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RISK ANALYSIS OF EMERGENCY INSTALLATION SERVICE IN RSUD DR. SOEWANDHIE USING ISO 31000:2009 AND HEALTHCARE FAILURE MODE AND EFFECT ANALYSIS (HFMEA)

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FINAL PROJECT

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ABSTRACT

RSUD Dr. Soewandhie is a public hospital which is owned by Indonesian government, it was built on 1964 in Surabaya city. One of the service that is being provided is emergency installation service, but the data shows that the customer satisfaction index only shows the score of 72, it falls below the target of 80. .*Peraturan Menteri Kesehatan Republik Indonesia nomor 1691* in 2011 about safety of hospital patient stated that there are seven standards for hospital one of them is to implement methods to improve performance standard, one of the criteria is to collect performance data those are related to risk management. This research has developed risk management process towards the emergency installation service in *RSUD Dr. Soewandhie* by using ISO 31000:2009 and HFMEA method. There are 6 processes and 16 sub-processes that have been identified in the emergency installation service and 75 risks that have been identified in the emergency installation service process of *RSUD Dr. Soewandhie* by conducting interview and analysis towards the graphical representation of the service process. The hazard score of identified risk based on the severity and occurrence of the risk resulted in 5 high hazard score risk, the criticality analysis resulted in 56 critical risks towards the process, the control measure analysis resulted in 53 risks that did not have effective control measure, and detectability analysis resulted in 41 risks that have to be mitigated. Risk mitigation plan was designed to 41 risks which are needed to be mitigated and resulted in 29 reducing occurrence mitigation plan, 6 reducing severity mitigation plan, 3 avoid risk mitigation plan, 2 reducing severity and occurrence mitigation plan, and 1 transfer risk mitigation plan.

Keywords : Emergency Installation, ISO 31000:2009, HFMEA, Risk Asessment, Risk Mitigation

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PREFACE

Praise a high gratitude to the Almighty God, for His Blessing and Guidance in helping to finish this research report by the time this book had published..

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The authors realize that there are imperfections in the writing, content, and presentation of this report. During writing process, the writers also realized that there are many commonness facets and obstacles that came from both internal and external factors. Therefore, some advices and corrections are really expected by us in purpose to build a better performance in the future as Industrial Engineers.

Surabaya, 2018

Author

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CHAPTER I
INTRODUCTION

In this chapter will provide the reasons for this research and problem raised in *RSUD Dr. Soewandhie* healthcare service, especially in their emergency installation service system. This chapter explained the background, problem formulation, and research objectives that is used in this final project.

1.1 Background

Indonesia as a developing country undergoes a serious challenge in order to improve the health and welfare of the society. As of March 2017, the poverty rate in Indonesia reaches 10.64% of the population, it's more than 27 million people from total of 261 million people in Indonesia (BPS,2017) , and the mortality rate per 1000 person in Indonesia is 6.5, while it falls above average relative to another countries in the world, it still falls behind another ASEAN countries such as Philippines, Vietnam, Malaysia, and Singapore with mortality rate 6.1, 5.9, 5.1, and 3.5 respectively (CIA World Factbook,2018). Feinstein.S (1993) explained that individuals of lower socioeconomic status, generally have faced higher mortality rates than individuals of higher status, but it's not necessarily the case with Indonesia since Indonesia has higher income per capita than Vietnam ($3,600 compared to $2,951(IMF,2015)) but with higher mortality rate. It means that Indonesia still has a lot of work to do with another area such as healthcare governance in the country.

In Indonesia, Ministry of Health has the functions to formulate regulation and policy regarding to the development of health services in Indonesia (Depkes,2016), and it should be followed by lower regulations at the ministerial level, until they are implemented. Health services activities in Indonesia are conducted by local governments through the local health offices. The governance of healthcare facilities, is set out in the Hospital Act, which provides the application of good governance and clinical governance principles. To support the good governance and clinical governance principle in Indonesia, the accreditation for hospital is conducted by Indonesian Commission for Hospital Accreditation (KARS), this accreditation as a standard in assessing a hospital, is used to ensure

the quality of hospital service, and hospital in Indonesia must be renewed after three years (*DPR*,2009a). This accreditation is adopted from the JCI standard for hospitals. JCI stands for Joint Commission International works to improve patient safety and quality of health care in the international community by offering international accreditation and certification (JCI,2018). One of the hospitals that will be renewing their accreditation certificate is *RSUD Dr. Soewandhie*.

RSUD Dr. Soewandhie is a public hospital which is owned by Indonesian government, it was built on 1964 in Surabaya city. *RSUD Dr. Soewandhie* was built to give healthcare service, healthcare education, and research in health field. In 2015, *RSUD Dr. Soewandhie* got the certification as a teaching hospital which has the function as a practical education center for medical students, internship, and specialist medical student.

Table 1. 1 Performance Indicator of RSUD Dr. Soewandhie (source: Annual report)

Performance Indicator	**Standard**	**Year**	
		2014	**2015**
BOR (Bed Occupation Rate)	>85	89.52	90.34
TOI (Turnover Interval)	<1	0.58	0.52
BTO (Bed Turnover Ratio)	>50	66.16	68
ALOS (Average Length of Stay)	<6	4.3	4.3
NDR (Net Death Rate)	<25	27.84	26.7
GDR (Gross Death Rate)	<45	45.26	45.4

Based on the performance indicator of *RSUD Dr. Soewandhie* in table 1.1, it can be seen that there are 2 indicators which fall below the standard (NDR and GDR) , NDR (Net Death Rate) is death rate of every 1,000 patient 48 hours after being discharged from the hospital and GDR (Gross Death Rate) is total death rate of every 1,000 patient discharged from the hospital. These two indicators depict the quality of hospital's service, and in this case, *RSUD Dr. Soewandhie* is still not able to provide expected service quality from the standard.

Peraturan Menteri Kesehatan Republik Indonesia nomor 1691 in 2011 about safety of hospital patient stated that there are seven standards for hospital patient safety which are patient's rights, educating patients and family, patient safety in service integration, leadership role, educating staff about patient's safety, designing information system process, and implementing methods to improve

performance. These standards then be used to evaluate hospitals in Indonesia. In implementing methods to improve performance standard, one of the criteria is to collect performance data those are related to risk management. It is also stated that one of the objective of the hospital for patient safety is to develop policy regarding implementation of root cause analysis towards occurred incident and to conduct Failure Mode and Effect Analysis to process that has high risk. In this case, *RSUD Dr. Soewandhie* still has not conducted Failure Mode and Effect Analysis and root cause analysis to their process and occurred incidents.

