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THE ROLE OF RISK MANAGEMENT IN ACHIEVING SUSTAINABLE DEVELOPMENT, WITHIN THE RADIATION DEPARTMENTS AT GOVERNMENTAL HOSPITALS IN NAJRAN CITY, SAUDI ARABIA

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Abstract:

Radiation departments play an effective and important role in hospitals in the early diagnosis of disease, as well as treatment. The risk management seek to identify, assess and prioritize risks to control of resources to reduce the likelihood and impact of unfortunate events or to limit opportunities. The aim of this study was assessing the role of risk management in achieving sustainable development within the radiation departments of government hospitals in Najran city, Saudi Arabia. The sample of the study was a census consisted of 191 Radiation Technologists and Radiologist. The researcher used a self-administered questionnaire. For data analysis, the researcher used the SPSS program (version 22). Statistical analysis included frequency, mean, and percentage, as well as independent sample t-test and one-way ANOVA. Results: The results of the study in the field of "risk management" revealed that the result of RII was (60.00%), Test-value =-3.56, and P value=0.001 which is smaller than the level of significance α=0.05. The sign of the test is negative, so the mean of this group is significantly smaller than the test value (2). In other words, there is no risk management within the radiation departments of governmental hospitals in Najran city. Where Regarding "Sustainable Development" field, the result of RII was (89.22%), Test value = 25.33, and P-value=0.001 which is smaller than the level of significance α=0.05. The sign of the test is positive, so the mean of this group is significantly greater than the test value (2). So, the respondents totally agreed about the importance of sustainable development. The study recommended the formation of a specialized risk management committee to facilitate the provision of radiological services in a sustainable manner.

Keywords: Governmental hospitals, Radiation, Radiologist, Saudi Arabia

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1. INTRODUCTION

The world is witnessing a huge informational and technological revolution, which in turn has contributed to the development of all aspects of life, especially in the field of medical imaging and interventional radiology. Therefore, there are uncertainties and concerns about standards of care, maintaining the safety of medical practitioners and patients, and managing risks in radiology.

Radiation is everywhere around us, which classified into ionizing and non-ionizing radiation. Ionizing radiation has enough energy to damage the material when interacts with it, as beta particles, alpha, Gamma- ray, and X-ray. Radiation plays an important role in the medical field, as it helps in diagnosing many diseases, also used as a treatment for cancer [1]. However, radiation has harmful effects on health, such as increasing the risk of cancer and distorting genetic mutations [2]. Radiography or radiology is "a photographic process used to depict anatomical structures. Instead of visible light, radiography uses x-ray energies that penetrate the body" [3]. The X-ray is a type of ionizing radiation widely used in medicine with many equipment's and varied procedures for using it. During X-ray imaging, the rays transferred through the desired organ, and the absorption of X-ray takes place by different tissues with varied degrees due to varied densities among tissues [4].

Ionizing radiation contains high energy, which can cause a cell component to change during its transmission through living tissues. The severity and type of health effect is related to the duration and amount of radiation exposure; however, the risks are not defined and there is no safe level of exposure to ionizing radiation [5].

Therefore, radiation departments in hospitals play an important and effective role in improving the quality of health care and services provided, through early diagnosis of diseases and treatment. However, overwork, radiation dose, risks from equipment damage and other external factors negatively affect the quality of services provided to patients as well as to staff. Risk management seeks to identify and evaluate risks in order to control the available resources to reduce the likelihood and reduce the chances of unfortunate events occurring. Thus, risk management in radiology is essential in the protection of patients and radiologists, medical [6].

In general, one of the most important goals of national policies in all countries of the world is to achieve sustainable development that positively affects the future of human development, the environment and natural resources. In January 2014, the Sustainable Development Strategy for the Health, Public Health and Welfare System 2014-2020 was released, which set a vision for a sustainable framework for health and welfare by reducing carbon outflows, planning communities for unusual climatic events, securing natural assets, and developing sound ways of life and environments [7].

Therefore, awareness of radiation risks and attention to protection principles is very important, especially among medical practitioners. Which prompts to consider risk management methods in radiology.

The aim of this paper is to assess the role of risk management in achieving sustainable development within the radiation departments of government hospitals in Najran Governmental Hospitals in the Kingdom of Saudi Arabia.

