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The Implementation of Hiradc Method in Computer Laboratory

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Abstract

The computer laboratory of the Faculty of Public Health, Universitas Airlangga is used as a research site, measurement or scientific training for about 15,000 students. There are various types of activities which are at high risk, especially in the use of electricity, which can cause short-circuit and leads to fire. The objective of this study was to apply the Hazard Identification, Risk Assessment and Determining Control (HIRADC) methods in the computer laboratory as an effort to prevent occupational accidents and illness of the user. This study was an observational research using cross sectional design. The observation was conducted on the source of hazard and control efforts on the computer laboratory. Interview was conducted on the lecturers and administrative staff who are in charge of the computer laboratory. The results of the hazard identification indicated that there were 17 hazard sources that can cause 18 risks. Based on the *risk assessment* conducted on a activities practicum, there are 18 risks classified into 2 risk levels, those are 3 risks with *moderate risk* level and 15 risks with *low risk* level. The three level of moderate risks include taking off the shoes in standing position which can cause sprains, there is no first aid box and using electric current which can cause short circuit, electric shock and fire risk. The control that can be carried out by management laboratory to reduce the three moderate risk are by giving advice to taking off the shoes in sitting position, covering the socket which has risky placement by using duct tape to avoid the risk of electric shock as well as the provision of a light fire extinguisher for fire risk and the last providing first aid kits to treat the accidents that occur in the laboratory as soon as possible.

Keywords: *HIRADC, risk, computer laboratory*

Introduction

The management of Occupational Health and Safety (OHS) risk is the effort to manage hazard which has a potential risk to the workers' safety and health. The aim is to prevent accidents and illnesses caused by the occupation in the workplace comprehensively, planned and structurally in a good system. The magnitude of the potential risk is determined by the accident and its severity which is possibly caused [(1)]. According to OHSAS 18001, organization must establish procedures and make efforts in terms of *Hazard Identification, Risk Assessment* and *Determining Control* or known as HIRADC [(2)].

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HIRADC is an essential element in the occupational safety and health management system because it is directly related to the prevention and control of hazards used to determine OHS purposes and plans [(1)].The OHS Management System in Indonesia refers to the Government Regulation Number 50 of 2012 on the Implementation of Occupational Health and Safety Systems. HIRADC is a part of the implementation of OHSS. The regulation in appendix II point 2.1.2 states that as the OHS strategy, the identification of potential hazards, as well as the assessment and control of OHS risks plan needs to be implemented by competent officers [(3)].

The computer library of the Faculty of Public Health is one of the largest laboratories at Universitas Airlangga. This laboratory is used as a research site,

and scientific measurement or training for about 15,000 students. The hazards which can occur in such place can be in the form of electric shock, tripping of cables, *low back pain* interference and fire or short circuit. The computer laboratory practicum are usually done 5 days a week. This laboratory is also supervised and protected by the Department of Biostatistics, Faculty of Public Health. This laboratory has not implemented the OHS Management System in spite of the number of thousands students participated in the laboratory which is potentially can cause hazards. Therefore, this place has bigger risk of accidents.

Based on the preliminary observation, hazard of electric shock or short circuit is a major hazard which has a high risk of causing fire. Power sources come from various types of cables connected to the computer and electric socket next to the computer desk. In addition, this laboratory has some rules which prohibited the students to wear any shoes or footwear and bring food or drink into the laboratory.

The objective of this study was to apply the *Hazard Identification, Risk Assessment and Determining Control (HIRADC)* method in the computer laboratory of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Material and Method

Based on the analysis characteristics and system, this research is a descriptive research. Based on the length of time this research was conducted, this research belongs to a cross sectional study. In addition, based on the research site, this study is an observational study since the data is obtained through observation and interviews. The population of this research is the computer laboratory staff which consists of two people. The sample was taken using total sampling method. The research was conducted for one month in July 2018.

This study was completed by implementing HIRADC method. The first step was doing hazard identification which include analysis of work activities, sources of hazards and risks. The second step was doing risk assessment by considering the likelihood and severity of risk. The assessment process is done by multiplying the *likelihood* value and *severity* value. Furthermore, multiplication results are used to determine the level of risk with Low (L), Moderate (M), High (H), or Extreme (E) risk categories. And the last step is determining the controls that have been carried out by management and giving the recomendation .The category level of Likelihood, Severity, and Risk Matriks accordance with AS/NZS 4360 standard [1,4] .