Table 1. 2 Emergency Installation visitation in 2014 until 2016 (Source: hospital's annual data)

Payment Method	**Patient visitation**		
	2014	**2015**	**2016**
General	26032	22547	19818
KAI	56	39	27
Inhealth	155	74	28
Regional Health Insurance	465	319	246
Maskin	5357	2077	2597
T4	93	101	107
BPJS	10875	15166	16169
BPJS non PBI	11223	15392	17074
Total	**54256**	**55715**	**56066**

From the table 1.2, it can be seen that emergency installation visitation of *RSUD Dr. Soewandhie* reached more than 50,000 patients each year, which means almost half of total patient visitation to *RSUD Dr. Soewandhie* came to emergency installation. With that many visitation, in 2015 the customer satisfaction index only shows the score of 72, it falls below the target of 80, thus to ensure the quality of services that is being provided by them and to minimize the undesirable events, RSUD *Dr. Soewandhie* needs to improve their service performance towards their patients by implementing new methods towards their emergency installation system. Thus, risk management as one of the standards from Ministry of Health is needed to be conducted by *RSUD Dr. Soewandhie* towards its emergency installation service system.

According to ISO 31000:2009, risk management refers to a coordinated set of activities and methods that is used to direct an organization and to control the many risks that can affect its ability to achieve objectives. It also refers to the

architecture that is used to manage risk. Risk management is used to assure uncertainty does not deflect the endeavor from the business goals. One of the output of risk management is risk register, risk register is a database of risk that contains the record of the details of all risk that have been identified along with their analysis and plans for how those risk will be treated (PMBOK,2013). The purpose of risk register is to manage the risks down to acceptable levels through a review and updating process.

To support and sustain risk management throughout an organization, principles and generic guidelines on risk management is needed. The principles and generic guidelines on risk management are provided in ISO 31000:2009, it also provides the standard on the implementation of risk management. ISO 31000:2009 is trying to formalizing risk management practices that will facilitate broader adoption by companies who requires an enterprise risk management standard that accommodates multiple management system.

In the context of healthcare organization such as hospital, role of risk management is crucial, it's necessary for the hospital to take proactive action in order to ensure patient safety. National Center for Patient Safety has developed a multidisciplinary method that combines the concepts, components, and the definition of industrial FMEA, Hazard Analysis Critical Control Point and Root Cause Analysis which is Healthcare Failure Mode and Effect Analysis. HFMEA is used to map out a high-risk healthcare process and identify the potential failure that can occur within the process activities (Faiella,et all.,2018). There are two roles in terms of operational process in hospital which are clinical and non-clinical work, clinical process often have face-to-face contact with patients for the purpose of diagnosis, treatment, and ongoing care. Some clinical work are behind-the-scenes, such as laboratory professionals whose work supports diagnosis and treatment. While non-clinical roles are those which do not provide any type of medical treatment or testing.

Thus, by understanding the existing condition at *RSUD Dr. Soewandhie* which still has not implement risk management in their healthcare process, it is being the reason *RSUD Dr. Soewandhie* is chosen as the observation object. This research will develop risk management process towards the emergency installation

service in *RSUD Dr. Soewandhie* by using ISO 31000:2009 and HFMEA method. By using the method, this research will identify, assess, and evaluate the risk that may occur in *RSUD Dr. Soewandhie* and produce risk register as the output of this research.

1.2 Problem Formulation

The formulation of the problem based on the background in this final project are:

1. How to identify and asses potential risk that may occur within the emergency installation process?
2. What are the suggestions for the mitigation of the identified risk events?

1.3 Research Objective

The objectives of this research are:

1. Identification and assessment of risk within the emergency installation process by using ISO 31000 and Healthcare Failure Mode and Effect Analysis.
2. Provide suggestion for the mitigation of the identified risk events.

1.4 Research Benefit

The benefits of this research are:

1. Provide *RSUD Dr. Soewandhie* with risk register.
2. Provide suggestion to mitigate identified risk events.
3. As a reference for risk management in other processes.
4. For the hospital to fulfill the standard needed from Ministry of Health.

1.5 Research Scope

This sub-chapter will provide the scope of the research.

The limitations of this research is that the scope of the risk is general clinical and non-clinical operational risk, neglecting other treatment needed based on the patient's disease.

The assumption of this research is that the emergency installation service process does not change during the research.

1.6 Writing Systematic

This sub-chapter gives the whole writing systematic process of the research.

The writing systematic that is used by the writer consists of:

CHAPTER 1 : INTRODUCTION

This chapter will provide the research background, problem identification, research objectives, research benefits, research scopes, and writing systematic of this research.

CHAPTER 2: LITERATURE REVIEW

This chapter will provide theoretical and conceptual literatures which are used as the thinking framework for this research.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter will provide the overview and description of the structured framework or plot and systematic way of doing this research.

CHAPTER 4: DATA COLLECTION AND PROCESSING

This chapter will provide how data will be collected and how it will be processed with some approaches which are already determined before. The result of the data processing will be analyzed later.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION

This chapter will provide the analysis and interpretation of the results data collecting and processing which are done in the previous chapter.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

This chapter will provide the results obtained from implementation of the conclusion of this research. The conclusion contains result of the research goals have been set previously. In addition, this chapter also contains suggestions for improvement regarding the company and for development of further research.

CHAPTER 2

LITERATURE REVIEW

This chapter will provide the literatures which will be used as the references in this research. These literatures contain healthcare management, risk, risk management, flow diagram, ISO 31000:2009, and Healthcare Failure Mode and Effect Analysis.

2.1. Healthcare Management

Healthcare management or hospital management is a very broad scope and can be defined from different aspect. It mainly refers to the management of all aspect of a hospital(Rnpedia,2018). WHO produced 4 outputs from their working paper in 2007 to help countries to develop and scale the coverage of the health services which is leadership and management framework.

2.1.1. Leadership and Management Framework

Leadership and Management framework is a complex concept which are relevant to many different parts of the health system. To structure work in this complex issue, a framework towards the condition necessary for good leadership and management is made.

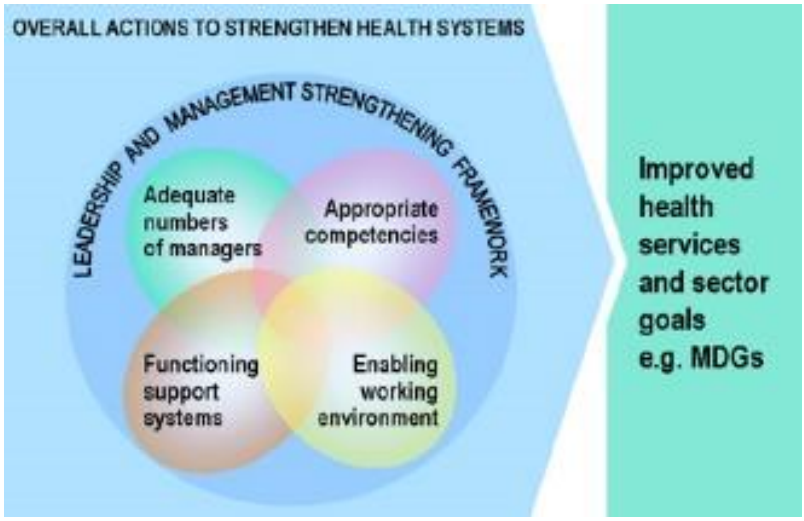


Figure 2. 1 Leadership and management framework in healthcare system (Source: WHO,2007)

From the figure 2.1 above, it can be seen that for good leadership and management, there has to be a balance between four dimension such as: ensuring

adequate numbers of managers, ensuring the managers have appropriate competencies for the work, ensuring there are functioning support system and enabling working environment.

