

Equipment's Layout and Performance in Health Houses: A Correlational Before-After Study

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Abstract:

Ensuring of specified physical and organizational terms and conditions in health facilities, has undeniable effect on performance. Equipments layout is one of issues that Ministry of Health had communicated its Instructions.

A before-after study was conducted in health houses affiliated with Urmia District Health Center, Iran in 2014 to determine the association between equipments layout and performance in health houses. Twenty health houses subject to the equipment's layout revision plan were studied. Data about performance and equipment's layout compliance with standards were collected using valid checklists before revision plan and six months later. Analyses were performed through SPSS statistical software (version 16.0), using paired t-test and regression.

Maximum and minimum people covered by a health house were 2730 and 366 persons respectively. Most of community health workers had secondary education. There was not full compliance with layout standards in none of health houses. Results indicated that scores had been raised after implementation of revision plan both in performance and layout. Paired t-test showed a statistically significant difference between the mean scores of performance before (Mean=15±0.98) and after (Mean =17.74±0.76) revision plan (P<0.001). The effect size of technical equipments on performance statistically were more than office equipments and mean differences were more about technical equipments (1.43±0.65) than office equipments (0.27±0.50).

This exploratory study showed positive and direct effect of layout of equipments, on performance in health house. Improvement of performance and productivity of first line health facilities needs considering the physical factors in organisation.

Key words: Layout, Health House, Performance

Introduction:

Health is the objective of the World Health Organization and health systems commitment to reach the goal of "Health for All", institutionalised in 1978 using "Primary Health Care" (PHC)¹.

Public health mostly depends on the PHC sector in every country². In the past decades, Iran has made basic changes in its health system³.

Rezaiyeh project was one of them, which later became a base for the countrywide networks of health care⁴. Another initiative was adoption of PHC³, with signing of Alma-Ata Declaration⁵. The base of service delivery in networks, are peripheral units called health houses which staffed by community health workers (CHWs) (*Behvarz* in Persian)⁶.

Efficient health system performance requires combination of many resources⁷. There fore physical and human resources are important parts of a health system capital, which defined as stock of productive assets⁸.

These facilities have fulfilled the policy of "Providing services where people live and work"⁹. World Health Organization has insisted on the standards of space and equipments of these units to maintain quality of provided health services¹⁰.

Health houses provide services in several areas, such as the census, Health Education, Maternal and Child Health, Management of Childhood Illness, Reproductive Health, Communicable and Non-communicable Diseases and Vaccination¹¹.

Some studies suggest the comprehensiveness of the CHWs program in Iran¹², but few research studied in detail factors affecting performance of them⁸. In several studies about the performance and efficiency of the organization, including health system, organizational factors such as workspace, equipments and layout have been highlighted [13-17].

Managerial efforts to improve the physical infrastructure and layout of workspace, will probably lead to increased productivity¹⁸. Employee productivity and satisfaction is affected by changes in the physical environment¹⁹. Some studies reported the impact of physical environment on more coverage of services²⁰, or staff effectiveness and efficiency²¹.

Impact of physical layout of the workplace in organizational performance is important²², because good layout improves performance¹⁸. Improving equipment's layout due to its positive impact on increasing productivity and improving quality has been considered in health care settings too [23-25].

To the best of our knowledge, layout and its effect on performance has not studied in health houses or other peripheral health facilities. Ensuring of specified organisational terms and conditions in health houses, such as proper equipment's layout, has undeniable effect on the performance. Therefore this explanatory study aimed to

determine compliance rate of equipments layout in health houses, according to the standards in the Urmia District Health Center (UDHN) and to determine the correlation between equipment's layout and performance.

Methods:

Study design: This ecological before-after study was conducted at UDHN (formerly Rezaiyeh), in Iran in 2013 - 2014.

Sample size: Twenty health houses subject to revision plan of equipment's layout selected by the relevant health authorities in UDHN were studied.

Inclusion criteria & Exclusion criteria: health houses subject to revision plan

Methodology: Related data about the equipments layout and performance were extracted and studied before revision plan and six months later.

Data collection were performed using an instrument containing three categories: 1) background and demographic information of health houses and health workers, 2) checklists of equipments layout and 3) performance checklists derived from existing national standards and guidelines [26-27].

