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THE RELATIONSHIP BETWEEN HOSPITAL INFORMATION SYSTEM QUALITY AND PREPAREDNESS OF HEALTH INFORMATION MANAGEMENT DEPARTMENT IN NATURAL DISASTERS IN TEHRAN HOSPITALS

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ABSTRACT

Introduction: Iran is among the most disastrous countries throughout the world. Due to the importance of hospitals' preparedness during natural disasters, the present research aims to study the relationship between hospital information system quality and preparedness of health information management department in natural disasters in Tehran hospitals. **Method:** This is an applied research in terms of results and it is a correlative research in terms of method. In present research, health information management department of three hospitals in Tehran was selected as the research setting and a checklist was used to collect data. The checklist includes two parts: the first part assesses hospital information system quality which is based on the fourth version of assessment indices of hospital information system. The second part has been made by the researcher and it is based on readiness of health information management department in disasters. **Results:** Results indicate that hospital information system quality associates with readiness of health information management department (p<0.001). In addition, admission system quality (p<0.001), information coding system quality (p<0.001) as well as statistic collection system quality (p<0.001) associate with readiness of health information management department and it has no statistical relationship with information retrieval system quality (p= 0.168). There is no statistical relationship between the variables and readiness of health information management department. There is no statistical relationship between variables and hospital information system quality. **Conclusion:** results showed that there was a significant relationship between hospital information system quality and readiness of health information management department in disasters. Therefore, health managers and authorities are suggested to provide national infrastructures for optimal use of health-based technology thus the considerable contribution of expectations from hospital information systems will be found.

KEYWORDS: health information system, preparedness, disaster, hospital.

INTRODUCTION

Natural disasters or man-made incidents are occurred annually in different regions of the world and they are followed by physical injuries and financial losses. The climatic changes have increased man-made manipulations in the nature, rapid growth of technology, public vulnerability and incidents (Khankeh et al, 2013).

Information is accounted as the basis of crisis management. Crisis managers should be aware of threatening risks of the region or the community under coverage as well as its vulnerability against different risks and possible outcomes of crises. However, the crisis managers were working in an ambiguous space before establishment of systematic information management & data analysis system.

The experiences resulted from incidence of crisis and disasters in Iran and the world have shown that although organizations, institutions and governmental and non-governmental institutes are sufficiently ready for on time presence in damaged regions due to disasters and incidents, they are poor or disable to cope with disasters due to different reasons such as inability of management in national, regional and organizational levels, absence of coordination between and inside departments, lack of an efficient and effective plan, lack of command system in organizations, unclear organizational authorities, lack of centralized leadership, scientific and executive inability in organizations that claim leadership of crisis, lack of

managers who are aware of crisis management science (Jahangiri, 2009).

Current information & communication management systems in crises focus primarily on identification of backgrounds and tracking of injured people then on radio and paper communication. These traditional systems have considerable limitations in crises. One of the most important limitations is that paper-based system is a static in situ information bank which does not allow information sharing among service providers, managers and decision makers. As a result, lack of proper access to required information in crisis leads to presentation of poor and low-quality services. Modern information technology has a high potential to cope with physical limitations of static in situ information systems (Ajami, 2014).

Executive policy makers and managers should assess the knowledge level of user, identify system as well as meet user's requirements during implementation of technology services in health system thus they can be effective in direction of increasing productivity (Mobasheri, 2013).

Concerning national conditions and standards, a proper model for records of injured people in unexpected incidents was designed and presented for physical features and information elements with cooperation of medical emergencies management center in Isfahan. Since in rescue operations of unexpected incidents, medical record should be simple, transparent and practical, the medical record used normally in hospitals is not efficient for injured people of unexpected incidents. In suggested model, the designed record is simple and transparent thus information of injured people can be documented during the incident and it is a rapid reference for accessing the most important clinical, executive and statistical emergency information of unexpected incidents (Jahanbakhsh, 2010).

Electronic health and internet will change continuously thus we can access correct and rapid information which can be shared. Users of health information data such as health experts, government, policy makers, researchers and patients should be able to access on time reliable correct information thus the old information system and applied programming should be assessed continuously (Kalen, 2016).

Implementation of personal health record will correct current healthcare system due to increase of responsibility of users and use of health information. A digital personal health record is preferred because it is updated automatically. At the moment, Electronic health record is not implemented due to financial obstacles, legal concerns and private problems.