2.1.2. Milestones to Develop High-Performing Hospital

After ensuring the basic framework of the leadership and management towards healthcare management system, Weimann(2017) provides milestone to develop high-performing hospital as a guide for developing and developed countries to improve their healthcare service. These milestones are:

a. Engage nurses, clinicians, and patients to drive hospitals.

   This means that staff members have to be aware of the health system's constraints and possible solutions, and understand the stakeholder to understand what they expect from the hospital.

b. Create a corporate identity.

   Corporate identity has to be lived as bottom-up approach at all level throughout the entire hospital. This will create the feeling of being part of the business processes and playing an important role in the hospital, thus, increasing the performance of the human resources.

c. Develop vision and communicate it

   The development of a business strategy and the strategic implementation of projects are tools for realizing visions. The project and project portfolio management have to align with the overall business strategy to achieve the vision.

d. Face the competitors

   The hospital should be designed around processes. the quality of processes has to be compared with other healthcare providers in benchmarking processes. Business process re-engineering and approach for continuous improvement should be implemented to be better than competitors.

e. Develop and communicate your strategy

   The control and definition of key performance indicators are an important part of business decision. Other method such as risk management should

be implemented and be communicated to ensure the development of the organization.

2.2. Ministry of Health's Policy Number 1691/2011

The policy of Ministry of Health number 1691/2011 is about the safety of hospital patient, this policy was mad to ensure the safety of patient in hospital. Based on the policy, hospital patient safety is a system which hospital ensure the safety of hospital patient which consists of risk assessment, identification and management of patient's risk, incident report and analysis, ability to learn from a incident and the implementation of solution to minimize risk occurence, and to prevent incident from a failure of an action. The scope of this policy consists of organization, patient safety standard, patient safety objectives, patient safety implementation, incident report, analysis and solution, and monitoring.

In the article number 7 first paragraph stated that every hospital must to implement patient safety standards. The standards consist of patient's rights, educating patients and family, patient safety in service integration, leadership role, educating staff about patient's safety, designing information system process, and implementing methods to improve performance.

In the attachment of the policy, the criteria of each standard is provided, which are:

a. Patient's Rights

   The criteria for patient's rights are there has to be a doctor that is responsible to the service, that doctor has to make service planning, and the doctor also has to give clear explaination towards the patient and family about the plan and the result of the service, drugs, or procedure for patient including the possibility of incident occurence.

b. Educating Patients and Family

   The criteria is that the hospital has to have mechanism and system to educate patient and its family about the responsibility of the patient.

c. Patient Safety in Service Integration

   The criteria of this standard are the hospital has to have thorough service coordination, service in which is needed by the patient, communication

system improvement for the stakeholders, and communication and information transfer between healthcare staff.

d. Implementing Methods to Improve Performance

The citeria of this standard are the hospital has to conduct designing process of the vision, mission, objectives, patient's need, and other factor according to "Seven Ways Toward Hospital Patient Safety". The hospital has also to collect performance data regarding to the incident report, accreditation, risk management, utilization, service quality, and financial report. Then, the hospital also has to do intensive evaluation regarding to all incidents. And lastly, the hospital has to use all data and information from analysis to decide the change in the system that is needed, to ensure the quality of performance and patient safety.

e. Leadership Role

This standard consists of criteria which are the hospital has to have multidiciplinary team to manage patient safety programme, availability of proactive programme to identify safety risk and program to minimize incident occurence, availability of work mechanism to ensure that every components of the hospital are being integrated and are participating in patient safety programme.

f. Educating Staff about Patient Safety.

The hospital has to have education, training, and orientation process for each job that cover the linkages between job with patient safety and hospital has to conduct continuous education and training to improve and maintain staff competence.

g. Designing Information System Process

The hospital has to plan and design information system process regarding to patient safety to fulfill information that is required from internal and external of the hospital.

2.3. Risk

The origin of the word 'risk' is thought to be either the Arabic word *risq* or the Latin word *riscum* (Kedar,1970). The Arabic *risq* signifies 'anything that has been given to you (by God) and from which you draw profit' and has connotations

of a fortuitous and favorable outcome.(Merna.et all, 2005). The word ‘risk’ entered the English language in the mid seventeenth century derived from the word ‘risque’. In the second quarter of the eighteenth century the anglicized spelling began to appear in insurance transactions (Flanagan and Norman,1993).

Based on ISO 31000:2009, risk is the effect of uncertainty that organization has when pursuing their objectives. The effect may be positive and/or negative. Risk is often characterized by reference to potential events and consequences or a combination of these. While Monahan(2008) explained that risk is anything that produces a distribution of various outcomes of various probabilities. By these definitions it can be known that risk is anything that produces a distribution of various outcomes that may affect an organization’s objective.

Kaplan and Gerrick (1981) proposed a triplet for recording risks which includes a set of scenarios or similar occurrences (something bad happens), the probabilities that the occurrences take place (the chances something bad happens), and the consequence measures associated with the occurrences. While ISO 31000:2009 explained that 2 dimensions of risk which are consequence and likelihood, consequence is an outcome of an event that affects the objectives while likelihood is the chance of the risk happening, these two dimensions are widely use nowadays.

A source of risk is any factor that can affect project or business performance, and risk arises when this effect is both uncertain and significant in its impact on project or business performance.

