

Key performance indicators of HSE in the hospital management system during corona virus pandemic

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Abstract

Healthcare is considered as one of the most important issues of today's societies. In recent years, healthcare economy has found a special status worldwide. Meanwhile, hospitals as the important arm of providing healthcare services and the first level of referral for healthcare services, with their specific areas and responsibilities, are considered the most important healthcare Institute in any country. This paper examines key performance indicators (KPIs) of HSE in the hospital management system through creating a strategic agenda and set of strategic decisions during corona virus pandemic. Using the available multiple decision-making tools based on the criteria of interest to patients, the research first deals with selecting the effective indicators in assessing the HSE management system of the hospital management by experts through a bank of collected indicators. It then ranks the KPIs of HSE using fuzzy TOPSIS method. The results indicated that TOPSIS algorithm is one of the most reliable, scientific, and managerial methods for decision-making. Also, based on the results, the most important factor in the HSE performance in the hospital management system was determined as the Absenteeism from work due to illness indicator.

Keywords: Key performance indicators, HSE, hospital management system

1- Introduction

Hospital is one of the important institutions in the modern healthcare system. Today, hospitals are important as they undertake the responsibility of large resources and capital associated with the public health as well as human resources, physical, financial, and equipment capital (Moktadir, et al, 2020). In today's society, in which complex systems are often used, failure of a system or incidence of accidents can cause impairments at different levels, and even be a threat for the public and environment (Ghasemi& Babaeinesami, 2020). Due to the existence of inherent uncertainty in natural disasters, related organizations are not able to optimally use the critical infrastructures to reduce destructive effects (Ghasemi& Babaeinesami, 2019) . For this reason, everyone is seeking a safe system with low risk probability. Here, risk means uncertainty and indicates incidence of an event with a certain severity (Apornak, 2020). The results of risk assessment determine what damage would be incurred to the system with incidence of every risk, and what would be the environmental consequences (Kejriwal, et al, 2021).

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The global standard organization defines risk to involve a probability of accident and resulting consequences. Ding (2018), defines risk as combination of the probability of incidence of any risk and its consequences.

The recent crisis that the entire world is facing caused by COVID-19 a pandemic that has forced all organizations whether public or private to rethink their mission and vision (Ghasemi, et al, 2021) Thus, the efficacy of the healthcare sector depends greatly on the rapidity to adapt to the new dramatic situation (Babaeinesami & Ghasemi. 2021). Before the World Health Organization (WHO) had declared the COVID-19, a pandemic crisis, on 11 March 2020, Algeria had the situation under control, although the first two cases were registered on 25 February 2020 (Shafipour-omran, et al, 2021). The rapid evolution of the pandemic coronavirus crisis requires that the common strategies should be oriented toward ensuring the health of the population and a continuous assessment of the events to give priority to future needs. The situation in Algeria is not far from the rest of the world, with a total of 55,081 cases and 1880 deaths recorded until 22 October 2020, with a mortality rate of 11.70%. This high rate represents a threat to the national health situation of the country that leads to making a study to understand how the healthcare sector is dealing with this crisis and what are the available and efficient managerial tools to help managers and healthcare staff to better control facilities (Ahmadi Choukolaei, et al, 2021). The international statistics of WHO place Algeria in the fourth position in Africa (with 50,914 cases) after South Africa (with 669,498 cases), Ethiopia (with 72,700 cases), and Uganda (with 7364 cases) with a total of 1,172,342 confirmed cases and 25,481 deaths in the continent as the last update. The pandemic crisis, thus, the other 39 percent consider that the pandemic has no impact on their business and over 60 percent called upon the need to prepare a viable strategy to tackle a pandemic situation. As a result, in 2007, the Australian SMEs were not prepared for a pandemic situation and 13 years later SMEs worldwide are in the same situation. Apornak, A. (2021), considered Human resources allocation in the hospital emergency department during COVID-19 pandemic. These analyses motivated us to approach this pandemic crisis from another perspective based on KPIs as instruments of human competencies in the fight against this enemy. The range of factors affecting sustainability performance is varied, from the small details to the big issues in healthcare facilities (Ghasemi & Talebi Brijani, 2014). Thus, most of them are not obvious to the decision makers (e.g., maintenance and building design) because of lack of technical skills (e.g., attention towards the aspects of bioclimatic passive strategies and incorrect architectural and flexible layouts, which often limit the clinical processes and causes the decrease of performance and sustainability criteria) (Khanchezharrin, et al, 2021). The uses of KPIs are as tools to improve the effect of public health measures and as indicators of the measures that need to change in function of true morbidity and mortality rates (Khalili-Damghani, et al, 2021).

