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Implementation Of Hospital Risk Management Using Bowtie Method

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ABSTRACT

Every hospital is required to have risk management to prevent adverse events when providing health services. The application of risk management in hospitals helps identify and control incidents of work accidents that occur in hospitals, especially in the General Affairs and Engineering sections at the Hospital. The purpose of this research is to identify the source of the cause, impact, and control of the dominant occupational accident risk during work activities in the general affairs and engineering section of the hospital. Analysis with qualitative methods using data from observations and questionnaires. The results of the study found that there were two most dominant risks, namely medical waste management and MEP work on electric voltage hazards. It was concluded that there was a match between the application of risk management by the hospital and the results of testing the Bowtie method. Suggestions for this research are to review the risk assessment in height work, as well as to supervise the work methods carried out by workers.

1. Introduction

The International Labor Organization (ILO) states that the Occupational Safety and Health Administration (OSHA) has a mission to prevent work-related injuries, illnesses, and deaths by enforcing regulations (standardization) for occupational health and safety. The objectives of OSHA are (a) to ensure the safety, health and well-being of people at work, (b) to protect people in the workplace (other than people at work), (c) to promote a work environment that is physiology and psychology of people who are working, (d) establish a legal system based on industrial regulations and practices in addition to the designation of the Deed. The hospital as an industry in the health sector has its own characteristics that are very dense, namely labor intensive, capital intensive, technology intensive and regulation intensive. With these conditions, of course, hospitals cannot be separated from the risk of errors and accidents in serving patients. To ensure patient safety to prevent unexpected events (KTD), hospitals need to implement risk management efforts.

Defined, risk is a form of uncertainty from a situation that can occur under certain conditions or in the future (Suma'mur, 2014; Lyon & Hollcroft, 2021). Furthermore, risk can arise as a result of an uncertainty related to the existing consequences, it can even result in an unfavorable condition (Ihsan et al., 2022; Pranata & Sukwika, 2022). The difference between risk and uncertainty lies in the presence or absence of information about the uncertainty. Thus, risk is the nature of the process that can harm individuals and/or the environment with varying degrees of severity (ISO/DIS 45001). The risk management process provides a framework that facilitates more effective decision making. Through risk management, hospitals can implement a policy design to prevent adverse events or unwanted events in providing health services.

Based on a preliminary study conducted by researchers in 2021, it is known that the targets of these programs have been achieved (Table 3). However, there are still some problems in its implementation, namely the risk evaluation report which is reported by each unit to the Quality Committee every three months. Risk management is carried out to prevent incidents from occurring. Based on data on the number of adverse events in October 2020 – February 2021, there has been a significant increase in adverse events with a total of nine

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incidents in the five months, including four incidents of needle sticks being punctured, ceiling burst in one incident, slipping three times, electrocution one time incident.

However, to obtain more complete information from the results of the identification or investigation of work accident risks, analytical tools such as Bowtie or SCAT or Systematic Cause Analysis Techniques can be used (Sulistyowati & Sukwika, 2022). Based on the considerations above, this study uses the Bowtie method to examine the incidence of accident risk in the General Affairs and Engineering section of the Hospital. The analysis of the implementation of risk management using the Bowtie method aims to determine the possible risks of work accidents that can occur (Alizadeh & Moshashaei, 2015; Mulcahy et al., 2017; Septian et al., 2021; Wijayanti et al., 2022).

The application of the bowtie application in this study is considered to be able to explain the possible risk of work accidents in the general affairs and engineering section of the hospital; as well as identifying the sources of causes, impacts, and control of the dominant work accident risks during work activities in the general affairs and engineering section of the hospital, so that it is expected to reduce the adverse impact caused by the risk of work accidents..

2. Method

This type of research is a qualitative study using primary and secondary data. Primary data were obtained through observation, photos, interviews using questionnaires to employees of the GA and RS Engineering sections. Secondary data comes from written documents such as hospital work accident data for the year 2020-2021 and information related to standard hospital procedures. The study was conducted in a hospital, located in the Sentul City area, Bogor Regency. The study was conducted in March-May 2021.Based on the organizational structure of GA and Engineering, it is shown that it consists of the Head of the GA and Engineering Section, GA Staff, Technical Staff, and the K3 Committee. The population of GA and Engineering employees is 53 employees. This study uses a saturated sample that is the entire population is used as a sample. The bowtie method is used to find the root cause of work accident problems based on data collected from interviews and observations from GA and Engineering employees at the Hospital (Arthur, 2014; Chapman, 2016).