Table 2. 1 Typical Sources of Risk to Business from Projects (Source: Merna and Smith 1996)

Source	Change and uncertainty in order due to :
Political	Government policy, public opinion, change in ideology, dogma, legislation, disorder (war, terrorism, riots)
Environmental	Contaminated land or pollution liability, nuisance (e.g., noise), permissions, public opinion, internal/corporate policy, environmental law or regulations or practice or 'impact' requirements
Planning	Permission requirements, policy and practice, land use, socio-economic impacts, public opinion
Market	Demand (forecasts), competition, obsolescence, customer satisfaction, fashion
Economic	Treasury policy, taxation, cost inflation, interest rates, exchange rates
Financial	Bankruptcy, margins, insurance, risk share
Natural	Unforeseen ground conditions, weather, earthquake, fire or explosion, archaeological discovery
Project	Definition, procurement strategy, performance requirements, standards, leadership, organization (maturity, commitment, competence and experience), planning and quality control, programmer, labor and resources, communications and culture
Technical	Design adequacy, operational efficiency, reliability
Regulatory	Changes by regulator
Human	Error, incompetence, ignorance, tiredness, communication ability, culture, work in the dark or at night
Criminal	Lack of security, vandalism, theft, fraud, corruption
Safety	Regulations (e.g., CDM, Health and Safety at Work), hazardous substances (COSSH), collisions, collapse, flooding, fire and explosion
Legal	Those associated with changes in legislation, both in the UK and from EU directives

2.4. Risk Management

Monahan(2008) stated that the definition of enterprise risk management is dealing with uncertainty for the organization. While Merna(1996) explained that Risk management can be defined as any set of actions taken by individuals or corporations in an effort to alter the risk arising from their business.

Risk analysis and risk management have been carried out in many fields for a number of decades and are being increasingly used as integral parts of the overall business management approach and on most major projects, in some cases they have become a mandatory requirement for financial planning and regulatory approval.

PMBOK (2013) states that project risk management includes the processes concerned with identifying, analyzing and responding to project risk. It also includes maximizing the results of positive events and minimizing the consequences of adverse events. The main processes involved in risk management will be provided below.

2.4.1. Risk Identification

Risk identification consists of determining which risks are likely to affect the project and documenting the characteristics of each one. Risk identification should address both the internal and the external risks.

The identification of risks using both historical and current information is a necessary step in the early stage of project appraisal and should occur before detailed analysis and allocation of risks can take place.

2.4.2. Risk Quantification and Analysis

This process evaluates risks and risk interaction to assess the range of possible outcomes. It is concerned with determining which risk events need to be mitigate. The major output is a list of opportunities that should be pursued and threats that require attention. It also should list the sources of risk and risk events of a risk.

2.4.3. Risk Response

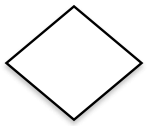
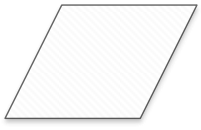
It involves defining enhancement steps for the opportunities and responses to the threats. There are some ways to response a risk which are: risk avoiding that remove a particular threat by either eliminating the source of the risk or by avoiding the process that has exposure to the risk, risk reduction that either lowering its probability or lessening its impact, risk transfer that giving the risk to other party in regards to a reward to them, and risk retention which accepting the risk and doing nothing to the risk.

2.5. Flow Diagram

Harris(1999) stated that flow diagram is a diagram that visually displays interrelated information such as events, steps in a process, functions, etc., in an organized fashion, such as sequentially or chronologically. Flow diagram is used to design and documenting simple processes or programs in order to help to understand a process and analyze them.

Flow diagram has their own standards that was set by International Organization for Standardization (ISO) in 1985. The shapes of flow diagram will be provided in the table below.

Table 2. 2 Description of Flow Diagram's Shapes (Source: smartdraw.com)

SHAPE	NAME	FUNCTION
	Terminal	Symbolizes a beginning or ending point of a process, represented as a rounded rectangle
	Process	Symbolizes a set of operation that change the value, form, or location of the entity. Represented as a rectangle.
	Decision	Symbolizes a conditional operation determining the paths the process will take. It usually consists of yes/no question. Represented as rhombus..
	Input/Output	Symbolizes input and/or output of a data. Represented as a parallelogram

2.6. ISO 31000:2009

ISO 31000 is a standard which relates to the risk management codified by the International Organization for Standardization (ISO) which has the purpose to provide principles and generic guidelines on risk management. ISO 31000 was published on 13 November 2009 (ISO.org) and provides standard on the implementation of risk management, and it is hoped to be applicable for any organization, association, group, or individual. ISO 31000:2009 has been developed on the basis of an existing standard on risk management, AS/NZS 4360:2004 and gives more holistic view toward risk management and addresses the entire management system that support the planning, implementation, monitoring, and improvement on the risk management process. In this International Standard, the expressions “risk management” and “managing risk” are both used. In general terms, “risk management” refers to the architecture (principles, framework and process) for managing risks effectively, while “managing risk” refers to applying that architecture to particular risks. Although this International Standard provides generic guidelines, it is not intended to promote uniformity of risk management across organizations. The design and implementation of risk management plans and frameworks will need to take into account the varying needs of a specific organization, its particular objectives, context, structure, operations, processes, functions, projects, products, services, or assets and specific practices employed. The general principles and guidelines of risk management in ISO 31000:2009 will be provided in the figure below.

