one were respectively: (1) Clarity, (2) Ability, (3) Incentive, (4) Evaluation, (5) Help, (6) Environment, and (7) Validity [Table 4].

Table 1: Demographic characteristics of the studied nurses and their relationships with nurses’ productivity

Demographic characteristics	Frequency (%)	Mean±SD of nurses’ productivity	t	Sig.
Sex				
Male	40 (36.4)	47.62±8.19	2.76	$P=0.008$
Female	70 (63.6)	43.44±6.55		
Total	110 (100)	44.97±7.43		
Marital status				
Single	33 (30)	41.38±2.72	4.72	$P<0/001$
Married	77 (70)	46.43±8.33		
Total	110 (100)	44.97±7.43		
Education level				
Bachelor’s degree	94 (85.5)	46.04±7.48	7.91	$P<0/001$
Master’s degree	16 (14.5)	38.64±2.11		
Total	110 (100)	44.97±7.43		

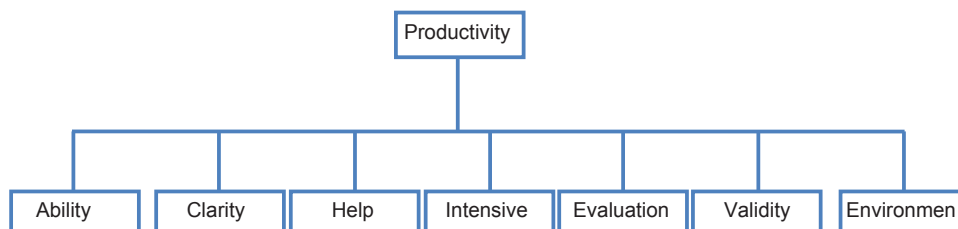


Figure 1: The AHP hierarchy for determining factors influencing human resource productivity based on the ACHIEVE Model

Table 2: The correlations between factors affecting the nurses' performance and their productivity based on the ACHIEVE model

Factors based on ACHIEVE model	Ability	Clarity	Help	Incentive	Evaluation	Validity	Environment	Productivity
Ability	1	0.07	0.13	0.05	0.41*	0.19*	0.19*	0.47*
Clarity		1	0.07	0.11	0.02	0.64*	0.43*	0.57*
Help			1	0.85*	0.2*	0.32*	0.24*	0.69*
Incentive				1	0.38*	0.35*	0.34*	0.78*
Evaluation					1	0.22*	0.04	0.45*
Validity						1	0.41*	0.73*
Environment							1	0.62*
Productivity								1

*P<0.05

Table 3: The complex judgment matrix of the head nurses' pairwise comparison matrices*

Total	Ability	Help	Evaluation	Validity	Incentive	Environment	Clarity
Ability	1.00	2.29	1.92	4.02	1.42	4.57	1.08
Help	-	1.00	0.91	1.61	0.68	2.69	0.44
Evaluation	-	-	1.00	1.95	0.64	2.99	0.51
Validity	-	-	-	1.00	0.35	1.69	0.29
Incentive	-	-	-	-	1.00	4.01	0.81
Environment	-	-	-	-	-	1.00	0.23
Clarity	-	-	-	-	-	-	1.00

*Inconsistency Index: 0.073

Table 4: Results of prioritizing factors affecting the productivity of nurses from the head nurses' perspective using AHP technique

Factors	Weights	Priority
Ability	0.209	2
Clarity	0.224	1
Help	0.113	5
Evaluation	0.127	4
Incentive	0.133	3
Environment	0.106	6
Validity	0.085	7

AHP=Analytic Hierarchy Process

DISCUSSION

This was an applied, cross-sectional and analytical-descriptive study conducted in Iran, Shiraz University of Medical Sciences teaching hospitals in 2012 in order to determine the factors affecting the human resource productivity using the ACHIEVE model from the nurses' perspective and then prioritize them from the perspective of head nurses using AHP technique.

The statistically significant difference in the mean of human resource productivity between male and female nurses, and higher productivity mean in male nurses can be due to their less preoccupation and having more opportunities to attend in training and

retraining courses. As a result, they can be more familiar with and focused on their jobs and therefore have higher productivity. The results of Amani (2008), Pourhoseini and Abdolmaleki (2007), and Rashidi and Abdolmaleki's (2007) studies confirm the results of the present study.^[34,41,42]

The reason for the significant difference in the mean of human resource productivity between single and married nurses and higher productivity mean in married nurses can be that they are usually faced with more familial, social and economic problems and therefore they require more job and economic security as well as, they need to earn more income. As a result, by receiving more instruction, they try to increase their knowledge of, understanding of, and compatibility with organizational tasks and responsibilities, as well as, gain more heads and customers' satisfaction. The results of Pourhoseini and Abdolmaleki's study (2007)^[41] are in line with the results of the current study. However, Tahmasebi (2009), Rahimi (2009) and Monajemzade and Baradaran (2009) did not find any significant relationships between human resource productivity and marital status in their studies.^[20,43,44]