The complex processes of technology and the human indiscriminate use of natural resources have caused negligence of the rightful needs of human, i.e. human health, public health, and environment (Papa, et al, 2020). With Industrial Revolution and development of energy withdrawal from natural resources, this has found a critical and alarming trend (Pourhassan, et al, 2021). This includes devastating explosions and firings, incidence of various accidents causing mortality or disability in occupational settings, different diseases resulting from activity in industrial environments, adverse effects caused by absence of industrial health in the society, extensive environmental degradation and damage to the ozone protective layer, incurring biological poverty for the earth, development of no biodegradable waste and wastewater, progressive pollution in the vital ecosystems of the earth as well as food production sources, etc (Chandra & Kumar, 2020). The life survival and maintaining the human physical and psychological health is the key for human life and purpose (Apornak et al, 2020), Thus, creating and developing proper structures are essential for maintaining and developing health, achieving the necessary safeties, and preventing health as well as environmental damages (Dabliz, et al, 2021).

Safety is a general and global value, and any culture should do their best in order to maintain it. Risk and safety as well as their strategies should be implemented through risk and safety management extensively across all countries and organizations (Rezaee, et al, 2020). Hospitals are considered as the most important healthcare Institute as they are the important arm of providing healthcare services and the first level of referral with certain territory and responsibilities (Sui, et al, 2020), on the other hand it is

obvious that service recovery strategies associated with customers' satisfaction is necessary for all organization(Keramati, et al,2018) World Health Organization considers hospital across the town level as the most important factor of success in achieving health for all until 2020. Neglecting the hospital personnel exposure to different risks that exist in different wards of these centers necessitates risk management in hospitals (Apornak, et al, 2020). Different studies have noted the necessity of applying risk management in hospital programs (Ahmadizadeh-Tourzani, et al, 2018). Safety issues in the hospital environment are important in terms of human resources, ethics, and economy. Risk management in hospital is a plan to reduce the incidence and prevalence of preventable accidents. One of the main pillars in patient safety is applying risk management programs (Singh, et al, 2020)

The hospital management tries to change all health, safety, and environment (HSE) programs in a transparent cycle from reactive approach to a proactive approach through establishing the HSE management system. Further, by codifying KPIs for monitoring and recording the results, it analyzes the aspects related to HSE during the hospital operation in executive activities, and then appraises its performance within specific time periods (Sabry et al., 2020). Today, establishing and implementing the requirements of HSE management system are very important in all plans as well as industrial-infrastructure projects (Tseng, et al, 2020). One of the important and sensitive issues in establishing the system is proper implementation of these systems, The integrated combination of HSE is a kind of uniform and effective factor, which subjects humans to well-informed relationship with others and environment. The logical arrangement of these three issues has had a constructive cultural and psychological reflection among the public, and provided a suitable motivation to establish proper behavior in the life and promotes social interactions at high levels (Apornak, et al, 2020). Health, safety, and environment all belong to one issue with interaction effects on each other. The ultimate goal of each of these three areas is to maintain the human health and life. Since humans are also a component of the environment, any factor that is life-threatening would eventually be also a threat for the environment. One of the necessities of combining these three issues is preventing parallel actions and reducing the related costs (Vanapalli, et al, 2021). This is because the HSE comprehensive management system offers a disciplined approach to reducing risks and maximizing opportunities. Concurrent consideration of these three issues means employing healthy workforce in a healthy environment with safe equipment and apparatuses, thereby producing products with higher qualities. Further, these three areas have synergistic effects on each other, whereby their effects would be far greater in enhancing productivity. Although industrial health has a long history in the oil industry of Iran, it has never been viewed with an engineering perspective. This kind of view causes identification, assessment, and control of many harmful factors (physical, chemical, biological, and ergonomic) in the occupational settings by industrial health specialists with a preventive outlook. In this way, the workforce exposure to all these detrimental factors would be minimized. On the other hand, previously a therapeutic view mostly existed about this issue, which means treating the problem after incidence of events.