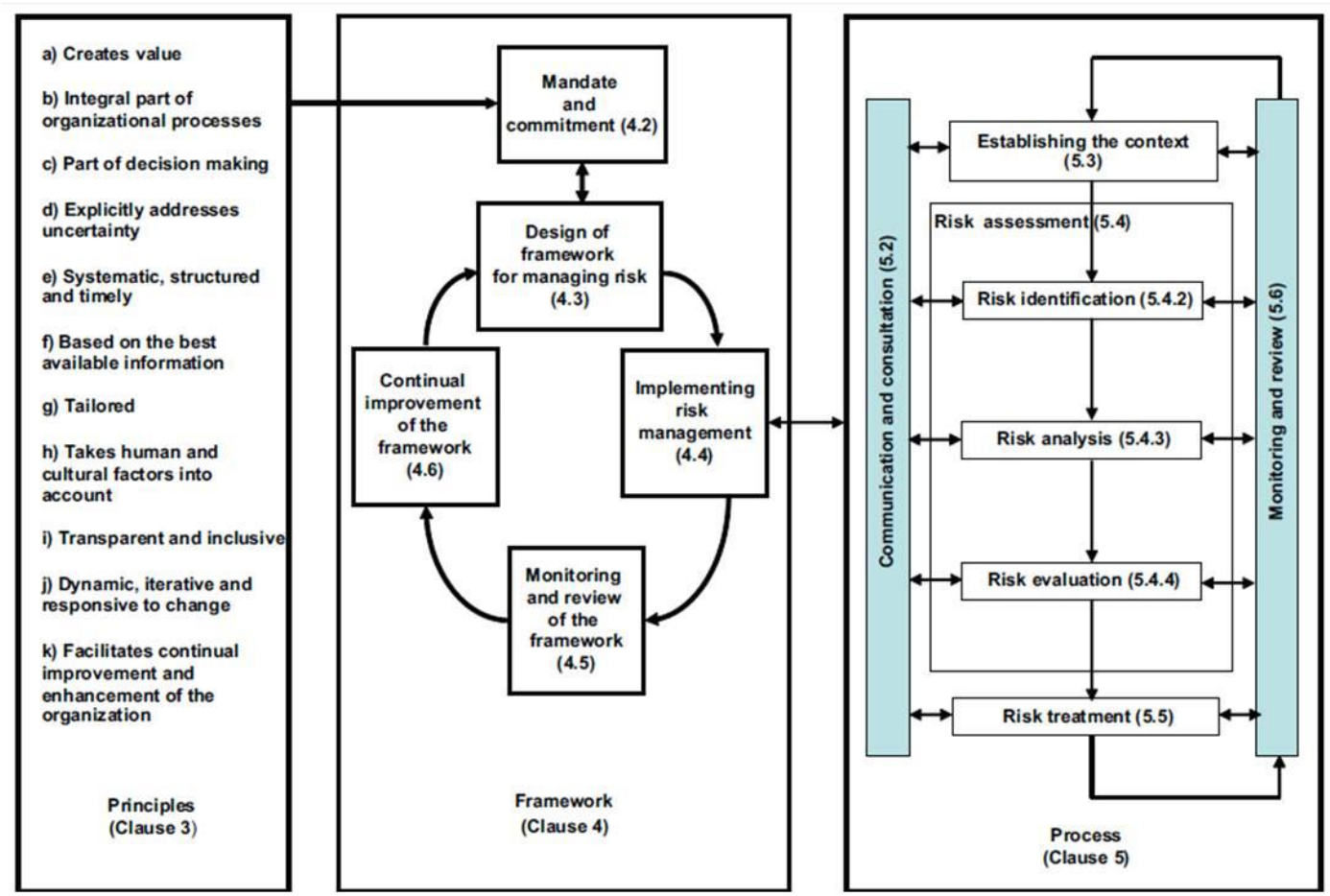


Figure 2. 2 Relationships between the risk management principles, framework, and process of ISO 31000:2009 (ISO.org)

2.6.1. Risk Management Principles

Risk Management principles are used so that risk management in the organization will be effective. It should comply at all level with the principles below.

a. Risk management creates and protects value

   Risk management contributes to the demonstrable achievement of objectives and improvement of performance in, for example, human health and safety, security, legal and regulatory compliance, public acceptance, environmental protection, product quality, project management, efficiency in operations, governance and reputation.

b. Risk management is an integral part of all organizational processes.

   Risk management is not a stand-alone activity that is separate from the main activities and processes of the organization. Risk management is part of the responsibilities of management and an integral part of all organizational processes, including strategic planning and all project and change management processes.

c. Risk management is part of decision making

   Risk management helps decision makers make informed choices, prioritize actions and distinguish among alternative courses of action.

d. Risk management explicitly addresses uncertainty

   Risk management explicitly takes account of uncertainty, the nature of that uncertainty, and how it can be addressed.

e. Risk management is systematic, structured and timely

   A systematic, timely and structured approach to risk management contributes to efficiency and to consistent, comparable and reliable results.

f. Risk management is based on the best available information

   The inputs to the process of managing risk are based on information sources such as historical data, experience, stakeholder feedback, observation, forecasts and expert judgement. However, decision makers should inform themselves of, and should take into account, any

limitations of the data or modelling used or the possibility of divergence among experts.

g. Risk management is tailored.

   Risk management is aligned with the organization's external and internal context and risk profile.

h. Risk management takes human and cultural factors into account.

   Risk management recognizes the capabilities, perceptions and intentions of external and internal people that can facilitate or hinder achievement of the organization's objectives.

i. Risk management is transparent and inclusive

   Appropriate and timely involvement of stakeholders and, in particular, decision makers at all levels of the organization, ensures that risk management remains relevant and up-to-date. Involvement also allows stakeholders to be properly represented and to have their views taken into account in determining risk criteria.

j. Risk management is dynamic, iterative and responsive to change

   Risk management continually senses and responds to change. As external and internal events occur, context and knowledge change, monitoring and review of risks take place, new risks emerge, some change, and others disappear.

k. Risk management facilitates continual improvement of the organization

   Organizations should develop and implement strategies to improve their risk management maturity alongside all other aspects of their organization.

2.6.2. Risk Management Framework

The success of risk management will depend on the effectiveness of the management framework providing the foundations and arrangements that will embed it throughout the organization at all levels. The framework assists in managing risks effectively through the application of the risk management process at varying levels and within specific contexts of the organization. The framework ensures that information about risk derived from the risk management process is

adequately reported and used as a basis for decision making and accountability at all relevant organizational levels.

This framework is used to assist the organization to integrate risk management into its overall management system. Therefore, organization should adapt the components of the framework to their specific needs.

a. Mandate and commitment

   The introduction of risk management and ensuring its ongoing effectiveness require strong and sustained commitment by management of the organization, as well as strategic and rigorous planning to achieve commitment at all levels.

b. Design of framework for managing risk

   Before starting the design and implementation of the framework for managing risk, it is important to evaluate and understand both the external and internal context of the organization, since these can significantly influence the design of the framework. Then the risk management policy should clearly state the organization's objectives for, and commitment to. The organization should also ensure that there is accountability, authority and appropriate competence for managing risk, including implementing and maintaining the risk management process and ensuring the adequacy, effectiveness and efficiency of any controls. Risk management should be embedded in all the organization's practices and processes in a way that it is relevant, effective and efficient. Third, the risk management process should become part of, and not separate from, those organizational processes. In particular, risk management should be embedded into the policy development, business and strategic planning and review, and change management processes. Then, the organization should establish internal communication and reporting mechanisms in order to support and encourage accountability and ownership of risk. And lastly, the organization should develop and implement a plan as to how it will communicate with external stakeholders.

c. Implementing risk management

In implementing the organization's framework for managing risk, the organization should define the appropriate timing and strategy for implementing the framework, apply the risk management policy and process to the organizational processes, comply with legal and regulatory requirements, ensure that decision making, including the development and setting of objectives, is aligned with the outcomes of risk management processes, hold information and training sessions, and communicate and consult with stakeholders to ensure that its risk management framework remains appropriate.

d. Monitoring and review of the framework

In order to ensure that risk management is effective and continues to support organizational performance, the organization should measure risk management performance against indicators, periodically measure progress against, and deviation from, the risk management plan, periodically review whether the risk management framework, report on risk, progress with the risk management plan and how well the risk management policy is being followed review the effectiveness of the risk management framework.

e. Continual improvement of the framework

Based on results of monitoring and reviews, decisions should be made on how the risk management framework, policy and plan can be improved. These decisions should lead to improvements in the organization's management of risk and its risk management culture.

