Original Article

Intrahospital Mortality Rate after the Implementation of the Second Phase of the Health Sector Reform in Comparison with Before that in Iran

Mojtaba Iravani, Reza Khadivi

Community and Family Medicine Department, Medical Faculty, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: The second phase of the health sector reform, called the Health Sector Evolution Plan (HSEP), has been implemented in Iran since 2014, aims to improve the equity and quality of health services. In the present study, we aimed to measure the trend of hospitalization and the crude intrahospital mortality rate from 1 year before the HSEP implementation (2013) to 5 years after the HSEP implementation (2018) in public hospitals compared with profit, nonprofit, and charity hospitals, which are affiliated with the Isfahan University of Medical Sciences (MUI). **Methods:** In a prospective, cross-sectional study, the data related to the frequency of hospitalized patients and intrahospital mortality during the time of hospitalization were collected through census sampling from 39 public hospitals as the *exposed* hospitals and 20 profit, nonprofit, and charity hospitals as the *control* hospitals. **Results:** After HSEP implementation, the frequency of hospitalization increased in public hospitals by 50.45% compared with the previous period. Although the crude intrahospital mortality rate increased from 12.61 to 12.93 per 1000 hospitalized patients (an increase of 2.54%) in public hospitals, the raise was not significant (P value = 0.348). The frequency of hospitalization increased in Social Security Organization's (SSO) hospitals as well as charity hospitals. However, the percent of decrease in the intrahospital mortality rates were −42.96%, −34.76%, and −18.47% in the private, charity, and SSO hospitals, respectively, but was not significant (P value > 0.05). **Conclusions:** The crude intrahospital mortality rates in public hospitals affiliated with MUI did not change significantly after the implementation of the HSEP.

Keywords: *Access, equity, health care quality, health care reform, hospitalization, mortality*

Introduction

Achieving a higher level of health status for people is the most important goal in health policy in the 21st century. This goal could be provided through a universal health coverage approach, in which health services are delivered equitably with proper quality.[1]

The in-hospital death rate is a useful indicator for assessing the quality of health services.[2,3] The in-hospital death rate is an important index for the accreditation of hospitals.[4] This index is the result of the services that have been provided to patients in the health care system in either outpatient or inpatient sections.[5] The in-hospital death index indicates the quality of hospital services in terms of hardware, such as specialized diagnostic or treatment equipment and facilities, or software, such as the diagnostic and treatment skills of medical teams, the speed of their work, and the way they interact with patients and their families.[6] The assessment of in-hospital death has always played a crucial role in assessing the burden of diseases and setting priorities in many low-income countries.[7]

In recent years, much attention has been focused on the control and reduction of in-hospital deaths. The in-hospital deaths in the United States decreased by 8% in 2010 compared to 2000, while the hospitalization rate increased by 11%. Out of every 100 hospitalized patients, an average of 2.5 patients died in the hospital in 2000, which decreased to 2 per 100 hospitalized patients in 2010.[8] Less than 2% of hospitalized patients in England die each year. New findings indicate that 3%-5% of in-hospital deaths can be prevented.[9] The crude in-hospital death rates were reported as 3.85% and 2.2% in the Netherlands and Poland, respectively.[10,11] To the best our knowledge, the in-hospital mortality rate has not been reported from the Iranian hospitals yet, while the intrahospital

How to cite this article: Iravani M, Khadivi R. Intrahospital mortality rate after the implementation of the second phase of the health sector reform in comparison with before that in Iran. Int J Prev Med 2024;15:33.

Address for correspondence:
Dr. Reza Khadivi,
Hazar Jarib Street, Community, and Family Medicine Department, Medical Faculty, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: khadivi@med.mui.ac.ir

Access this article online

Website: www.ijpvmjournal.net/www.ijpm.ir

DOI: 10.4103/ijpvm.ijpvm_288_23

Quick Response Code:

mortality rate has been reported as 13.2 at 4 months before the HSEP.[12]

The second phase of health sector reform in Iran has been implemented since 2014. It was named the Health Sector Evolution Plan (HSEP). The HSEP was implemented to improve health equity and health quality, particularly for patients suffering from complicated chronic non-communicable diseases, with priority given to the citizens staying in deprived regions of the country.[13]