2.1 Analysis Stage

Hazard risk identification is carried out on the environmental impact aspect of the company's operations around the company's area. Through risk analysis, the magnitude of a risk can be determined by considering the severity or possibility that may occur. This analysis is carried out based on the context that has been determined by the company, of course by adjusting the risk category based on the AS/NZ Risk Management Standard 4360:1999 (SAA, 2010). The severity or probability scale is shown in Table 1.

Tabel 1
Nilai Tingkat Kemungkinan

Level	Deskripsi	Keterangan
1	*Rare*	Hampir tidak pernah, sangat jarang terjadi
2	*Unlikely*	Jarang terjadi
3	*Possible*	Dapat terjadi sekali-sekali
4	*Likely*	Sering terjadi
5	*Almost Certain*	Dapat terjadi setiap saat

2.2 Risk Identification Step

The initial stage is to identify the risk of work accidents in the General Affairs and Engineering (GAT) division, namely: (a) conducting field surveys and direct interviews, this is done to find out the work items in the GAT division, and find out the potential risk factors which may occur in the GAT division; (b) determine the hazard or hazard, this step is carried out to find out what hazards occur from work items based on Australian Standards/Standards New Zealand (AS/SNZ), namely (SAA, 2004): hazard is an activity, situation, and source; (c) identification of occupational accident risk. Work accident analysis is carried out by identifying the type of work accident risk according to the work accident data. The last step is to make a questionnaire to identify the risk of accidents, to know the magnitude of the probability and impact, and to respond to the risk of work accidents. Table 2 shows a list of jobs in the GAT RS division.

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Table 2
Gat Divisi Work Activities

No	Work Activities
1	Medical Waste Management
2	High Voltage MEP Job
3	Ceiling Work
4	Ceramic tile work
5	Wall and ceiling painting work
6	Management of infectious and non-infectious linen
7	Pest control management

3. Result and Discussion

The results of the preliminary survey obtained variables that were relevant to the AS/NZ Risk Management Standard 4360:1999, so that they could be re-analyzed in the follow-up survey questionnaire. Examples of the results of distributing questionnaires and interviews in the preliminary survey are shown in Table 3 and the classification of risk levels according to the results of the rating scale is presented in Table 4. It is known that the results of the probability scale risk assessment in work in the GAT division show the highest risk value (high risk), namely management activities. medical waste and high-voltage MEP work. Next, the matrix is classified by plotting it on the risk analysis matrix table. Qualitatively, the risk value is written with the following formula:

Risk = Probability x Impact

Based on Table 5, the accident risk analysis matrix on MEP work with high voltage hazards is included in the very high risk category, which often occurs and results in large losses, to production disruptions. Table 5 shows the results of surveys and interviews from the probability index, impact index and the classification of the matrix of the risk of work accidents that occur in the field. The causes of work accidents will be discussed in general from the results of the matrix assessment of the most dominant level of risk (high risk) are: (1) MEP work with the risk of electrical equipment and medical devices shorting (not functioning); and (2) Medical waste management with the risk of staff being punctured by syringe waste. The causes of work accidents from these two risks are obtained from the assessment of the dominant risk level, so that the cause of the accident can be analyzed using the Bowtie method.

Based on the results of preliminary observations, several potential risks were found within the GAT Division, such as being punctured by syringe waste with two incidents, high electricity voltage with three incidents, ceiling breaking in one incident, slipping twice, hospital management, and pest control management. After conducting further research in the form of direct observation in the field, it was found types of work with high potential. Examples are the presence of high voltage in some areas, and reports of needle sticks.