2. MATERIALS AND METHODS:

2.1. Study design and setting

An institution-based cross-sectional study design was conducted in government hospitals in the Najran region - KSA. The data collection was conducted from November, to December 2022. Sampling with simple random sampling method was used to get the required sample size. The target population were the RT and radiologist working in radiation departments at the governmental hospitals in Najran city, which include (191 employees).

Data collection was carried out using an interviewer administered pre-tested, structured, and standardized questionnaire. The questionnaire was initially prepared in English and then was translated into Arabic (the local language) and later on back to English to check for consistency.

Ethical approval obtained from the Ethics Committee of the Directorate of Health in Najran. study's goals and benefits described to the participants, and the importance of participant confidentiality and privacy explained.

2.2. Study participants

The Radiologists who agreed to participate screened by research assistants who are qualified Radiology department managers, to ensure that they meet the inclusion criteria. The list of Radiologists permanently employed was obtained from the Human Resource Department. Participants included all radiation departments in government hospitals in Najran, Saudi Arabia, which provide medical imaging and diagnostic services to patients. All staff

and radiologists were also included in the current study, and excluded if they were trained RTs, as well as any risks other than radiation dose, overload work, equipment damage, external factors and high voltage electricity. Convenience sampling used. A significance level of 0.05, 95% CI and power of 80% were used. Based on this sample size calculation, including 10% nonresponse rate the total sample is (191).

2.3. Study instruments

The current study relies on the questionnaire as a main tool for collecting data related to the study sample. The questionnaires were a set of questions used to elicit a wide range of objective data from radiation personnel as well as subjective data about their thoughts and perceptions. Questionnaires are an effective data collection mechanism that provides the researcher with the required information. The questionnaire was initially designed based on an extensive literature review of previous studies.

The questionnaire was provided with a cover letter explaining the purpose of the study, the method of response, the aim of the research, and data security in order to encourage a high response. The questionnaire was provided with a covering letter clarifying the purpose of the study, the way of responding, the aim of the research and the security of the data in order to encourage a high response.

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2.4. Statistical methods

Data entry and analysis were done using the Statistical Package for Social Sciences version 22 (SPSS Inc., Chicago, IL). Arithmetic means and standard deviations were applied to describe continuous data, whereas frequency and percentages were applied for categorical data. Chi-squared tests were utilised to assess the associations between categorical data and unpaired t-test to test for the significant difference between two continuous variables. A p-value of less than 0.05 was considered for statistical significance.

3. RESULTS:

3.1. Socio-demographics of the participants

Table 1.Sociodemographic traits of participants (n=191)

Variable		n	%
Your gender	male	132	69.1
	Female	59	30.9
Your age	20-30 year	32	16.8
	30-40year	89	46.6
	40-50 year	44	23.0
	more than 50 year	26	13.6
Marital status	Single	68	35.6
	married	108	56.5
	Divorced	15	7.9
Highest qualification achieved	Diploma	36	18.8
	Bachelor	113	59.2
	Master Degree	31	16.2
	PHD	11	5.8
Years of experience	less than 5 year	54	28.3
	5-10 year	69	36.1
	10-15 year	48	25.1
	15-20 year	24	12.6
	more than 20 year	6	3.1
Job title	Manager	18	9.4
	Head Of Department	11	5.8
	Head Of Division	20	10.5

	Employee	142	74.3
Job Description	Radiation Technologist	90	47.1
	Radiologist	101	52.9
Having TLD badge	yes	154	80.6
	No	37	19.4
Are you notified of your TLD readings	yes	160	83.8
	No	31	16.2

Participants in the questionnaire were RT and radiologists working in radiation departments in the government hospitals in Najran city. the results in Table (1) showed that most of the participants was males (74.4%) is about two times that of females working in radiation departments, were young people between the ages of 30 and 40 years (35.9 %) and this indicates that they are newly employed in these jobs. The researcher attributed this to the level of awareness of the Ministry of Health and females about the dangers of exposure to radiation, especially during pregnancy, which makes them stay away from such a job. The results showed that the social status of most employees in the sample was married (71.8%) and had a higher risk of radiation, The most of employees have an experience in working within the radiation departments for 10 - 15 years (38.5 %), indicating their adequate knowledge of risks of the radiation department. This indicates that they have an experience and proficiency in protection and continuity in work in a sustainable manner. Paloniemi, conducted study about experience, competence and workplace learning aimed to examine employees' conceptions of the meaning of experience in job competence and its development in workplace context, which founded the importance given to experience in efficiency and learning in the workplace. Staff also appreciate work experience as their primary source of competence, and the extent of learning through experiences has been emphasized [8]. Finally, most of participants have TLD badge (66.7%), and notified of your TLD readings (79.5%)