To evaluate performance, services of health houses were specified in 13 programs, including census, maternal health, healthy child, Integrated Management of Childhood Illness, reproductive health, communicable diseases, non-communicable diseases, vaccination, environmental health, occupational health, school health (care only), basic first aid and treatment of simple symptoms.

Three programs including census, environmental health and occupational health were not considered in the study, because of providing a major part of them out of health houses. On the other hand, health education was not considered independently, since it had been considered within each of the remaining ten programs. Performance checking in each of mentioned programs was carried out using the program's dedicated checklist.

All selected programs were equally weighted and score of 10 was dedicated to each of them, so overall performance score was 100. Each program have own specific scoring but it was similar in different health houses. Questions in performance checklists were graded as absolutely correct, Relatively correct and Incorrect.

Checklist dedicated to gather information about the state of equipment's layout in health houses had two subscales; technical equipments and office equipments and a maximum score of 20 was determined for full compliance with standards. items of layout checklists were graded as yes or no with regard to compliance or non-compliance with standards²⁷. In a pilot study all checklists were completed by health experts and if needed, reconsideration were conducted. The face and content validity of the performance checklist was determined by health professionals. Reliability of the performance checklist was determined by Cronbach's α -coefficient ($\alpha = 0.73$).

A six-person team of experts collected data regarding performance and layout before implementation of layout revision plan by visiting health houses in December 2013. The same group collected related data six months after implementation of layout revision plan for the second time in July 2014. Background factors, working conditions and equipments in under reviewed health houses were steady during study. Performance data collected by reviewing records and observation of employees in practice. Layout of technical and office equipments checked by viewing the location of equipments based on related standards²⁷.

To evaluate effect of layout on overall performance, scores of performance in selected 10

programmes were calculated using collected data in health houses before and after implementation of layout revision plan, and difference between them were investigated. Likewise the scores of equipment's layout were calculated based on data collected before and after implementation of layout revision plan, and statistical difference between them were also studied. Then Association between performance and layout were investigated.

Shapiro-Wilk test, showed that performance and layout data had normal distribution, so parametric tests were used for data analysis. Data were analysed using SPSS version 16.0 software (SPSS Inc., Chicago, IL) with central and scattering indices, paired t-test, and simple linear regression. For ethical considerations findings and conclusions were expressed anonymously. To reduce bias probability, the researchers did not take part in data collection process. In all statistical analyses, $P < 0.05$ was considered significant.

Results:

In this before-after study, layout and performance were evaluated in 20 health houses subject to layout revision plan. 60% of health houses buildings (12 cases) have 40 square meters workspace. Most of CHWs had high school education and less than 10 years work experience (Table 1).

Table 1: Demographic and Background information of Studied Health Houses and CHWs

No.	Variable	N	% *	Total	
1.	Building lifetime (year)	<10	4	20	20
		11-20	7	35	
		>21	9	45	
2.	Owner	State	18	90	20
		Leased	2	10	
3.	Distance from city (km)	<10	4	20	20
		11-30	8	40	
		>31	8	40	
4.	Number of staff	1	4	20	20
		2	16	80	
5.	Level of study	Primary School	2	5.3	38
		Middle School	4	10.2	
		High school	32	84.2	
6.	Years of work	<10	31	81.6	38
		11-20	4	10.5	
		>21	3	7.9	

There was not full compliance with layout standards in none of health houses. Maximum and minimum compliance with layout standards were

83% and 77%, respectively. Mean score of performance improvement in health houses was 13.2350 ± 5.49217 .

Results indicated that scores of equipments layout and performance in selected health houses, had been raised after implementation of revision plan both in technical and office equipments. In this

regard results showed performance scores have also increased after implementation of plan in all health houses (Table 2).

Table 2: Difference in Performance Scores of Health Houses before and after Layout Revision

NO.	Performance Before	Performance After	Difference	P value
1	75.10	90.90	15.80	0.001
2	73.60	89.85	16.25	0.001
3	80.50	94.60	14.10	0.001
4	77.65	86.95	9.30	0.001
5	74.85	85.45	10.60	0.001
6	80.30	95.60	15.3	0.001
7	72.45	94.00	21.55	0.001
8	67.10	88.20	21.10	0.001
9	68.55	90.10	20.50	0.001
10	76.80	91.70	14.90	0.001
11	73.80	80.20	11.40	0.001
12	68.75	88.95	20.20	0.001
13	80.20	91.05	8.95	0.001
14	71.95	87.20	15.25	0.001
15	85.05	88.75	5.70	0.001
16	71.70	83.95	12.25	0.001
17	77.10	88.40	11.30	0.001
18	78.90	88.35	9.55	0.001
19	71.65	83.80	12.15	0.001
20	83.75	86.45	2.70	0.001