2.6.3. Risk Management Process

The risk management process should be an integral part of management, embedded in the culture and practices, and tailored to the business processes of the organization.

a. Communication and consultation

Communication and consultation with external and internal stakeholders should take place during all stages of the risk management process. Therefore, plans for communication and consultation should be developed at an early stage in order to address issues relating to the risk

itself, its causes, its consequences, and the measures being taken to treat it.

b. Establishing the context

   In this phase, the organization articulates its objectives, defines the external and internal parameters to be taken into account when managing risk, and sets the scope and risk criteria for the remaining process.

c. Risk assessment

   Risk assessment is the overall process of risk identification, risk analysis, and risk evaluation. Risk identification is the process of identifying sources of risk, area of impacts, events, and their causes, and their potential consequences. The aim of risk identification is to generate a comprehensive list of risks and its data. Risk analysis is the process which involves developing an understanding of the risk. It produces an input to risk evaluation and to decisions on whether risks need to be response. And risk evaluation is a process to assist in making decision based on the outcomes of risk analysis in order to response to the risk.

d. Risk treatment

   Risk treatment involves selecting one or more options for modifying risks, and implementing those options.

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CHAPTER 3
RESEARCH METHODOLOGY

In this chapter will provide the stages in conducting research in this final project. These stages will be used as a guide in order to conduct research in a systematic and purposeful. Overview of the research methods used are shown in the following figures.

3.1. Research Methodology Description

This sub-chapter will provide the explanation of research methodology flowchart in this research from figure 3.1 and 3.2.

3.1.1. Identification and Problem Formulation Stage

There are several steps to conduct in this stage. Those stages are brainstorming and identifying the current condition of risk management system in *RSUD Dr. Soewandhie* and their needs, determining problem formulation and research objective and literature and field study.

3.1.1.1. Brainstorming and Identifying Current Condition of *RSUD Dr. Soewandhie*'s Risk Management System.

In this first step of brainstorming and identifying the current condition of *RSUD Dr. Soewandhie*'s risk management system, this process is done to analyze the problem that occur and to determine the research's objective. The information regarding the needs of risk management in hospital is researched by conducting interview to the management of *RSUD dr. Soewandhie* and research based on policy of Ministry of Health, then the direct observation to the observation object to understand the condition of risk management system is conducted.

3.1.1.2. Formulating Problem and Determining Research Objective

In this step, with the information regarding the existing condition from the object, the problem is being formulated and subsequently determining the research objective of the research so that this research may has clear goal.

3.1.1.3. Literature and Field Study

After determining the objectives and formulating the problem that occurs in the object, the next step is doing literature and field study. Literature study is conducted as a support for the research to learn the method and theories that will be

used in this research. Namely, healthcare management, risk, risk management, flow diagram, ISO 31000:2009 and HFMEA.

Field study is conducted to study about the condition of existing object regarding to the problem. In addition, researching through secondary data was conducted to understand more about the condition of the object.

3.1.2. Data Collection Stage

In this stage, the data will be collected to reflect the condition of the object. The data that will be needed in order to be processed and analyzed are:

3.1.2.1. Company's Profile

The data of the company's profile is needed to conduct business process analysis of the company, It will be done by interviewing the director or by researching through secondary data.

3.1.2.2. Service Process

The data of service process of the hospital is needed to be collected in order to be processed by drawing the flow diagram to make it easier to understand and analyze. The data collection will be done by interviewing the director.

3.1.2.3. Risk Events Documents

The risk events documents will be needed in order to understand the historical data of the risk events that has happened in the past. It will be used to be processed and analyzed in the next stage. The data collection will be done by interviewing the director.

3.1.3. Data Processing Stage

In this stage, there are two processes that will be conducted, which are establishing the context of risk management application and risk assessment. The risk assessment process will consist of another sub-processes which are risk identification, risk analysis, and risk evaluation. In this stage, the process of risk management of ISO 31000:2009 is used to process the data. And the process of HFMEA will be aligned in the steps of conducting risk management process in ISO 31000:2009. This is done because HFMEA combines root cause analysis and Failure Mode and Effect Analysis towards the risk management process and it is hoped that the output will be more comprehensive.

3.1.4. Data Analyzing Stage

In this stage, the analysis towards the result of the data collection and processing will be conducted. The analysis will be consisted of the identified risks and risk mitigation plan.

3.1.5. Concluding Stage

In this stage, the conclusions and suggestions will be drawn. Conclusions and suggestions are generated by the data analysis and interpretation of the results that have been defined previously.

CHAPTER IV
DATA COLLECTION AND PROCESSING

In this chapter the data that is needed for the analyzing stage from *RSUD Dr. Soewandhie* will be provided and processed.

4.1. Company's Profile

RSUD Dr. Soewandhie is government owned hospital that was built in 1964 and is located at *Jl. Tambakrejo* number 45-47 Surabaya, it is a class B hospital which means the hospital is able to provide broad medical specialist service and limited subspecialist. The vision of *RSUD Dr. Soewandhie* is

"*Menjadi Rumah Sakit Pilihan dan Unggulan Dalam Pelayanan dan Pendidikan di Kota Surabaya*"

and the mission of *RSUD Dr. Soewandhie* is

"*Memberikan pelayanan kesehatan yang profesional, melaksanakan pendidikan, penelitian yang berkualitas, dan membentuk Sumber Daya Manusia Rumah Sakit yang kompeten, santun, berintegritas serta membangun kemitraan yang harmonis*".

In 2016, the average score of customer satisfaction index is 77.03 with the category of "Good", and in 2012, *RSUD Dr. Soewandhie* already had been accredited with the *paripurna* predict.

RSUD Dr. Soewandhie is using functional organization structure as the type of organization structure with 4 level of hierarchy and led by the director.