Some of the main objectives that have been pursued following the HSEP implementation were as follows:

1. Reducing co-payment for patients admitted to public hospitals to 10% of the hospital costs, as well as providing medicine, medical equipment, consumables, and diagnostic services. Based on this, public hospitals are not allowed to reject or refer some patients to private hospitals on the pretext of lack of services and/or resources (except for referring to educational or subspecialty hospitals).
2. Supporting doctors to stay in deprived, less-developed, and remote areas to improve the quality of health services.
3. To increase people's access to second- and third-level care and eliminate informal payments, the tariffs of inpatient services have been multiplied, and those expenses are reimbursed by governmental health insurance.
4. Planning the presence of specialists and staff in public hospitals to achieve response within 24 hours. In addition to their basic monthly salaries, additional payment was provided to specialists based on the number of nights they stayed in the hospitals.
5. Planning to improve the quality of clinic visits in public hospitals to make the full utilization of the facilities that are available, maintaining academic staff in educational hospitals, and increasing patient satisfaction.
6. Improving the quality of hotel services in public hospitals either quantitatively or qualitatively.
7. Financial support for patients suffering from chronic incurable noncommunicable diseases by reducing co-payment and developing systematic care for them.[14]

In the early years of the HSEP implementation, following the increase in the annual budget of the health sector, 39,000 hospital beds in the country were renovated or upgraded and 21,000 beds (equivalent to 21%) were added to the government (public) hospitals.[15]

In 2014, despite the HSEP implementation in the public hospitals affiliated with Isfahan University of Medical Sciences (MUI) and simultaneously increasing access to inpatient services for patients, unfortunately, little research has measured the efficiency of the HSEP.[12,16] After a major intervention through reducing co-payment for receiving inpatient services, it appears that many patients had unmet health needs, particularly elective surgeries and/or treatment of chronic diseases that required a lot of financial resources. In this new situation, low-income patients will utilize these expensive health services more comfortably. Hence, these patients who are from a low socioeconomic background, suffered from several complications that resulted in higher intrahospital mortality rates, which did not affect the quality of the hospital services. Therefore, for accurate interpretation of HSEP outcomes, particularly the intrahospital mortality rate, it appears that measuring the intrahospital mortality rate for many years after HSEP implementation can display the consequences of HSEP exactly. Although the public hospital settings, the admitted patients in terms of socioeconomic status, and disease severity markedly differ from private, nonprofit, or charity hospitals, in general, the intrahospital mortality rate differs obviously between public hospitals and other hospitals, particularly private hospitals. However, in the present study, we aimed to measure the trend of hospitalization and the crude intrahospital mortality rate from 1 year before the HSEP implementation (2013) to 5 years after the HSEP implementation (2018) in public hospitals, which are affiliated with the MUI as the exposed hospitals. Simultaneously, we measured the trend of hospitalization and the crude intrahospital mortality rate in other hospitals affiliated to MUI including private, charity, and other nonprofit hospitals as the control hospitals during that interval.

Methods

In a prospective, cross-sectional study in 2022, based on the dataset from the Directorate of Treatment of MUI, the data related to hospitalized patients (more than 6 hours) and intrahospital deaths (deaths that occurred exclusively during hospitalization before patients were discharged from the hospital) were collected from 2 time periods, before the HSEP implementation in 2013 and after the HSEP implementation from 2014 to 2018.

Sampling was done through the census method. The statistical population included the data regarding hospitalized patients and intrahospital deaths. We considered 39 governmental (public) hospitals as the exposed hospitals, while 4 hospitals affiliated with the SSO (nonprofit and nonpublic hospitals belonging to workers and their families), 8 private (for-profit) hospitals, 4 hospitals affiliated with military and revolutionary institutions, and 4 charity hospitals as the control hospitals.

Data related to hospitalized patients (more than 6 hours) and intrahospital deaths, based on the researcher's checklist, were collected in terms of the year of research and the type of hospital and were categorized into 2 distinct groups: a) deaths that occurred within 24 hours of patient's admission, and b) deaths that occurred after 24 hours of hospitalization.

The crude intrahospital mortality rate was calculated by dividing the patients who died during hospitalization time per 1000 hospitalized patients each year.