Table 3
Introduction Survey Result

No	Work Item	Hazard	Potential Risk	Relevant
1	Medical Waste Management	Syringe Waste	1a. Staff Punctured by Syringe Waste	√
		Inappropriate Types of Garbage Labeling	1b. Officers Wrong in Disposing of Waste According to Type	√
2	MEP Job	High voltage	2a. Electric Shock Officer	√
			2b. Shorted Electrical Equipment And Medical Devices (Not Functioning)	√
		Hot Panel Room Temperature	2c. Shorting And Burning Panel Room	√
		UPS Battery Damage	2d. UPS Cannot Backup And Medical Device Not Working	√
		The Solar Generator Runs Out	2e. Genset Won't Run When PLN Power Outages	√

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		Network Cable Pulling	2f. Dust Exposed Officer	√
		Welding	2g. Burned Workers	√
3	Ceiling Work	Sturdy Scaffold	3a. Fallen Workers	√
		Hook Not Strong	3b. Material Overwhelm Workers	√
4	Ceramic Installation Job	Ceramic Cutting	4a. Exposure to Dust	√
		Grinding Wheel Breaking	4b. Worker Exposed to Grinding Machine	√
5	Painting Work (Wall And Ceiling)	Painting	5a. Workers Breathe Strong Paint Smell	√
		Painting Using Stairs or Gondola For Outside The Building	5b. Workers Fall from a Height	√
6	Management of Infectious and Non Infectious Linen	Giving Chemical To A Large Washing Machine Does Not Use	6a. B3 Liquid Spill Worker	√
		Linen Ironing	6b. Workers Burned by Ironing Machine	√
		Use of Non-Standard PPE	6c. Workers are still not standard in using PPE, especially not wearing footwear in clean areas	√
7	Pest Control Management	Insect Treatment using Chemical	7a. Workers Inhaled Chemical Liquids	√

Table 4
Risk Assessment Result

No	Item Pekerjaan	Bahaya	Potensi Risiko	Probability					Dampak					Nilai Risiko
				1	2	3	4	5	1	2	3	4	5	
1	Medical Waste Management	Syringe Waste	1a. Staff Punctured by Syringe Waste				√					√		16
		Inappropriate Types of Garbage Labeling	1b. Officers Wrong in Disposing of Waste According to Type				√				√			12
2	MEP Job	High voltage	2a. Electric Shock Officer		√								√	10
			2b. Shorted Electrical Equipment And Medical Devices (Not Functioning)				√						√	20
		Hot Panel Room Temperature	2c. Shorting And Burning Panel Room		√								√	10
		UPS Battery Damage	2d. UPS Cannot Backup And Medical Device Not Working		√							√		8
		The Solar Generator Runs Out	2e. Genset Won't Run When PLN Power Outages	√									√	**5**
		Network Cable Pulling	2f. Dust Exposed Officer			√				√				6
		Welding	2g. Burned Workers			√						√		12
3	Ceiling Work	Sturdy Scaffold	3a. Fallen Workers	√								√		4
		Hook Not Strong	3b. Material Overwhelm Workers	√								√		4
4	Ceramic Installation Job	Ceramic Cutting	4a. Exposure to Dust		√							√		8
		Grinding Wheel Breaking	4b. Worker Exposed to Grinding Machine	√							√			3

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5	Painting Work (Wall And Ceiling)	Painting	5a. Workers Breathe Strong Paint Smell		√	√	9
		Painting Using Stairs or Gondola For Outside The Building	5b. Workers Fall from a Height		√	√	9
6	Management of Infectious and Non Infectious Linen	Giving Chemical To A Large Washing Machine Does Not Use	6a. B3 Liquid Spill Worker		√	√	9
		Linen Ironing	6b. Workers Burned by Ironing Machine	√		√	8
		Use of Non-Standard PPE	6c. Workers are still not standard in using PPE, especially not wearing footwear in clean areas		√	√	6
7	Pengelolaan pest control	Insect Treatment using Chemical	7a. Workers Inhaled Chemical Liquids		√	√	9

Table 5
Plot Matrix Result

Probability	Impact				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Extrime (5)
Rare (1) Unlikely (2) Possible (3)					
Likely (4) Almost Certain (5)					HIGH RISK

The results of the identification of occupational accident risk using the bowtie method along with the risk response are shown in Figure 1 and Figure 2. MEP work with the risk of short circuiting (non-functioning) electrical equipment and medical devices. In MEP work, dangerous conditions can arise from high voltages, while risk conditions originate from electrical and medical devices. When testing the tools, some medical devices experienced problems, namely shoots (outs), after checking the electrical voltage on several switches had increased from the standard, which was at 234 volts, while the normal voltage had to be below 230 volts.