Currently, the world is facing coronavirus pandemic, the speed of transmission and global scale of infection by this virus are so large that it necessitates taking essential strategic, resource management, and infection control measures. In such conditions, use of smart technologies of the fourth Industrial Revolution can significantly help improve the performance of healthcare systems as well as safety and occupational health of staff. Concerning the growing course of Covid 19 epidemic and the importance of observing the measures of staffing hospitals to control and prevent contagion of this virus to workers and healthcare HSE among supervisor engineers as well as executive personnel experts controlling biological risks and constant supervision on their implementation. Today, the healthcare sector, in spite of its ever-increasing significance, is facing new challenges. Recent advances and the nature of services provided in healthcare have created the need to implement new strategic techniques. Meanwhile, healthcare consumers are different than other types of consumer, and demand different types of relationships. Accordingly, when providing services, attention should be absolutely paid to strategic principles. In this paper we investigate the key performance indicators of health, safety, and environment in the hospital management system in corona virus pandemic in a case study in Iran so this article is presented in five sections in order to achieve the goal.

2- Literature review

In a research by Severo et al (2021), investigated the Impact of the COVID-19 pandemic on environmental awareness, sustainable consumption and social responsibility in the case study of Brazil and Portugal, in this research illustrated that The COVID-19 Pandemic has become a major public health concern worldwide. In this context, environmental awareness, sustainable consumption and social actions of people have been effectively changed, as a period of quarantine, social isolation and health crisis caused by Pandemic has been experienced. The method used was quantitative research, of a descriptive character, through a survey applied to 3236 people, which was analyzed with the use of Structural Equation Modeling. The results indicate that COVID-19 Pandemic is an important vector in people's behavioral change, which reflects on environmental sustainability and social responsibility. It is noteworthy that the impact of the COVID-19 Pandemic had a greater influence on sustainable consumption, followed by environmental awareness, and to a lesser extent, on social responsibility. There was also greater relevance in Portugal, as well as the perception of the Baby Boomers generation. This study also provides a framework such as metrics to measure a transformational event, which is the COVID-19 Pandemic in socio-environmental aspects and conscious consumption. In a research by Watterson (2020) examined the occupational health and safety issues faced by the UK workers in the COVID-19 pandemic, against the background of government cuts in health care and in occupational health and safety budgets, and a deregulatory climate. UK politicians, government bodies, medical and scientific advisors, and employers periodically ignored or abused that knowledge. Regulatory and ministerial inaction and errors on the workplace virus risks emerged. In contrast, several trade unions, health professional bodies, and nongovernmental organizations identified COVID-19 threats from poor personal protection equipment, working practices, and knowledge gaps and offered solutions for health care workers, social care workers, production workers, and service workers in "essential" occupations. In a research by Tahir & Batool (2020), investigated Healthy environmental impact for public safety and menaces oil market in In the COVID-19 period. Within months the world has been transformed into new order, thousands of people died and many more are fallen ill due to COVID-19 outbreak. China was the first country to see the outbreak and the first country to control it. However, the disease has broken out in Europe, the Middle East, the United States and other places. The United States has the highest number of cases in the world. In a research by Bielicki et al. (2020), investigated Monitoring approaches for health-care workers during the COVID-19 pandemic, in this paper illustrated that Health-care workers are crucial to any health-care system. During the ongoing COVID-19 pandemic, health-care workers are at a substantially increased risk of becoming infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and could come to considerable harm as a result. Depending on the phase of the pandemic, patients with COVID-19 might not be the main source of SARS-CoV-2 infection and health-care workers could be exposed to atypical patients, infected family members, contacts, and colleagues, or lives in communities of active transmission. Clear strategies to support and appropriately manage exposed and infected health-care workers are essential to ensure effective staff management and to engender trust in the workplace. These management strategies should focus on risk stratification, suitable clinical monitoring, low-threshold access to diagnostics, and decision making about removal from and return to work. Policy makers need to support health-care facilities in interpreting guidance during a pandemic that will probably be characterized by fluctuating local incidence of SARS-CoV-2 to mitigate the impact of this pandemic on their workforce.