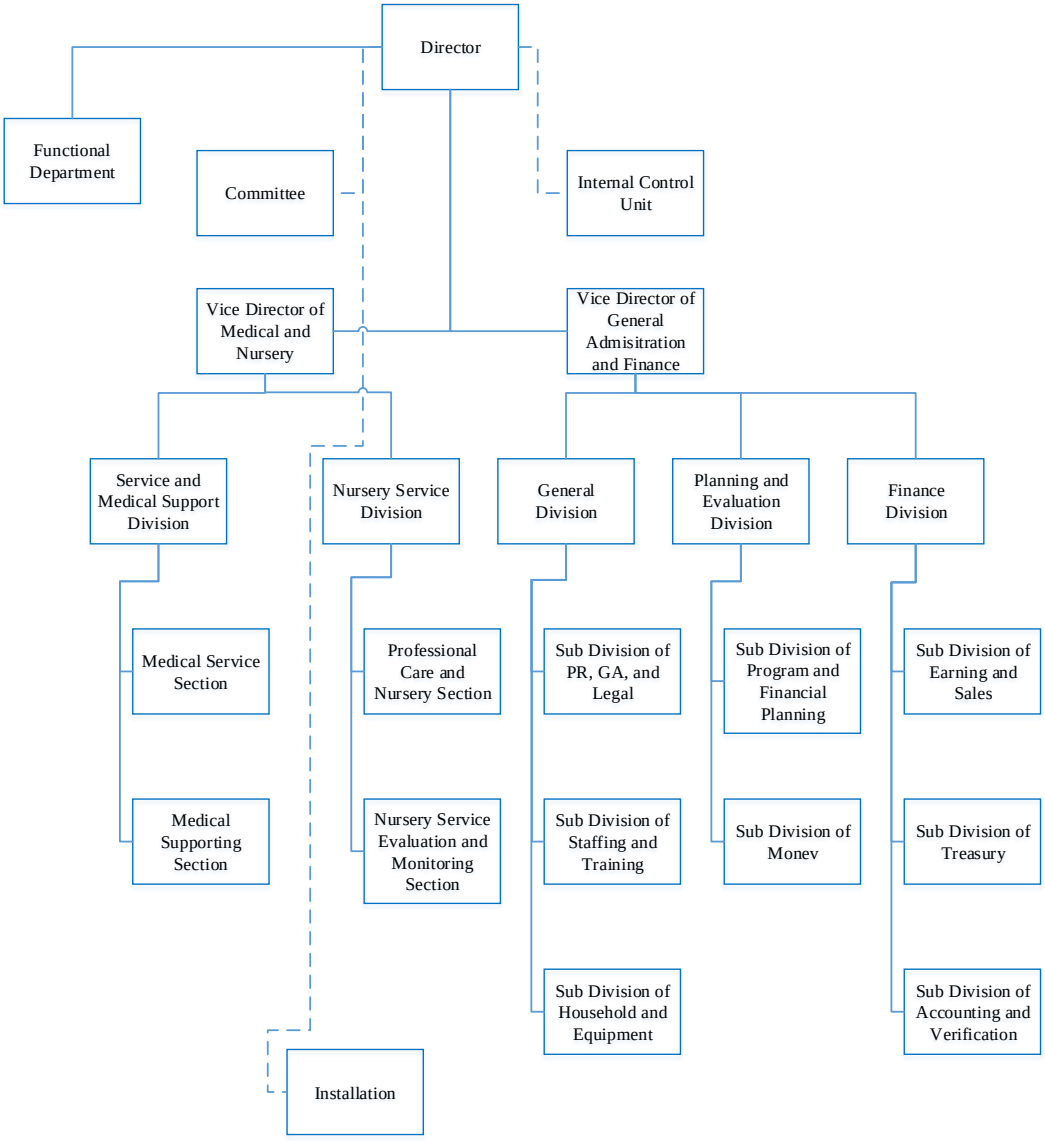


Figure 4. 1 Organization structure of *RSUD Dr. Soewandhie*

The service process that will be analyzed in this research is in the installation under the coordination of the director of hospital. Emergency installation in RSUD Dr. Soewandhie gives emergency service that is being provided by general practitioner accompanied by senior medical personnel in anesthesis and general surgeon, supported by specialist(on call). Emergency installation is equipped with life saving equipments and 24 hours service of ambulance.

4.2. Identification of Risk in Emergency Installation Service Process

In this sub-chapter, the risk from the sub-process that has been identified by interview and brainstorm process will be provided. The process of interview and brainstorming was done by using table 2.1 (source of risk) as the base of identifying risk that may occur within the sub-process. The interview and brainstorm was done with the vice head of emergency installation, dr. Suprapto and Ilham as a medical personnel, and the source of risk mostly came from 4 source which are human, technical, project, and financial.

4.3.1. List of Identified Risk

The list of identified risk will be provided in the table 4.2 below.

Table 4. 1 List of identified risk (example)

<table>
<tr><th rowspan="2">Process</th><th rowspan="2">Sub-process</th><th colspan="4">Source</th></tr>
<tr><th>Human</th><th>Technical</th><th>Project</th><th>Financial</th></tr>
<tr><td rowspan="4">Registration</td><td rowspan="3">The staff will be filling the medical form by interviewing the patient</td><td>Error in typing the form</td><td>Computer is not usable</td><td rowspan="3">-</td><td rowspan="3">-</td></tr>
<tr><td>File is not completed</td><td rowspan="2">System is error</td></tr>
<tr><td>Mistake in typing the desired service</td></tr>
<tr><td>The staff will be printing medical identity card and patient's primary index</td><td>-</td><td>Printer is not usable
Computer is not usable</td><td>Lack of card</td><td></td></tr>
<tr><td>The staff will be accepting and assessing the medical identity card</td><td>Missing or broken medical identity card</td><td>Data is not stored in information system</td><td>-</td><td>-</td></tr>
</table>

4.3.2. List of Identified Potential Impact of Risk

The next step is to provide the code for the risk to simplify the referenced risk and identifying potential impact, the identified potential impact of the risk then will be used to determine the severity score of the risk.

Table 4. 2 Potential impact of risk

Process	Sub-process	Risk	Code	Potential Impact
Registration	The staff will be filling the medical form by interviewing the patient	Error in typing the form	R1	Wrong patient identification
		File is not completed	R2	Unable to register to the service
		Mistake in typing the desired service	R3	Patient will unable to use the service
		Computer is not usable	R4	Unable to register the patient
		System is error	R5	Unable to register the patient
	The staff will be printing medical identity card and patient's primary index	Printer is not usable	R6	Unable to print identity card and medical record
		Computer is not usable	R7	Unable to print identity card and medical record
		Lack of card	R8	Patient will not have medical identity card
	The staff will be accepting and assessing the medical identity card	Missing or broken medical identity card	R9	Unable to identify the patient
		Data is not stored in information system	R10	Patient has to re-register

4.3. Analysis and Evaluation of Risk in Emergency Installation Service Process

In this sub-chapter the analysis and evaluation of risk in emergency installation service process is being provided.

4.4.1. Severity and Occurrence Rating

In this sub-chapter the severity and occurrence of each risk will be provided. The score was being filled from a questionnaire that is given to the vice head of emergency installation by using table 2.3, 2.4, and 2.5 as the score rating and description.

Table 4. 3 Severity and occurrence rating of the risks

Risk	Code	Potential Impact	Severity	Occurrence	Hazard score
Error in typing the form	R1	Wrong patient identification	1	4	4
File is not completed	R2	Unable to register to the service	1	3	3
Mistake in typing the desired service	R3	Patient will unable to use the service	2	2	4
Computer is not usable	R4	Unable to register the patient	1	3	3
System is error	R5	Unable to register the patient	1	3	3
Printer is not usable	R6	Unable to print identity card and medical record	1	4	4
Computer is not usable	R7	Unable to print identity card and medical record	1	3	3
Lack of card	R8	Patient will not have medical identity card	1	2	2
Missing or broken medical identity card	R9	Unable to identify the patient	1	4	4
Data is not stored in information system	R10	Patient has to re-register	1	2	2
Medical form is not fully filled	R11	Medical personnel will have problem in giving treatment to the patient	1	2	2
Medical form is teared	R12	Medical personnel will have problem in giving treatment to the patient	1	1	1

4.4.2. Criticality Analysis of the Risks

The next step is to do criticality analysis, in this step, the risk with the hazard score below 8 will be analyzed whether if the process will fail when the risk occur. The data of criticality analysis and its description will be provided below.