3.2. Analysis of Risk Management field.

Table 2. Analysis of Risk Management, RII's and test values

no	Questions	Mean	Std. Dev	RII (%)	T value	P value Sig	Rank
1	You have formal system of Risk management in radiation department.	2.43	0.84	81.00	5.92	0.001 *	1
2	There is a section / committee responsible for identifying, monitoring and controlling radiology risks.	2.41	0.84	80.29	5.72	0.001 *	3
3	The radiation department have in place an internal control system capable of dealing with newly recognized risks arising from changes in environment, etc.	1.59	0.80	53.04	-5.98	0.001 *	9
4	The radiation department have internal guidelines / rules and concrete procedures with respect to the risk management system.	1.93	0.94	64.23	-0.91	0.367	7
5	The radiation department have in place a regular reporting system regarding risk	1.42	0.68	47.20	-10.02	0.001 *	14

	management for senior officers and management.						
6	The manager responsible to review and identify the risk management systems, guidelines and risk reports	2.20	0.89	73.48	2.68	0.008*	4
7	The radiation department have contingency plans against disasters and accidents.	2.42	0.89	80.54	5.48	0.001 *	2
8	Radiation department complies with the standards of the International Protection Committee.	1.47	0.69	48.91	-9.08	0.001 *	12
9	The radiation department have tools and procedures for protection of employee.	1.55	0.83	51.58	-6.37	0.001 *	10
10	Your Radiation department determines your protection requirements to reduce radiation risks.	1.81	0.94	60.47	-2.24	0.027*	8
11	Review and approve control process take place periodically.	1.45	0.65	48.42	-9.82	0.001 *	13
12	There is a disclosure about radiation risk in the annual report.	1.48	0.67	49.39	-9.12	0.001 *	11
13	The Radiation department has a system to evaluate the causes of overworked work quantitatively.	1.38	0.72	45.99	-10.10	0.001 *	15
14	Department of Radiology adopted and utilized guidelines for protection employees.	2.01	0.95	66.91	0.09	0.929	5
15	Radiation exposure limits for employees are set and monitored	1.97	0.94	65.69	-0.36	0.716	6
16	The radiation department have in place a system for managing problems.	1.32	0.62	44.04	-12.87	0.001 *	16
	All statements	**1.80**	**0.805**	**60.0**	**-3.56**	**0.001 ***	

Table (2) showed that the Paragraph "You have formal system of Risk management in radiation department" was ranked in the first position by the respondents under this group with relative

importance index equals (81.00%), Test-value = 5.92, and P-value = 0.001 which is smaller than the level of significance (α= 0.05). The sign of the test is positive, so the mean of this paragraph is significantly greater than the test value (2). This result illustrates that there is an agreement by respondents about this paragraph. The researcher attributed the radiation sections provide occupational dosimeters (TLD) as protection requirements to reduce radiation risks.

Regarding the whole paragraphs, the RII equals (60.0%), Test-value =-3.56, and P-value=0.001 which is smaller than the level of significance α=0.05. The sign of the test is negative, so the mean of this group is significantly smaller than the test value (2). This explains the difference in the respondents' opinions regarding risk management in radiation departments in Najran government hospitals, which confirms the existence of a problem in radiation risk management. The results indicate that radiation departments determine the protection requirements for employees to reduce radiation risks. This is because radiation departments provide personal protection equipment from radiation such as protective devices made of lead as a means of protection without work to reduce the radiation doses that employees may be exposed to during working hours due to the increase in daily work pressure.

Moreover, there are no awareness systems and no employee awareness courses. The department heads attributed this lack of performance to the lack of coordination between the Ministry of Health and the Electricity Authority and the lack of logistical services in the radiation departments.