In a research by Yan et al. (2017), investigated Key factors identification and dynamic fuzzy assessment of health, safety and environment performance in petroleum enterprises. As HSE has been applied in petrochemical fields for decades, it is always time-consuming to assess HSE performance because there are so many evaluation indicators. Besides, conventional scoring method is too cursory and arbitrary by simply grading according to total scores of all indicators. An improved fuzzy comprehensive evaluation method is proposed to address this problem, as well as improve the predictability of HSE performance trends based on dynamic fuzzy theory. Finally, the HSE performance evaluation of gas transmission field is chosen as a case to illustrate the effectiveness of the method and a comparison with traditional fuzzy comprehensive evaluation method is made.

In a research by Kang et al (2016) investigated the performance evaluation of health, safety and environment management system by combining fuzzy cognitive maps and relative degree analysis. In order to interpreting and ranking HSE management system performance evaluation elements, Initially, Fuzzy Cognitive Maps is adopted to illustrate the direct and indirect effects of HSE management system elements on system performance indicators, and the results of Fuzzy Cognitive Maps are used to develop leading factors helpful for decision making in an intensive management system. Then, the weight distribution from FCM is amended by Relative Degree Analysis. Finally, the level of HSE management system performance is obtained and analyzed. The whole performance evaluation framework highlights the potential correlations of evaluation elements as well as expert opinions, which will improve the reasonability of the HSE-MS performance evaluation.

In a research by Li et al(2015), investigated the Performance assessment system of health, safety and environment based on experts' weights and fuzzy comprehensive evaluation, in this research illustrated that In order to receive a comprehensive and objective evaluation result, it is necessary to consider all evaluation factors and experts at different levels when HSE performance assessment is conducted. To improve conventional HSE performance evaluation, where weighted average method was used, a Fuzzy Comprehensive Evaluation method is used in this study by taking experts' weights into account. Further, an HSE operating performance assessment system is designed to simplify manual and complex assessment process and generate charts and analysis reports automatically.

In the paper by Bisbe and Malagueño (2012), using archived data and data collected from 257 major or average companies in Spain, they could find evidence on existence of a positive relationship between strategic performance measurement systems and organizational performance, mediated by the comprehensiveness of the strategic decision sets resulting from processes of strategy codification. They found that this mediation was modified negatively by the environmental dynamicity. Accordingly, the comprehensiveness of set of strategic decisions, which are a result of (open) processes of strategy codification would modify the relationship between SPMS and organizational performance only when the environmental dynamicity is low rather than high.

In the paper by Kuo, et al (2012), presented a new method for performance assessment of solving difficult multi-criteria fuzzy decision-making problems based on the combination of VIKOR and fuzzy number sets with a range value. The performance assessment problem mostly occurs in complex executive processes, in which multiple assessment criteria, subjective/objective assessments, and fuzzy conditions should be considered and managed simultaneously. Here, they formulated theoretical, inaccurate, and uncertain processes into fuzzy numbers with the help of linguistic expressions. This is because fuzzy theory can be a suitable option to deal with such uncertain issues. Nevertheless, presenting linguistic expressions as typical fuzzy series is not clear enough. Fuzzy number sets with range value offer greater flexibility and can better indicate uncertain and vague results that emerge, while also being more accurate. In this paper, they discussed fuzzy method with VIKOR range value, with the aim of solving MCDM problems. The weight and implementation of different criteria have been based on fuzzy number sets with unequal range value. In order to demonstrate efficiency of this method, a research was performed to assess the performance of three major intra-city bus companies benefiting from intra city public transportation system.