It is suggested that the government plays the role of leadership in implementation of digital personal health record. Several partners should participate in extension of national electronic health record to have a successful financial supply. For medical and user obstacles, information should be transferred from electronic health record to personal health record thus the problem of privacy protection will be solved (Karan, 2015). Information is the basis of health which often is not available after disasters. Concerning local capacities some days after natural disaster, information should be available. A wide range of data is essential for primary management and health effects of disasters for supporting people as well as controlling and assessing the program. Data collection & processing system should be strengthened to meet requirements. These processes are data collection, data transfer, data analysis, data presentation, data quality and check and feedback. All these processes require that all health information systems are standardized before disaster by providing protocols and methods. Followings should be paid attention to design and keep an effective health information system.

- Sufficient number of qualified human sources
- Commitment and support of health authorities and the government
- Accessible budget
- Policy and legislation for support of health information system
- Sufficient sources (Ang, 2010)

Health information system, as a vital part in healthcare facilities, should have a planned response for recovery of medical records. The problems should be discussed and studied via staffs of health information system and an on-time plan should be decided for disasters (Smith, 2006).

METHOD

This is an applied research in terms of results, an analytical research in terms of method as well as a cross sectional, qualitative, quantitative research. It was conducted in three hospitals of Sasan (private hospital), Fayazbaksh (social security) and Shahid Modares (university). It includes all staffs in admission, archive, coding, statistics departments as well as health information management office (N= 36). Data were collected by a checklist which contains two parts. The first part assesses hospital information system quality and it is based on the fourth version of assessment indices of hospital information systems. The second part was made by the researcher and it is based on preparedness of health information management department. Information was collected by field method and the checklist was completed by staffs of health information management, admission, coding, archive and statistics in three hospitals. Data were analyzed using SPSS 22. Descriptive statistics (frequency indices, frequency percent, mean, mean standard error, variance), inferential statistics as well as Spearman correlation tests have been used to study the correlation between research variables in objectives and questions.

Kruskal-Wallis test has been used to measure the relationship between education, the preparedness of health information management department and hospital information system quality. Mann-Whitney test has been used to measure the relationship between gender, the preparedness of health information management department and hospital information system quality. Significance level has been considered as 0.50.

RESULTS

Descriptive statistics
The number of checklists completed by personnel of health information management department in every hospital
Totally, 10 respondents (27.8%), 15 respondents (41.7%) and 11 respondents (30.6%) participated respectively from Sasan, Fayazbakhsh and Modares hospitals.

Descriptive statistics related to the checklist of hospital information system quality
Electronic medical record (information retrieval)
In this questionnaire, 15 items associate with electronical medical record (information retrieval). the total answers have been calculated per respondent. The score of electronic medical record (information retrieval) is 7. The minimum score is 16 and the maximum score is 23. The mean score is 21.03 with mean standard error of 0.406. In addition, standard deviation and variance are 2.368 and 5.605 respectively. The median is equal to 22. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Bed management system (statistics)
In this questionnaire, 8 items associate with bed management system. The total answers have been calculated per respondent. The score of bed management system is 5. The minimum score is 8 and the maximum score is 13. The mean score is 10.24 with mean standard error of 0.351. In addition, standard deviation and variance are 2.046 and 4.185 respectively. The median is equal to 9. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Coding service
In this questionnaire, 5 items associate with coding service. the total answers have been calculated per respondent. The score of coding service is 2. The minimum score is 5 and the maximum score is 7. The mean score is 5.47 with mean standard error of 0.105. In addition, standard deviation and variance are 0.615 and 0.378 respectively. The median is equal to 5. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Admission information system
In this questionnaire, 34 items associate with admission information system. The total answers have been calculated per respondent. The score of admission information system is 22. The minimum score is 38 and the maximum score is 60. The mean score is 45.47 with mean standard error of 1.149. In addition, standard deviation and variance are 6.702 and 44.923 respectively. The median is equal to 43.5. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

The variables related to hospital information system quality

Variable \ Index	Record information retrieval system	Statistic information system	Coding information system	Admission information system
(lost) number	34 (2)	34 (2)	34 (2)	34 (2)
Range	7	5	2	22
Minimum	16	8	5	38
Maximum	23	13	7	60
Median	22	9	5	43.5
Mean	21.03	10.24	5.47	45.47
Mean standard error	0.406	0.351	0.105	1.149
Standard deviation	2.368	2.046	0.615	6.702
Variance	5.605	4.185	0.378	44.923