Table 1: Level of Likelihood

Levels	Description	Explanation
1	Rare	The possibility of hazards is very small, almost never happens
2	Unikely	It usually do not occur, but the likelihood is rare, the frequency is annual
3	Possible	The possibility of hazard is small or coincidental, the frequency is monthly
4	Likely	The likelihood of hazard in particular circumstances, the frequency is almost 100%
5	Almost Certain	Very likely to happen, the frequency is certain

Table 2: Level of Severity

Levels	Description	Explanation
1	Insignificant	No injuries
2	Minor	First aid kit, employees continue to work
3	Moderate	Injuries that need medical treatment, employees do not go to work
4	Major	Severe injuries, loss of production capacity
5	Catastrophic	Death

Table 3: Risk Matriks Table

Description	Severity				
Likelihood	5 (M)	10 (H)	15 (H)	20 (E)	25 (E)
	4 (L)	8 (M)	12 (H)	16 (H)	20 (E)
	3 (L)	6 (M)	9 (M)	12 (H)	15 (H)
	2 (L)	4 (L)	6 (M)	8 (M)	10 (H)
	1 (L)	2 (L)	3 (L)	4 (L)	5 (M)

Findings

The activities conducted in student practicum in the computer laboratory of the Faculty of Public Health consist of seven activities, including taking off shoes before entering the laboratory, putting the bag into the laboratory's locker, sitting on the seat, the lecture gives lectures using wired microphone, practicum preparation which include checking the computer equipment, the implementation of the computer practicum and the closing of computer practicum. According to the identification results, there are 17 potential hazards from all of the activities which can lead to 18 risks. After the hazards were identified in the practicum activities, the next step is to carry out the *risk assessment*. Based on the *risk assessment* conducted on all work activities, there are 18 risks classified into 2 risk levels, those are 3 risks with *moderate risk* level and 15 risks with *low risk* level. The three level of moderate risks include taking off the shoes in standing position which can cause sprains, there is no first aid box and using electric current which can cause short circuit, electric shock and fire risk. Then, the management's existing control were giving advice to taking off the shoes in sitting position, covering the socket which has risky placement by using duct tape to avoid the risk of electric shock as well as the provision of a light fire extinguisher for fire risk and the last providing first aid kits to treat the accidents that occur in the laboratory as soon as possible.

Hazard Identification

Hazard identification is a process that can be done to recognize the whole situation which potentially can cause occupational accidents and illness in the workplace [(5)]. This research used the proactive method. Proactive methods are the best method for identifying hazards [(1)].

Laboratory regulations prohibit footwear from entering the computer laboratory, therefore students must take off their shoes and put them in the locker. The students usually take off their shoes in a standing position, which makes their body unbalanced and can cause their legs to dislocate. In a certain time, the floor in the front of the laboratory is sometimes slippery which can cause risks to the students.

The activity sitting on the chair was found a source of hazard, in which the sitting position which was less ergonomic for a long time can cause a *low back pain* disorder. According to Sumekar's research (2010), a good sitting position caused 27 out of 65 respondents (41.5%) experienced low back pain, while in a bad sitting position, 11 of 12 respondents (91.7%) also experienced low back pain with a risk of 15,481 times [(6)].

The source of hazard in the computer practicum preparation activity was turning on the computer that can cause electric shock. The electric shock hazard during plugging in or removing an electronic cable can cause electric shock and weakness [(7)]. Then, the second source of hazard is the use of electric current sources in the form of a socket which can cause a short circuit leading to fire and electric shock. This is due to the type and the placement of the socket which is appropriate. The third source of hazard is in the form of the sparks of the electrical cables installation which is unknown by the people since it is covered by the plywood, so that it can cause a fire. The fire extinguishers must be near the workplace to help extinguish the fire [(8)]. The fourth source of hazard is the noise of a damaged computer that can cause hearing disorder. This has been

experienced by the students when they are operating a damaged computer. The fifth source of hazard is the unavailability of first aid kits in the laboratory. Based on the Law Number 1 of 1970 article 3 paragraph 1, one of the requirements for occupational safety is to provide first aid kits [9]. The absence of this equipment can make the injury occurred becomes worse.