3- Research methodology

In this research, we intended to quantify different important roles of healthcare which plays in the society as a service sector. For this purpose, based on the expert opinion, we tried to identify the important factors for customer needs in order to improve services and to assess the performance. Accordingly, using TOPSIS-fuzzy method, we gave weights to the criteria obtained from experts and patient opinions in order to prioritize them. To classify the patient's needs for exploring the KPIs of HSE the hospital management system, TOPSIS method was employed alongside a questionnaire.

4- Results

Accordingly, based on the method and the current criteria obtained from the literature review, the experts' and patients' opinions were as follows:

- ✓ total reportable occupational illness frequency (TROIF)
- ✓ total lost time of occupational illness frequency (TLOIF)
- ✓ sickness absence rate (SAR)
- ✓ total reportable cases of injuries and diseases per 100 (TRC)
- ✓ cases causing days away restricted or transferred per 100 full-time personnel (DART)

According to the identified elements and based on the TOPSIS-fuzzy method, the results have been shown in table 1.

Table 1-The results required for calculating the rank of the health performance indicators

criteria	Weight of criteria			indicator	mean			Weighted matrix			Normalized matrix			Deviation from negative ideal	Deviation from positive ideal
S	0.6524	0.8286	0.935	1	4.857	6.714	8.286	3.169	5.563	7.747	0.340	0.596	0.830	0.622	0.458
				2	4.571	6.476	8.000	2.982	5.366	7.480	0.320	0.575	0.801	0.599	0.477
				3	6.429	8.190	9.333	4.194	6.786	8.727	0.449	0.727	0.935	0.731	0.357
				4	5.524	7.381	8.857	3.604	6.116	8.281	0.386	0.655	0.887	0.675	0.412
				5	5.762	7.381	8.571	3.759	6.116	8.014	0.403	0.655	0.859	0.666	0.406
M	0.6905	0.8524	0.950	1	4.952	6.714	8.238	3.420	5.723	7.826	0.366	0.613	0.839	0.636	0.439
				2	4.857	6.619	8.048	3.354	5.642	7.645	0.359	0.604	0.819	0.623	0.447
				3	6.476	8.143	9.190	4.472	6.941	8.731	0.479	0.744	0.935	0.743	0.337
				4	4.667	6.381	7.810	3.222	5.439	7.419	0.345	0.583	0.795	0.603	0.464
				5	5.190	6.952	8.333	3.584	5.926	7.917	0.384	0.635	0.848	0.651	0.423
A	0.6905	0.8429	0.945	1	3.238	5.000	6.762	2.236	4.214	6.390	0.240	0.452	0.685	0.493	0.571
				2	3.143	4.714	6.333	2.170	3.973	5.985	0.233	0.426	0.641	0.464	0.591
				3	4.524	6.238	7.714	3.124	5.258	7.290	0.335	0.563	0.781	0.589	0.477
				4	3.286	5.000	6.667	2.269	4.214	6.300	0.243	0.452	0.675	0.489	0.571
				5	3.619	5.286	6.857	2.499	4.455	6.480	0.268	0.477	0.694	0.510	0.549
R	0.700	0.8571	0.955	1	5.762	7.571	8.905	4.033	6.490	8.504	0.432	0.695	0.911	0.707	0.376
				2	5.762	7.571	8.905	4.033	6.490	8.504	0.432	0.695	0.911	0.707	0.376
				3	5.762	7.524	8.857	4.033	6.449	8.459	0.432	0.691	0.906	0.704	0.377
				4	5.619	7.429	8.762	3.933	6.367	8.368	0.421	0.682	0.897	0.694	0.386
				5	5.619	7.381	8.714	3.933	6.327	8.322	0.421	0.678	0.892	0.691	0.387
T	0.6048	0.7762	0.900	1	4.571	6.476	8.190	2.765	5.027	7.371	0.296	0.539	0.790	0.578	0.501
				2	4.952	6.810	8.429	2.995	5.285	7.586	0.321	0.566	0.813	0.601	0.478
				3	5.762	7.381	8.524	3.485	5.729	7.671	0.373	0.614	0.822	0.630	0.437
				4	5.048	6.952	8.476	3.053	5.396	7.629	0.327	0.578	0.817	0.608	0.471
				5	4.619	6.476	8.190	2.793	5.027	7.371	0.299	0.539	0.790	0.578	0.499
The highest level of positive indicators			MAX Cij	9.333											