The data regarding intrahospital mortality rates were entered into the computer under SPSS Inc., Chicago, IL, USA, version 16 for Windows. The changes in hospitalization rate and the intrahospital mortality rate were calculated according to each hospital type by determining the difference between each indicator in 2018 from 2013, followed by dividing this amount of difference by the value of that index in 2013. After that, it was multiplied by 100. Moreover, the mean of intrahospital mortality rate in 2 periods, before and after the HSEP implementation, were compared using the "Paired Sample Test," whereas $\alpha < 0.05$ was considered significant.

Results

After the HSEP implementation (in 2018) compared to its preceding period (2013), not only the frequency of hospitalization increased in the public hospitals (50.45%), but it also increased in the charity and the SSO's hospitals that were 89.47% and 47.51%, respectively. However, the frequency of hospitalization decreased in the defense and private hospitals as 12.78% and 13.59%, respectively.

In public hospitals, the crude intrahospital mortality rates in patients with less than 24 hours of hospitalization increased from 2.69 to 3.58 per 1000 hospitalized patients (an increase of 33.08%) during 2013 to 2018 [Table 1].

In public hospitals, the crude intrahospital mortality rates in patients who were hospitalized for more than 24 hours decreased from 9.92 to 9.35 per 1000 hospitalized patients (a decrease of 5.75%) during 2013 to 2018 [Table 1].

In public hospitals, the total crude intrahospital mortality rates in patients who were hospitalized increased from 12.61 to 12.93 per 1000 hospitalized patients (an increase of 2.54%) during 2013 to 2018 [Table 1]. According to the statistical analysis using the "Paired Samples Test," the mean crude intrahospital mortality rate in public hospitals after the HSEP implementation did not statistically show a significant difference compared with the preceding period (P value = 0.348).

Despite the constantly increasing trend of intrahospital mortality rate in hospitals affiliated with defense and revolutionary institutions from 4.9% to 6.78% (increasing trend of 38.37%), a decreasing trend of intrahospital mortality rate in SSO, charity, and private hospitals were observed, which were (6.55%–5.34%), (12.14%–7.92%), and (2.77%–1.58%) respectively. The percentage of the decrease in the intrahospital mortality rates were −42.96%, −34.76%, and −18.47% in the private, charity, and SSO hospitals, respectively, but were not significant (P value > 0.05).

Discussion

After the HSEP implementation compared with its preceding period, the frequency of hospitalization increased primarily in the public and charity hospitals at 50.45% and 89.47%, respectively, The Isfahan province comprises more than 5 million people living in 24 districts. According to the Iranian Health and Medical Education Ministry's guidelines, geographical and physical access to inpatient services is proper in this province.[17] It appears that reducing co-payment to less than 10% of bills at the time of discharge in nonprofit hospitals, particularly in public hospitals, will improve the economic access. Furthermore, upgrading the physical access following HSEP implementation led to more hospital services utilization in nonprofit hospitals.[18]

In the present study, the total crude intrahospital mortality rates in public hospitals were 12.61 and 12.93 per 1000 hospitalized patients in 2013 and 2018, respectively. We and other Iranian researchers mainly have reported intrahospital death (the frequency of death of patients that occurred during hospitalization and before discharge from the hospital), whereas in the developed countries, the hospital death comprised the death of any hospitalized patient even after being discharged from the hospital till 1 month later (i.e., 30 days after discharge), and termed as in-hospital mortality rate. The in-hospital mortality rates were reported in the United States of America, England, the Netherlands, and Poland as 2%, 2%, 3.85%, and 2.2%, respectively.[8-11] The intrahospital mortality rate in the Iranian reports is lower than the in-hospital mortality rates, which were reported from developed countries. It is noteworthy that according to a cultural habit, many doctors and companions of seriously ill patients prefer their patients to die at their homes rather than in hospitals. In such a situation, it appears that the in-hospital mortality rate

Table 1: The trend of frequency of hospitalized patients and the crude intrahospital mortality rates in the public hospitals affiliated with MUI during 2013-2018 (per 1000 hospitalized patients)