3.1 Electrical Equipment Risk Identification

a. Threat measures

The cause of risk and hazard events is the checking factor, namely the technical officer does not carry out routine checks. To control it, technical officers must routinely check the electricity voltage, technical officers need to make daily checklists and documentation reports such as photos, as evidence that routine checks of electricity voltage have been carried out in all areas. Electrically sourced equipment has the potential to have risks such as hands can be scratched, cut, touched by hot objects and can be electrocuted when operating the machine (Septian et al., 2021; Pranata & Sukwika, 2022; Wijayanti et al., 2022).

The escalation factor is that the operator does not perform or forgets the SPO (standard operating procedure), its control, refresh training and SPO socialization are carried out, in addition, general maintenance needs to be carried out once a year, such as transformers, generators, and others. Another escalating factor is the high local electrical voltage in some electrical panels. The control is first checking the voltage on each switch before the tool is used, checking the room temperature on each floor panel regularly, checking the electrical lines in each floor panel. Finally, the health condition of workers lacks concentration. Control, routine health checks for workers. The role of operators who have competence can minimize the risk of accidents while operating equipment according to SPO (Veroza & Nurcahyo, 2017; Sari & Sukwika, 2020).

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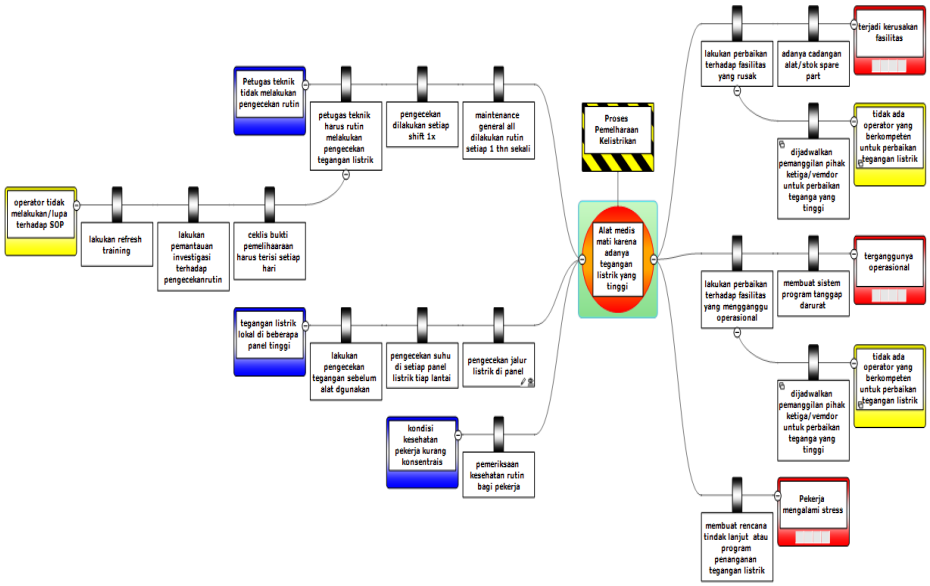