Descriptive statistics related to the checklist of preparedness of health information management department
Planning and analysis of the status quo
In this questionnaire, 11 items associate with the planning and analysis of the status quo. The total answers have been calculated per respondent. The score of planning and analysis of the status quo is 7. The minimum score is 15 and the maximum score is 22. The mean score is 18.72 with mean standard error of 0.417. In addition, standard deviation and variance are 2.503 and 6.263 respectively. The median is equal to 19. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Organizational framework
In this questionnaire, 7 items associate with organizational framework. The total answers have been calculated per respondent. The score of organizational framework is 6. The minimum score is 8 and the maximum score is 14. The mean is 11.89 with mean standard error of 0.373. In addition, standard deviation

and variance are 2.240 and 5.016 respectively. The median is equal to 13. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Information registration system
In this questionnaire, 2 items associate with information registration system. the total answers have been calculated per respondent. The score of information registration system is 2. The minimum score is 2 and the maximum score is 4. The mean is 2.67 with mean standard error of 0.154. In addition, standard deviation and variance are 0.926 and 0.857 respectively. The median is equal to 2. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Basic sources
In this questionnaire, 7 items associate with basic sources. The total answers have been calculated per respondent. The score of basic sources is 7. The minimum score is 7 and the maximum score is 14. The mean score is 9.44 with mean standard error of 0.534. In addition, standard deviation and variance are 3.202 and 10.254 respectively. The median is equal to 7. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Alarm systems
In this questionnaire, 3 items associate with alarm system. The total answers have been calculated per respondent. The score of alarm system is 3. The minimum score is 3 and the maximum score is 6. The mean score is 4.19 with mean standard error of 0.163. In addition, standard deviation and variance are 0.980 and 0.961 respectively. The median is equal to 4. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Mechanism of responsiveness
In this questionnaire, 3 items associate with mechanism of responsiveness. The total answers have been calculated per respondent. The score of mechanism of responsiveness is 3. The minimum score is 3 and the maximum score is 6. The mean score is 3.97 with mean standard error of 0.224. In addition, standard deviation and variance are 1.341 and 1.799 respectively. The median is equal to 3. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Education
In this questionnaire, 4 items associate with education. the total answers have been calculated per respondent. The score of education is 4. The minimum score is 4 and the maximum score is 8. The mean score is 6.17 with mean standard error of 0.269. In addition, standard deviation and variance are 1.612 and 2.6 respectively. The median is equal to 4. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

Maneuver
In this questionnaire, 4 items associate with maneuver. The total answers have been calculated per respondent. The score of maneuver is 3. The minimum score is 5 and the maximum score is 8. The mean score is 6.64 with mean standard error of 0.183. In addition, standard deviation and variance are 1.099 and 1.209 respectively. The median is equal to 7. The p-value is below 0.05 using Shapiro-Wilcoxon test. Therefore, data normalization hypothesis is rejected.

The variables related to preparedness of health information management department.

Index \\ Variable	Planning & analysis of the status quo	Organizational framework	Information registration system	Basic sources	Alarm systems	Mechanism of responsiveness	education	Maneuver
(lost) number	36	36	36	36	36	36	36	36
Range	7	6	2	7	3	3	4	3
Minimum	15	8	2	7	3	3	4	5
Maximum	32	14	4	14	6	6	8	8
Median	19	13	2	7	4	3	4	7
Mean	18.72	11.89	2.67	9.44	4.19	3.97	6.17	6.64
Mean standard error	0.417	0.373	0.154	0.534	0.163	0.224	0.269	0.183
Standard deviation	2.503	2.240	0.926	3.202	0.980	1.34	1.612	1.099
Variance	6.263	5.016	0.857	10.254	0.961	1.799	2.6	1.209

Results of Inferential Statistics
The main hypothesis (significant relationship between hospital information system quality and readiness of health information management department in natural disasters) has been proved based on following table.

The relationship between hospital information system quality and readiness of health information management department in natural disasters.

		Hospital information system quality	The readiness of health information management department
Hospital information system quality	Spearman correlation P-value	1	0.572 <0.001
The readiness of health information management department	Spearman correlation P-value	0.572 <0.001	1

DISCUSSION

Patients' admission quality associates with preparedness of health information management department in natural crises

According to above table, correlation coefficient has been statistically significant in level of 0.05 and it is equal to 0.556. There is a significant relationship between preparedness of health information management department and patients' admission quality.