Finally, the results showed that there is no definition or disclosure of risks in radiation departments that could threaten employees and work continuity, which that there is no risk management within radiation departments in government hospitals in Najran, Saudi Arabia. This anomaly may be attributed to the lack of a formal risk management system or even problem management that serves as a guideline to protect employees and ensure business continuity, so without risk management that covers all its stages in radiation departments, it is difficult to achieve sustainable development.

Table 3. Frequency and percentage of administrative level issued by the Risk Management Policy

management level	Frequency	Percent (%)
MOH	63	54.3
Power Authority	20	17.2
Hospital management	32	27.6
External specialized agencies	1	0.9

The results in Table (3) show that (54.3%) of the sample members said that the risk management policy in the radiation departments is issued by the MoH. (27.6%) said that hospital management issues risk management policy in the radiation departments. (17.2%) said that issued by Power Authority, while the remaining percentage (0.9%) said that such policies issued by specialized external agencies. The researcher attributed the high percentage of the respondents' tendency to choose the hospital administration as the entity responsible for implementing the risk management policy, because it is the responsibility of the hospital administration to follow up periodically and continuously to maintain employees and follow up on work through it. Developing a risk management policy by identifying and evaluating risks, setting priorities for dealing with them, and coordinating with the Ministry of Health and the Power Authority.

Table 4. Frequency and percentage of use of prediction models

Report type	**yes**		**no**	
	F	**%**	**F**	**%**
Radiation dose risk	46	24.1	145	75.9
Equipment damage rate risk	99	51.8	92	48.2
Over loud work risk	136	71.2	55	28.8
High voltage electric risk	115	60.2	76	39.8

The results in Table (4) show the main hazards that can be present and the reports required are radiation dose, overwork, equipment damage, and a high voltage electricity hazard report. The results show

that a large percentage of workers in radiation departments believe that many reports related to the risks of overwork and occupational safety have not been issued, including reports of high voltage risks. This call for officials and heads of departments to pay attention and accuracy in issuing these reports to preserve the safety of employees ensure business continuity and achieve sustainability. On the other hand, it was the lowest percentage of reports about radiation dose hazards. The researchers attributed this situation to the lack of radiation dosimeters (radiation dose measurement) that employees receive during work time.

3.3. Analysis of Sustainable Development

no	Statement	Mean	Std. Dev	RII (%)	T value	P value Sig	Rank
1	Economic development is necessary for sustainable development.	0.86	0.39	95.38	26.05	0.001 *	11
2	A good clinical examination of the condition of The patient and the need for radiographic imaging helps to reduce the randomness and congestion on the sections of radiation, which helps in the sustainability of the service.	2.95	0.25	98.30	44.06	0.001 *	1
3	The acquisition of modern and computerized equipment to reduce effort and time helps to sustainability	2.93	0.29	97.57	37.69	0.001 *	2
4	Sustainable development demands that we humans reduce all sorts of (Risk).	2.92	0.30	97.32	36.07	0.529	3
5	The organization of specialized courses on a continuous basis for employees in the departments of radiation allows for the development of the quality of work and sustainability	2.88	0.38	96.11	26.87	0.001 *	8
6	Radiation maintenance technicians receive advanced courses to repair emergency faults and maintain the safety of devices contributes to sustainability.	1.96	0.81	65.21	-0.63	0.529	15
7	To achieve sustainable development, radiation departments must treat their employees in a fair way.	2.81	0.49	93.67	19.23	0.001 *	12
8	Preserving department equipment's is necessary for sustainable development.	2.92	0.27	97.32	39.47	0.001 *	4

9	Sustainable development requires equitable distribution, for example a periodic follow-up of equipment and ways of protecting employees	2.88	0.34	96.11	30.02	0.001 *	9
10	Sustainable development demands to organize number of courses (courses include for example, radiation protection, good practices, emergency management).	2.90	0.30	96.59	34.57	0.001 *	6
11	.For sustainable development, occupational radiation dose must be reduce.	2.89	0.34	96.35	31.02	0.001 *	7
12	Using more X-ray resources than we need does not threaten people's health or medical prospects in the future.	1.35	0.71	45.01	-10.6	0.001 *	16
13	I think that it is important to do something about problems which have to do with over loud work	2.62	0.75	87.35	9.70	0.001 *	13
14	I think that the government should make all its decisions on the basis of sustainable development.	2.17	0.94	72.26	2.10	0.038*	14
15	I think there is strong relation between risk management and achieving sustainable development.	2.88	0.37	96.11	28.31	0.001 *	10
16	I think that the government should be using building back better approach when renewing or reconstruction by using safety standards and sustainability.	2.91	0.32	96.84	33.30	0.001 *	5
	All statements	**2.55**	**0.45**	**89.22**	**25.53**	**0.001 ***	