The change in variables in 2018 compared to 2013 (%)	2018	2017	2016	2015	2014	2013	Year
50.45%	529,048	391,523	395,565	354,758	352,373	351,653	Number of hospitalized cases
33.08%	3.58	2.82	2.89	2.76	2.60	2.69	Mortality rate in <24 hours of hospitalization
-5.75%	9.35	12.34	11.36	11.55	9.79	9.92	Mortality rate in >24 hours of hospitalization
2.54%	12.93	15.17	14.25	14.30	12.39	12.61	Total intrahospital mortality rate

would be much higher than the intrahospital mortality rate in the Iranian hospital. Therefore, to compare the clinical quality of hospital services in Iranian hospitals with that of hospitals in developed countries based on the hospital death index, it is necessary to measure the in-hospital mortality rate in Iranian hospitals.

According to our findings, the intrahospital mortality rates did not display a significant difference before and after the HSEP implementation in public hospitals affiliated with MUI, particularly when the intrahospital mortality rate in less than 24 hours of admission. According to another study in Iran, the intrahospital mortality rate in public hospitals was 13.2 per 1000 hospitalized patients before the HSEP implementation.[12] The rate of intrahospital death in the present study did not show a significant difference from the previous similar research findings. These findings reported the intrahospital deaths in two 6-month intervals before and after the implementation of HSEP. As the findings of current research were based on the annual reports of 5 years, it appears that these findings are more reliable.

Based on the findings of this study, the highest rate of intrahospital death occurred in public hospitals. In addition, the crude intrahospital mortality rates in patients with less than 24 hours of hospitalization in public hospitals increased by 33.08% per 1000 hospitalized patients from 2013 to 2018. In public hospitals, as well as in teaching hospitals generally admit patients who are in medium and low socioeconomic status, particularly those with emergency conditions, such as patients suffering from trauma and/or those with complicated clinical conditions.[12] The results of Bayati's study in Iran also suggested a higher rate of intrahospital death in university hospitals than in non-university hospitals. In addition, according to our data, the rate of intrahospital death in the public hospitals affiliated with MUI was 15.17 per 1000 admitted patients in 2017, which was higher than the sum of intrahospital mortality rate in the Bayati's study in 2017 (in which the intrahospital mortality rates were 6.24 and 5.58 per 1000 admitted patients in teaching and non-teaching hospitals, respectively.[16] Similarly, in the United States of America, the in-hospital mortality rate in teaching hospitals was 4.64%, which was higher than in non-teaching hospitals by 3.68%.[19]

In a situation where the insurance coverage amount of government has significantly increased, and, on the other hand, the reimbursement system for inpatient services in Iranian hospitals is a case-mixed payment system, the hospitalization rate in the charity and the SSO's hospitals increased by 89.47% and 47.51%, respectively. Although private hospitals as well as charity hospitals have guaranteed a better profit margin for their hospitals by reducing the average length of stay of patients to the lowest possible amount,[20] it is worth considering that the intrahospital mortality rate in patients who died in less than 24 hours of hospitalization, as well as the overall intrahospital mortality rate in charity hospitals, were the lowest compared with other nonprofit hospitals in these 5 years exhibiting a general downward trend. This finding may confirm that by improving the chance of utilization of inpatient services, particularly in charity hospitals, where low-income people seek inpatient services, who have been admitted in the early stage of diseases for their treatment. Obviously, with these facilities, the probability of intrahospital death is reduced.[1,21,22] Consequently, the hospitalization rate in private hospitals would be reduced and the data showed a similar pattern. This finding, with the contents of the previous paragraph, suggest that the HSEP implementation displays the positive impact of improving health equity with access to inpatient services for low-income patients and improving the relative efficiency of inpatient services in charity hospitals.