The patients' identification is among very important factors during natural crises. For this purpose, admission information system should be able to make inter- and intra-organizational relationship.

Information retrieval quality associates with preparedness of health information management department in natural crises

According to above table, correlation coefficient has not been statistically significant in level of 0.05 and it is equal to - 0.235. Therefore, there is no significant relationship between preparedness of health information management department and information retrieval quality.
Concerning that information retrieval should be paid attention by hospital information system and only static paper-based sources have been considered in Iran with considerable limitations, hospital information system should be able to recover the record. The patient's health record should be available when transferring the patient to a new place as well as in emergency conditions.

Document coding quality associates with preparedness of health information management department in natural crises

According to above table, correlation coefficient has been statistically significant in level of 0.05 and it is equal to - 0.793. There is a significant relationship between preparedness of health information management department and document coding quality.

Coding system should allocate codes to all diseases and measures based on international disease & measures coding books. The coding system of hospital should update diseases codes based on international standards.

Statistics collection quality associates with preparedness of health information management department in natural crises

Above correlation coefficient has been statistically significant in level of 0.05 and it is equal to 0.556. There is a significant relationship between preparedness of

health information management department and statistic collection quality.

It is important to present correct statistics and facts during natural disasters. On time information and correct communications play important roles in preparedness of health-treatment organizations during disasters and incidents. Statistical information system should add extra beds, determine active beds, report the number of admissions and transfer them to other centers as well as extract the percent of occupied beds.

Research variable associates with preparedness of health information management department in natural crises

Spearman correlation test was used regarding the relationship between age and preparedness of health information management department. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.188. There is no significant relationship between preparedness of health information management department and age.

Spearman correlation test was used regarding the relationship between years of work experience and preparedness of health information management department. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.933. There is no significant relationship between preparedness of health information management department and years of work experience.

Spearman correlation test was used regarding the relationship between work experience and preparedness of health information management department. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.188. There is no significant relationship between preparedness of health information management department and work experience.

Mann-Whitney test was used regarding the relationship between background variable of gender and preparedness of health information management department. The above test has not been statistically significant in level of 0.05 and the p-value is equal to 0.667. There is no significant relationship between preparedness of health information management department and gender.

Kruskal-Wallis test was used regarding the relationship between background variable of education and preparedness of health information management

department. The above test has not been statistically significant in level of 0.05 and the p-value is equal to 0.127. There is no significant relationship between preparedness of health information management department and education. The personnel should participate in all processes related to crisis management cycle. Maneuver and training are important principles in preparedness for disasters.

Research variables associate with hospital information system quality in natural crises

Spearman correlation test was used regarding the relationship between background variable of age and hospital information system quality. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.969. There is no significant relationship between hospital information system quality and age.

Spearman correlation test was used regarding the relationship between years of work experience and hospital information system quality. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.969. There is no significant relationship between hospital information system quality and years of work experience.

Spearman correlation test was used regarding the relationship between years of work and hospital information system quality. The above correlation has not been statistically significant in level of 0.05 and the p-value is equal to 0.969. There is no significant relationship between hospital information system quality and age.

Mann-Whitney test was used regarding the relationship between gender and hospital information system quality. The above test has not been statistically significant in level of 0.05 and the p-value is equal to 0.909. There is no significant relationship between hospital information system quality and gender.

Kruskal-Wallis test was used regarding the relationship between background variable of education and hospital information system quality. The above test has not been statistically significant in level of 0.05 and the p-value is equal to 0.161. There is no significant relationship between hospital information system quality and education.

Users are the system's clients. Hospitals should train users the goals and nature of hospital information system thus users can be familiar with all functions and services provided by information system.

CONCLUSION

According to results of present research, admission quality, coding quality, statistics quality there is a significant relationship between hospital information system quality and preparedness of health information management department in disasters. Therefore, managers and authorities are suggested to provide national infrastructures for optimal use of health information technology thus, we can reach considerable contribution of hospital information systems and reduce the outcomes of inaccessibility of health information during crises. Furthermore, results showed that there was no significant relationship between variables and hospital information system quality as well as between variables and preparedness of health information management department. Therefore, policies should be done in a way that the experience and knowledge of staffs are used.

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