The computer practicum implementation activity have two sources of hazard, those are ultraviolet (UV) radiation and cold temperatures in the laboratory. A long exposure to UV radiation from a monitor screen can cause eye disorders, which can lead to a disorder of *Computer Vision Syndrome (CVS)*. When *Computer Vision Syndrome* is not treated well, it can decrease one's daily work productivity, increase the level of error in work, and decrease the job satisfaction [10]. The source of hazard in the form of cold temperatures in the laboratory can cause unbalance fluid or water on body (mild dehydration) with the symptoms of dry and cracked skin, sleepy, dry mouth as well as reduced saliva.

Risk Assessment

Risk assessment is the process of evaluating risks caused by hazards, taking into account the adequacy of controls owned, and determining whether the risks are acceptable or not [2]. This study used a qualitative risk assessment method according to AS/NZS 4360:2004 standard which consists of *likelihood* and *severity* criteria [4]. This method uses a risk matrix that describes the level of likelihood and severity of an event that is expressed in the form of a range from the lowest to the highest risk. The danger of taking off the shoes in standing position, there is no first aid and using electric current gets likelihood 2 value and severity value 3. If multiplied then gets a total value of 6. Value 6 is included in the moderate risk category in the risk matrix.

The danger of sitting less ergonomic for a long time get likelihood value of 3 and a severity value of 1. If multiplied then gets a total value of 3. The danger of turning on the computer get likelihood value of 2 and a severity value of 2. If multiplied then gets a total value of 4. This means that risk is included in the low risk category. The danger of sparks on electric cables under plywood get likelihood value of 1 and a severity value of 4. If multiplied then gets a total value of 4. The danger of damaged computer causes noise get likelihood value of 1 and a severity value of 3. If multiplied then gets a total value of 3. And the last, the danger of laboratory temperature is quite cold and ultra violet radiation from monitor screen gets likelihood value of 3 and a severity value of 1. If multiplied then gets a total value of 3. This means, all of the total values above are included in the low risk category in the risk matrix.

Work activities with *moderate risk* requires action to reduce risks including prevention costs that are needed to be carefully calculated and limited and measurement of risk reduction needs to be implemented properly and correctly [4]. work activities with *low risk* does not require additional control measures, but requires monitoring actions to ensure that controls are maintained and implemented properly and correctly [4].

Determining Control

Risk control plays a role in minimizing or reducing the level of risk to the lowest level. There are five hierarchies of risk control including elimination, substitution, engineering, administration and the use of personal protective equipment [2]. The determining controls carried out by the laboratory management were adjusted to the existing hazards, including:

For moderate risk, the determining controls were the student should taking off the shoes in sitting position to avoid sprains, covering the socket which has risky placement by using duct tape to avoid the risk of electric shock as well as regularly checking the socket to avoid the hazard risk of circuit and fire and the last providing first aid kits to treat the accidents that occur in the laboratory as soon as possible.

For low risk, the determining controls were chair design is adjusted to the computer desk to avoid *musculoskeletal disorders* on the student, giving a warning to carefully contact with the electrical appliance and attaching warning stickers to prohibit the students to bring food and drinks into the laboratory room to avoid the risk of electric shock and short circuit, checking the condition of the cable installation under the plywood and the provision of a light fire extinguisher for fire risk, do not operate the damage computer to avoid hearing disorders, and giving attention to rest their eyes for a moment after long facing the computer screen to avoid *computer vision syndrom*.

Conclusions

The computer laboratory of the Faculty of Public

Health, Airlangga University is used as a research site, measurement or scientific training for about 15,000 students. There are various types of activities which are at high risk, especially in the use of electricity, which can cause short-circuit and leads to fire. Based on HIRADC analysis, there are three level of moderate risks include taking off the shoes in standing position which can cause sprains, there is no first aid box and using electric current which can cause short circuit, electric shock and fire risk. Then, the management's existing control were giving advice to taking off the shoes in sitting position, covering the socket which has risky placement by using duct tape to avoid the risk of electric shock as well as the provision of a light fire extinguisher for fire risk and the last providing first aid kits to treat the accidents that occur in the laboratory.

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