Figure 1. MEP (Electrical Maintenance) Work Bowtie Diagram

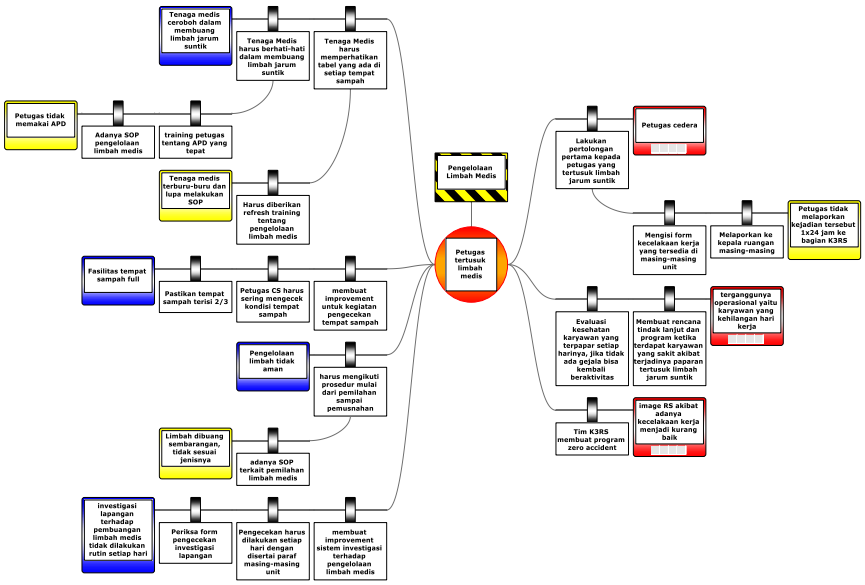

Figure 2. Syringe Waste Management Bowtie Diagram

b. Consequence

If there is damage to the facility, then the form of control is the need for a backup of tools / spare part stock, repair the damaged facilities. As for the escalation factor, it is known that there is no competent operator for electrical voltage repair, while for the control chart. Controlling, scheduling calls to third parties/vendors for high voltage repairs and refresh training for handling high voltage trouble shoots. In the bowtie chart, operational disturbances are found, the control is to make an emergency response program system, make repairs to facilities that interfere with operations. Finally, on the item that workers experience stress, the controller makes a follow-up plan or program for handling electricity voltages and provides one day of rest time for employees.

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3.2 Medical Device Risk Identification

Management of medical waste at risk needs to be carried out to avoid the incident of personnel being punctured by syringe waste. Syringe waste that should be disposed of in the safety box, but several times it is often found thrown away in yellow plastic, not in the safety box.

a. Threat measures

Bowtie chart on threat measures (cause), namely medical personnel are careless in disposing of syringe waste. To control, medical personnel must be careful in disposing of syringe waste, medical personnel must pay attention to the table in the trash. The first escalation factor is that officers do not use PPE, the control that can be done is the need for an SOP on medical waste management, officers are refreshed on training on the right PPE (Kartikasari, & Sukwika, 2021; Sulistyowati & Sukwika, 2022). In the second escalation factor, medical personnel are in a hurry and forget to carry out SOPs, and the control is that officers are given refresh training on medical waste management.

It was found that the trash bin facility was fully filled, while the control was that the cleaning service officer had to check the condition of the trash can regularly, so that if it was full, it was immediately replaced or disposed of, the volume of waste in each trash can was a maximum of 2/3 filled, making improvements to checking the trash can. . In the bowtie chart for unsafe waste management, the control is to follow procedures from waste sorting to destruction. The escalation factor is that waste is disposed of carelessly, not according to its type so that the control that can be done is the existence of SOPs related to the sorting of medical waste. Field investigations of medical waste disposal are not carried out routinely every day. The control is carried out by checking the field check investigation form, checking the form must be proven by the initials of each unit, making field investigation improvements.

b. Consequence

In the risk group for short-circuited (non-functioning) medical devices, the consequence (impact) was that the officer was injured. The control carried out is to provide first aid to officers who are punctured by syringe waste. The escalation factor is that the officers do not report the incident of being stabbed by the syringe waste 1x24 hours to the K3RS Team, so the control is to report to the head of each room, filling out work accident forms in their respective units. In the bowtie chart, operational disruptions are that employees lose working days, the control is to create an emergency response program system, make follow-up plans and programs when employees get sick due to needle sticks, follow-up employee health evaluations, hospital image due to work accidents is not good and the K3RS team created a zero accident program.

4. Conclusion

The dominant occupational accident risk in the GA & Engineering Division is MEP work, which is a high voltage hazard with the source of risk coming from electrical devices and short medical devices. Medical waste management techniques that are not in accordance with procedures and incompetent operators are the causes, consequences and escalation factors. The probability of a work accident at the Hospital in the GA & Engineering division is caused by not carrying out routine checks on the electrical panel which ultimately results in damage to facilities, disruption of operations, and stress. Suggestions for this study recommend that hospitals need to review the risk assessment of the work carried out in the engineering department, because there are so many potential risk activities. Supervise workers to always use PPE at work, and Supervise the work methods carried out by workers.

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