Paired t-test showed that there were a statistically significant difference between the mean scores of performance before (75.48±4.98) and after (88.72±3.79) revision plan (P<0.001). Scores of layout were also, calculated before and six

months later and paired t-test showed a statistically significant difference between the mean scores of overall layout before (Mean =15±0.65) and after (Mean =15.97±0.42) revision plan (P<0.001) (Table 3).

Table 3: Mean Scores of Overall Performance and Layout in Health Houses before and after Layout Revision:

NO.	Variable	Mean ± Std. Deviation		P value
		Before	After	
1	Performance	75.48±4.98	88.72±3.79	<0.001
2	Technical Equipments	16.53±0.72	17.96±0.42	<0.001
3	Office Equipments	13.75±0.95	14.02±0.59	0.024

To investigate the effect size of layout on performance by technical and office equipments, mean scores were calculated. Paired T-test showed that the results were statistically significant in terms of technical (P<0.001) and office (P= 0.024) equipments (Table 3). The comparison showed

before and after mean differences were more about technical equipments (1.43±0.65) than office equipments (0.27±0.50).

For further investigation, matching of work space was done and health houses with the same size were selected (12 of 20 cases). Simple linear

regression showed pure effect of layout on performance, so that each unit rise in the layout score resulted in a 2.1unit increase in the performance score. The model was as follows

$$Y=10.69 + 2.1X$$

Discussion:

This study was exploratory and results showed equipment's layout and performance have improved after implementation of revision plan. Results indicated positive and direct effect of layout of equipments on performance, with more effect size for technical equipments. Full compliance with layout standards not observed in none of health houses. Studies in health house in Iran, are mostly about satisfaction, quality of service and cost, which are affected by the performance or constitute its components. Layout and its association with performance has not studied in frontline units of service delivery such as health houses or other peripheral health facilities.

A good physical infrastructure is effective on improving employee performance [28-30]. In studies on the performance and productivity of the organization, including health system, organizational factors such as work space and equipments highlighted. Top has reported these factors as the most effective in performance of nurses¹⁵. In the present study performance was affected by layout of equipments.

Sehgal has concluded that workplace designing as an inevitable factor in improving the performance of individual, and even placed emphasis on the specific role of every component in performance¹⁶ which confirms the results of the present study.

MAJI has reported association between the magnitude of work space used for the provision of services and more vaccination coverage²⁰ which is in line with this study. Forthas noted in his study in Armeniathat space, equipmentand organization of work, as effective factors in the performance of staff and has announced space as an important factor from the perspective of employees³¹. Therelevance and importance of space was revealed in the present study, too.

Young concluded that complying different aspects of layout were result in efficient workplaces with better safety and rised productivity²³ and, Kanamori reported that the quality improvement in health services were result of paying attention

to layout of equipment²⁵. These findings are in agreement with the results of this study.

Oswald showed that the working environmental components, including equipments have an important effect on the performance level of health staff in the Reproductive and Child Health units¹⁷ and the study of Sadatsafavi showed that physical work environment and health human resource activities affect each other³², which are consistent with the results of present study.

This exploratory study was based on searching available published resources. It was one of few studies about the organizational factors affecting performance and was the first study on the effect of equipments layout on performance of CHWs in Iran. It is suggested more studies should be done on the impact of organizational factors on performance of CHWs.

Conclusion:

This study showed the effect of equipments layout on performance in health houses, where services are provided to the clients. Improvement of performance and productivity needs considering the organizational factors.

Proper layout requires enough space, lack of full compliance with layout standards after implementation of revision plan can be the result of insufficient space in health houses. Probably, standard space take precedence over the equipment's layout.

This study showed the effect of equipments layout on performance in health houses, where services are provided to the clients. Improvement of performance and productivity needs considering the organizational factors.

Limitation of this study was the lack of previous studies on the effect of organizational factors on employees performance in health houses, so interpretation of findings should be taken with caution.

Equal weighting of programs in performance evaluation and allocation of equal points to different equipments can also be considered as constraints.

Conflict of Interest:

Authors stated that there is no case of conflict of interests

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