Based on the results obtained from Table 1, correlation coefficient or CC_i can be calculated for each indicator. Table 1 reports the final results of the TOPSIS-fuzzy method for calculating CC_i of the health performance indicators. For example, for the total reportable occupational illness frequency (TROIF) indicator, the sum of the deviation from negative ideal is calculated by table 2 as follows:

Table 2- Proximity coefficients and the rank of health performance indicators

Row	Health performance indicators	Sum of deviations from negative ideal	Sum of deviations from positive ideal	CC_i	rank
1	total reportable occupational illness frequency (TROIF)	3.036	2.344	0.564	4
2	total lost time of occupational illness frequency (TLOIF)	2.994	2.368	0.558	5
3	sickness absence rate (SAR)	3.397	1.985	0.631	1
4	total reportable cases of injuries and diseases per 100 (TRC)	3.070	2.303	0.571	3
5	cases causing days away restricted or transferred per 100 full-time personnel (DART)	3.096	2.264	0.578	2

Figure 1 displays the graphical representation of comparing the health performance indicators based on their **proximity** coefficients. According to this figure, the most important indicator among the health performance indicators is "sickness absence rate (SAR)"; with the proximity coefficient of 0.631 it has the minimum deviation with the positive ideal and maximum deviation with negative ideal. As the proximity coefficient diminishes, the distance between the indicator and positive ideal increases and approaches the negative ideal, thereby reducing the importance of the indicator. According to table 1, TLOIF indicator, with the minimum proximity coefficient (0.558) has been the last item in terms of priority.

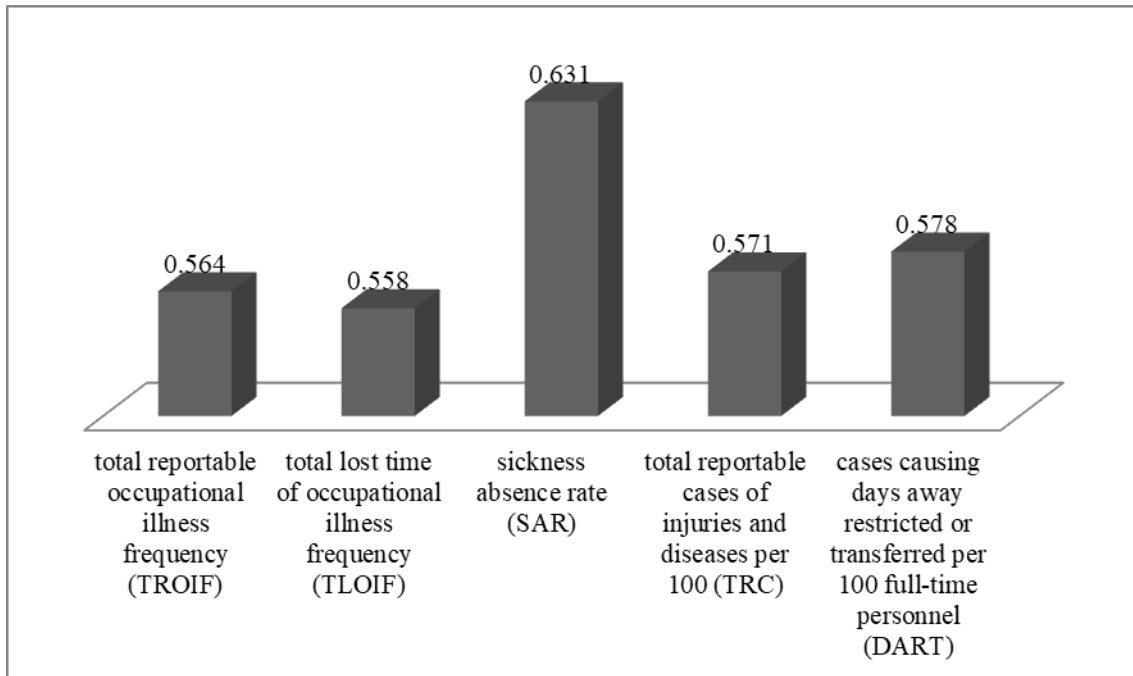


Fig 1. The diagram comparing the health performance indicators based on the proximity coefficient criterion