The explanation for the significant difference between the mean of human resource productivity and nurses' education level, and higher productivity mean in

nurses who had a bachelor's degree can be that usually the higher the education level, the more jobs and duties, each with its own role expectations, are assigned to them. This would cause problems and confusion in performing their jobs and duties and thereby, their productivity is decreased. The results of Monajemzade and Baradaran (2009), and Amani (2008), Pourhosseini and Abdolmaleki's (2007) studies are consistent with the results of the present study.^[34,41,44] However, Hariri and colleagues (2009), Tahmasebi (2009), and Rahimi (2009) did not report any significant relationships between employees' education level and their productivity in their studies.^[20,43,45]

Contrary to the Tahmasebi (2009), and Pourhosseini and Abdolmaleki's studies (2007),^[20,41] in the present study, age and job experience did not have any statistically significant relationships with nurses' productivity.

According to the results, the priority of factors affecting human resource productivity based on the ACHIEVE model from the head nurses' viewpoint using AHP technique, respectively, were: (1) Clarity, (2) Ability, (3) Incentive, (4) Evaluation, (5) Help, (6) Environment and (7) Validity.

Clarity was the highest priority because when employees are completely familiar with their tasks and career goals and expectations, their working errors come down and the quality of work and productivity increase. Also, in this case, they require less official description and explanation of their duties, and less time of the heads of units and hospital is consumed with discussing about the employees' jobs and related expectations.

Among the factors affecting nurses' productivity, Validity was the lowest priority. In Iran, hospital care systems, due to the importance of jobs and dealing with the lives of patients, there are accurate and objective performance standards and systems that monitor and evaluate nurses' performance and the outcomes of care provided by them. On the other hand, different decisions about the nursing staff including their reward and punishment decisions are usually taken by the hospital heads and managers based on existing laws and regulations, without the direct involvement of head nurses. However, the most important and least important factors affecting human resources productivity in the Yaghoubi and colleagues' study (2009) were, respectively, Ability and Evaluation^[35] and in Nasiripour and colleagues' study (2007) were, respectively, Clarity and Help.^[22]

In general, the following reasons can be given for the differences observed between some of the present study results and the results of other studies mentioned above: Differences in the type of samples and target populations, as well as, the sample sizes studied in these studies.

Some possible limitations to this study should be considered. The sample size in this study was relatively small sample size and the nurses' productivity was studied only in teaching hospitals which may result in reducing the statistical significance of the results and can restrict the generalization of the results.

In conclusion, the results showed that there were statistically significant relationships between productivity and nurses' sex, marital status and educational level. Also, the priority of factors affecting the productivity of nurses based on the ACHIEVE model from the head nurses' perspective using AHP technique, from the highest priority to the lowest one respectively, were: Clarity, Ability, Incentive, Evaluation, Help, Environment and Validity. Therefore, according to these results and the priorities expressed by the head nurses, the following suggestions can be offered in order to improve the productivity of nurses.

To increase "clarity", the orientation and training courses should be provided in the hospitals to familiarize nurses with their duties and career goals and expectations. Also, to increase the "ability" of nurses, retraining courses should be offered to familiarize them with new technologies and methods of doing tasks.

In order to improve nurses' feedback and motivation in the hospitals, developing performance-based management systems and fair systems of reward and punishment also, holding continuous performance evaluation and review meetings between individual nurses and their heads are proposed to provide timely and accurate feedback and also rewards and punishment commensurate with their performance and individual characteristics.

To increase organizational help and support increasing funding and improving organizational facilities in order to do things better is recommended.

Also, delegating authority to staff based on their abilities and capabilities, providing more welfare and recreational services and facilities such as nursery schools, transportation services, etc., in order to provide more relief and welfare for the nurses, esp.

women nurses, can result in increase in nurses' productivity.

Finally, according to the limitations of this study, it is suggested conducting similar studies with larger sample sizes and in other types of hospitals, and comparing their results with the results of the present study.

ACKNOWLEDGEMENT

We would like to thank the studied hospitals' heads and nursing staff for their kind co-operation with the researchers in collecting and analyzing data.

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How to cite this article: Farhadi P, Ravangard R, Sajjadnia Z, Jafari A, Ghasemi H, Rahgoshay I. Study of factors affecting the productivity of nurses based on the ACHIEVE model and prioritizing them using analytic hierarchy process technique, 2012. *Arch Pharma Pract* 2013;4:63-70.

Source of Support: Nil. **Conflict of Interest:** None declared.

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