Table (5) showed that the paragraph "A good clinical examination of the condition of the patient and the need for radiographic imaging helps to reduce the randomness and congestion on the sections of radiation, which helps in the sustainability of the service". Ranked in the first position by the respondents under this group with relative important index equals (98.30%), Test-value = 44.06, and P-value = 0.001 which is smaller than the level of significance α= 0.05. The sign of the test is positive, so the mean of this paragraph is significantly greater than the test value (2). The researcher attributed the high response rate in this paragraph to the importance of the clinical examination of the patient, as the identification of radiological images required for diagnosis more accurately, and this reduces re-imaging. This indicates that workers in radiation departments are aware of the dangers of exposure to radiation and helps protect themselves and maintain radiation equipment, which ensures continuity of work and sustainable development.

However, The paragraph "Using more X-ray resources than we need does not threaten people's health or medical prospects in the future" was ranked in the last position by the respondents under this group with relative important index equals (45.01%), Test value = -10.66, and P value = 0.001 which is

smaller than the level of significance α= 0.05. The sign of the test is negative, so the mean of this paragraph is significantly smaller than the test value (2). The researcher attributed the reasons for the disagreement with this paragraph to an increase in workload, which may lead to increased exposure to radiation and an increase in the depletion of radiation equipment. Moreover, it increases the possibility of equipment damage and service interruption, which is an obstacle to achieving sustainable development in radiation departments.

According to the results, achieving sustainable development clearly requires the following: Respecting the protection rights of others in the radiation department is essential to achieving sustainable development, good clinical examination of the patient's condition and the need for radiography are necessary to reduce randomness and crowding in radiation departments, and overexposure to radiation, which helps to sustain the service. In addition, for sustainable development, radiology personnel need to be educated about how to protect themselves from radiation hazards.

Finally, according to the respondents' opinions about the obstacles to sustainable development, they mentioned that there is an attempt to achieve sustainability in the service because it is essential in diagnosing diseases. In addition, there is a clear development plan to implement the risk management policy in the Ministry of Health, as the current approval of the Ministry depends on supporting the health sector through Vision 2030 and the National Transformation Plan.

4. CONCLUSIONS:

The importance of risk management comes from the importance of providing safety for workers and maintaining the integrity of equipment. Qualified personnel and appropriate management increase safety, productivity and quality of services provided to patients. This study was conducted to assess the role of risk management within the radiation departments in government hospitals in Najran, Saudi Arabia, and the possibilities of achieving sustainable development. The researcher utilized an observation, analytical cross-sectional design with a triangulated approach. (quantitative and qualitative survey approach has been adopted). A self-developed questionnaire were chosen as research technique to measure objectives.

Regarding risk management, the results indicate that the radiation departments do not provide full protection to the employees and that the quality control process is not carried out periodically. In addition, there is no definition or detection of risks in the radiation departments that could threaten employees, and work continuity. Which meaning that there is no risk management within the radiation departments in government hospitals in Najran. Therefore, without risk management that covers all its stages in radiation departments, it is difficult to achieve sustainable development. Regarding the implementation of the risk management policy, there is no reliable risk management policy and there is no entity that implements risk management policies within the radiation departments. Therefore, there is no definition or disclosure of risks in radiation departments that could threaten employees and business continuity. Therefore, without risk management that covers all its stages in radiation departments, it is difficult to achieve sustainable development.

According to the results of the study, the majority of workers in radiation departments agreed on the importance of sustainable development, and there is a consensus among department heads that the Ministry of Health has a policy of moving towards sustainability in providing service in radiation departments. In addition, there is a clear development plan for the implementation of the risk management policy in the Ministry of Health, as the current approval of the Ministry is based on Vision 2030 of the Kingdom of Saudi Arabia and the National Transformation Plan.

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Conflict of Interest

All authors declare no conflicts of interest in this paper.

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