It appears that the interventions that have been carried out in public hospitals in the format of the HSEP include expanding active hospital beds, providing high-standard diagnostic and treatment equipment, upgrading the hoteling system, and establishing at least 1 specialist doctor in government hospitals outside the office hours or on holidays – all of which have chiefly led to an increased level of patient satisfaction.[1,4,23] However, the expenses incurred for the reimbursement of the inpatient costs due to the increase in the tariffs for diagnostic and therapeutic services, as well as compensation for the co-payments of inpatient services for low-income patients were grown up to 149% after the establishment of the HSEP compared with the preceding period.[24] Nevertheless, despite the increase in the expenses and resources that were spent on hospital services, it is worth considering the trend of intrahospital deaths in public hospitals did not decrease significantly after the HSEP implementation compared with its preceding period. These findings are in concordance with Farzadfar's report, which emphasized that after the implementation of the HSEP, there was not a rebate in the burden of diseases in Iran.[25] This evidence suggests that the need to review the HSEP approaches by senior authorities concerned in the Iranian Ministry of Health and Medical Education and pay attention to those approaches that improve the clinical quality of inpatient services in public hospitals is required. It is also essential to improve the adherence of doctors, other inpatient care providers, and hospital authorities to the standard guidelines. In addition, those interventions related to lifestyle modification and health promotion of the population could be prioritized in the next steps of health sector reform.[26]

Limitations

In this research, we did not evaluate the in-hospital mortality rate and assess the factors affecting intrahospital

death including age and sex of patients, type of disease-causing hospitalization death, type of intrahospital ward, and the time of intrahospital death.[21,22,27]

For evaluation of the other outcomes after the implementation of HSEP such as the quality of inpatient services, it is necessary to measure the in-hospital mortality rate, disease complications rate, nosocomial infection rate, and patient satisfaction in the next research, possibly in a long period year far away from 2013 to similar interval after HSEP implementation.[1]

Conclusions

Following the Health Sector Evolution Plan (HSEP), the frequency of hospitalization increased in the public hospitals affiliated with Isfahan University of Medical Sciences, whereas the crude intrahospital mortality rate did not display a statistically significant change after the implementation of the HSEP compared to its preceding period.

Acknowledgments

We are thankful to administrators, experts, and other respectful health staff of the Statistics office involved in the treatment vice chancellor at Isfahan University of Medical Sciences, particularly *Nafiseh Tavakol* and *Elham Forouzandeh*. We are also grateful to the Deputy of Research and Technology of Isfahan University of Medical Sciences for their support.

Ethics statement

This research was conducted based on the license from the Research Ethics Committee of Isfahan University of Medical Sciences with the code number: IR.MUI.REC.1400.093. The present research was completed in accordance with the Declaration of Helsinki as revised in 2013.

Ethics considerations

"Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors."

Financial support and sponsorship

This study was supported by the vice chancellor for Research and Technology of Isfahan University of Medical Sciences in executive matters. This paper was taken from thesis No. 340028 in the Medical Faculty of Isfahan University of Medical Sciences.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

There are no conflicts of interest.