5- Conclusion

Health-oriented HSE has an important effect on the course of sustainable development in the country. Agenda 21, which is a global and modern plan to achieve sustainable develop and in the 21st century, was approved in Earth's related meetings in Rio de Janeiro. This agenda is an outcome of global agreement and commitments of leaders of countries about coordination for sustainable development with all economic, social, industrial, and cultural factors as well as HSE. In this agenda, maintaining and developing human health as well as reducing health risks resulting from pollution and risky environmental factors as well as codifying plans to control and reduce diseases have been emphasized. Now, after more than one decade of approving this agenda and once the requirements of this global plan were determined for systemic development in the leaders' meetings in Johannesburg (August 2002), human health, public health, environmental health have been set to the top priority. This involves the main pillar of HSE and its role in establishing sustainable development. The fifth and seventh chapters of the fourth five-year plan of the Iran's development have also dealt with protecting the environment and promoting public health as well as improving quality of life, suggesting the approach of Iran towards developmental requirements.

Examining the medical center HSE performance assessment methods, it was found that the issues raised in the field of evaluation of medical centers from the perspective of HSE are very limited and many key issues such as strategy development, HSE goals and programs, allocation of resources in the HSE field, identification and assessment of stakeholder needs from the perspective of HSE assessment, evaluation and selection of suppliers, compliance with HSE rules and requirements, and many other important issues have not been considered. Therefore, in future studies, the medical center HSE management evaluation criteria can be reviewed and formulated to provide a platform for evaluation of these centers from the perspective of HSE issues. The present research was performed to examine the key performance indicators of HSE in the HSE management system for hospital management. In this research, we presented a framework in which the KPIs of HSE were ranked.

In hospitals and care facilities worldwide, millions of individuals work in various occupations the health of who is threatened by many occupational hazards, With regard to the first research objective, the

indicators affecting the assessment of HSE management system performance were chosen by experts based on the bank of indicators collected by the researcher. Regarding the second objective, the KPIs of HSE were ranked using TOPSIS-Fuzzy method. The results indicated that TOPSIS algorithm is one of the most reliable scientific and managerial methods for decision-making. This method prioritizes relevant criteria, measures the weight of criteria in relation to each other, and then ranks them in a rational way.

The strong points of TOPSIS-fuzzy in major and diverse organizations (even if not similar units exist in the organization) include simultaneous analysis of quantitative and qualitative criteria as well as the factors affecting the conditions in the organization. Based on the results of this research, strategy-oriented organizations can take measures more reliably for assessing the performance of the organization across various predetermined dimensions. Then, in case of deviations, they can take proper corrective measures. Selection of operating indicators compared to the divergent indicators in their group of HSE KPIs in this research suggests the importance of HSE experts for monitoring the current performance of the management system and risk management in the organization.

Suggestions for future research:

For evaluating the hospital performance, the future research can deal with the following issues:

1- As our problem has been of questionnaire type, to further examine the problem, research can be conducted across various bank sectors in a more general way and can assess different levels including management, expertise, and the payment staff.

2. In the presented model, based on expert opinion, we assigned weights for dealing with the goals stated. By performing sensitivity analysis, the relative importance of each of these goals in relation to each other can be examined; in the present research, we considered them equal.

4. Another suggestion for solving the model is employing hybrid approach of other decision-making processes including analytical hierarchy process (AHP) and Vikor in order to achieve more complete and accurate results.

Generally, presentation of the proposed model can be an important step to enhance the level of hospital services.

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