Received: 24 Oct 23 **Accepted:** 04 Apr 24
Published: 12 Aug 24

References

1. Roberts MJ, Hsiao W, Berman P, Reich M. Getting Health Reform Right: A Guide to Improving Performance and Equity. New York: Oxford Academic; 2008.
2. Ruiz M, Bottle A, Aylin PP. The global comparators project: International comparison of 30-day in-hospital mortality by day of the week. BMJ Qual Saf 2015;24:492-504.
3. Goodacre S, Campbell M, Carter A. What do hospital mortality rates tell us about quality of care? Emerg Med J 2015;32:244-7.
4. Hussein M, Pavlova M, Ghalwash M, Groot W. The impact of hospital accreditation on the quality of healthcare: A systematic literature review. BMC Health Serv Res 2021;21:1-12. doi: 10.1186/s12913-021-07097-6.
5. Stone GS, Tarus T, Shikanga M, Biwott B, Ngetich T, Andale T, *et al*. The association between insurance status and in-hospital mortality on the public medical wards of a Kenyan referral hospital. Glob Health Action 2014;7:23137.
6. Fisher ES, Wennberg JE, Stukel TA, Skinner JS, Sharp SM, Freeman JL, *et al*. Associations among hospital capacity, utilization, and mortality of US Medicare beneficiaries, controlling for sociodemographic factors. Health Serv Res 2000;34:1351.
7. English M, Mwaniki P, Julius T, Chepkirui M, Gathara D, Ouma PO, *et al*. Hospital mortality – A neglected but rich source of information supporting the transition to higher quality health systems in low and middle income countries. BMC Med 2018;16:1-9. doi: 10.1186/s12916-018-1024-8.
8. Hall MJ, Levant S, DeFrances CJ. Trends in Inpatient Hospital Deaths: National Hospital Discharge Survey, 2000-2010. US Department of Health and Human Services, Centers for Centers for Disease Control and Prevention, National Center for Health Statistics, 2013.
9. Stewart K, Choudry MI, Buckingham R. Learning from hospital mortality. Clin Med 2016;16:530.
10. Jarman B, Pieter D, van der Veen AA, Kool RB, Aylin P, Bottle A, *et al*. The hospital standardised mortality ratio: A powerful tool for Dutch hospitals to assess their quality of care? BMJ Qual Saf 2010;19:9-13.
11. Wieczorek-Wojcik B, Gaworska-Krzemińska A, Owczarek AJ, Kilańska D. In-hospital mortality as the side effect of missed care. J Nurs Manag 2020;28:2240-6.
12. Sajadi HS, Sajadi ZS, Sajadi FA, Hadi M, Zahmatkesh M. The comparison of hospitals' performance indicators before and after the Iran's hospital care transformations plan. J Educ Health Promot 2017;6:89.
13. Abdi Z, Hsu J, Ahmadnezhad E, Majdzadeh R, Harirchi I. An analysis of financial protection before and after the Iranian health transformation plan. East Mediterr Health J 2020;26:1025-33.
14. Arab-zozani M. Health sector evolution in Iran; A short review. Evid Based Health Policy Manag Econ 2017;1:193-7.
15. Kakemam E, Dargahi H. The health sector evolution plan and the technical efficiency of public hospitals in Iran. Iran J Public Health 2019;48:1681-9.
16. Bayati M, Emadi M. Factors affecting hospital mortality rate in Iran: A panel data analysis. BMC Res Notes 2020;13:1-5. doi: 10.1186/s13104-020-05410-w.
17. Available from: https://nnt.sci.org.ir/sites/apps/yearbook/year_book_doc/99-10-03.pdf. [Last accessed on 2022 Nov 14].
18. Rahimisadegh R, Haghdoost AA, Emadi S, Noori Hekmat S. Assessing the performance of hospitals before and after the

implementation of Iran's health sector evolution plan (HSEP) using the Pabon Lasso model. Med J Islam Repub Iran 2021;35:23.
19. Golikov E, Patel S, Salem S, Bhatia T, Vinod J. Hospital teaching status on mortality, length of stay, and cost amongst patients with primary biliary cholangitis. Am J Gastroenterol 2018;113:S16-7.
20. Khadivi R, Dehcheshme MS. The hospital performance indices after implementing the universal health coverage in the Iran. Soc Determinants Health 2020;6:e38.
21. Lin X, Cai M, Tao H, Liu E, Cheng Z, Xu C, *et al*. Insurance status, inhospital mortality and length of stay in hospitalised patients in Shanxi, China: A cross-sectional study. BMJ Open 2017;7:e015884. doi: 10.1136/bmjopen-2017-015884.
22. Elson LE, Luke AA, Barker AR, McBride TD, Joynt Maddox KE. Trends in hospital mortality for uninsured rural and urban populations, 2012-2016. J Rural Health 2021;37:318-27.
23. Detels R, *et al*. Oxford Textbook of Global Public Health. Oxford Textbook; 2022 .
24. Khadivi R, Rezayatmand M, Bank H, Etesampor A, Ghasemi N. The comparison of direct health expenditures of selected insurance organizations of Isfahan Province and Isfahan University of Medical Sciences, Iran, before and after Health Care Reform in Years 2013 and 2015. Health Inf Manag 2019;15:274-80.
25. GBD 2019 Iran Collaborators. Health system performance in Iran: A systematic analysis for the global burden of disease study 2019. Lancet 2022;399:1625-45.
26. Ayat SA, Rostami S, Khadivi R. The incidence and mortality rates due to stroke and myocardial infarction following implementing the package of essential non-communicable diseases; A historical cohort study. J Cardiovasc Thorac Res 2022;14:191.
27. Volpp KG, Small DS, Romano PS, Itani KM, Rosen AK, Even-Shoshan O, *et al*. Teaching hospital five-year mortality trends in the wake of duty hour reforms. J Gen Intern Med 2013;28:1048-55.