Table 4. 4 Criticality analysis of the risks

Risk	Code	Criticality	Description
Error in typing the form	R1	N	Patient still able to register to the service
File is not completed	R2	Y	Patient is unable to register to the service
Mistake in typing the desired service	R3	Y	Patient will not be able to obtain the service
Computer is not usable	R4	Y	Patient is unable to register to the service
System is error	R5	Y	Patient is unable to register to the service
Printer is not usable	R6	Y	Patient is unable to register to the service
Computer is not usable	R7	Y	Patient is unable to register to the service
Lack of card	R8	Y	Patient is unable to register to the service
Missing or broken medical identity card	R9	Y	Patient is unable to register to the service

4.4.3. Control Measure Analysis of the Risks

The next step is to do control measure analysis, it was done to understand whether if the high hazard score and critical risk had already have a effective control measure or not. The data of control measure analysis will be provided in the table 4.6 below.

Table 4. 5 Control measure analysis of risks

Risk	Code	Control Measure	Description
File is not completed	R2	N	No effective control measure for the risk yet
Mistake in typing the desired service	R3	N	No effective control measure for the risk yet
Computer is not usable	R4	N	No effective control measure for the risk yet
System is error	R5	N	No effective control measure for the risk yet
Printer is not usable	R6	N	No effective control measure for the risk yet
Computer is not usable	R7	N	No effective control measure for the risk yet
Lack of card	R8	Y	The staff is checking the availability of card every end of day
Missing or broken medical identity card	R9	N	No effective control measure for the risk yet
Data is not stored in information system	R10	N	No effective control measure for the risk yet

4.4.4. Detectability Analysis of the Risks

The last process in the decision tree is to determine whether if the risk has high detectability or not so the mitigation is not needed. The detectability analysis and its description data is provided in the table 4.7 below.

Table 4. 6 Detectability analysis of the risk

Risk	Code	Detectability	Description
File is not completed	R2	Y	System will not accept uncompleted file
Mistake in typing the desired service	R3	N	The risk is not apparent and needs a mitigation

Computer is not usable	R4	Y	The computer is slowing down
System is error	R5	N	The risk is not apparent and needs a mitigation
Printer is not usable	R6	Y	Printer will deliver warning
Computer is not usable	R7	Y	The computer is slowing down
Missing or broken medical identity card	R9	N	The risk is not apparent and needs a mitigation
Data is not stored in information system	R10	N	The risk is not apparent and needs a mitigation

4.4.5. HFMEA Worksheet of the Risks

The list of risks and the data from decision tree is provided in the table 4.8 below. This data shows which risk will need mitigation.

Table 4. 7 HFMEA Worksheet

Process	Sub-process	Risk	Code	Potential Impact	Severity	Occurrence	Hazard score	Criticality	Control Measure	Detectability	Proceed?
Registration	The staff will be filling the medical form by interviewing the patient	Error in typing the form	R1	Wrong patient identification	1	4	4	N	-	-	N
		File is not completed	R2	Unable to register to the service	1	3	3	Y	N	Y	N
		Mistake in typing the desired service	R3	Patient will unable to use the service	2	2	4	Y	N	N	Y
		Computer is not usable	R4	Unable to register the patient	1	3	3	Y	N	Y	N
		System is error	R5	Unable to register the patient	1	3	3	Y	N	N	Y
	The staff will be printing medical identity card and patient's primary index	Printer is not usable	R6	Unable to print identity card and medical record	1	4	4	Y	N	Y	N
		Computer is not usable	R7	Unable to print identity card and medical record	1	3	3	Y	N	Y	N

4.4.6. Potential Cause Analysis of the Risks

Based on the HFMEA methodology, the next step is to analyze the potential cause of the risk that will be mitigated, this is done by interview and this data will be used to design mitigation plan for each risk. The data of potential cause of the risk will be provided beow.

Table 4. 8 Potential cause of risks

Risk	Code	Potential Cause	Added Information
Mistake in typing the desired service	R3	Fatigue ; incompetent staff	The complain from the staff because the height of the registration table is higher than the table and computer and the staff needs to bend down and stand for a long time
Information system is error	R5	Unreliable software system	There are many freezes and lag while using the software, the internet connection sometimes is not avaiable
Missing or broken medical identity card	R9	Human factor	Some patient came with broken and unreadable or missing card
Data is not stored in information system	R10	Data is not stored correcly	Mistake in the registration process

4.4.7. Mitigation Plan for Identified Risks

Based on the potential cause(s) of the risk, the mitigation plan will be designed. Based on *The Basics of FMEA*(2009), there are 4 mitigation type for the identified risk which are avoid, transfer, control or reduce, and accept risk. The mitigation plan that was being designed is based on the severity score, occurrence score, and the total hazard score and then find the mitigatioin plan for the potential cause of the risk. In this research, the ability of the emergency installation to do mitigation is also considered, because the emergency installation has limited resource. The process of designing the mitigation plan was done by literature review and finding best practice to mitigate the risk and consulting the mitigation plan to the management of emergency installation in *RSUD dr. Soewandhie*. Thus, the mitigation type and description of the mitigation are being provided in the table 4.10 below.

Table 4. 9 Mitigation plan for identified risk

Risk	Code	Potential Cause	Added Information	Severity	occurence	Hazard score	Mitigation Type	Description
Mistake in typing the desired service	R3	Fatigue	The complain from the staff because the height of the registration table is higher than the table and computer and the staff needs to bend down and stand for a long time	2	2	4	Control (reducing occurence)	Refacilitate the registration staff's office
Information system is error	R5	Unreliable software system	There are many freezes and lag while using the software, the internet connection sometimes is not avaiable	1	3	3	Control (reducing severity)	Manual form for the patient

Table 4. 10 Mitigation plan for identified risk (con't)

Risk	Code	Potential Cause	Added Information	Severity	occurence	Hazard score	Mitigation Type	Description
Missing or broken medical identity card	R9	Human factor	Some patient came with broken and unreadable or missing card	1	4	4	Transfer	Apply charge for missing or broken medical identity card for the patient
Data is not stored in information system	R10	Data is not stored correcly	Mistake in the registration process	1	2	2	Control (reducing severity)	Re-register

CHAPTER V

ANALYSIS AND INTERPRETATION

In this chapter, the analysis and interpretation based on the data processing will be done. The data that will be analyzed consists of service process and identified analysis, risk assessment analysis, analysis of risk mitigation, and analysis of dashboard design.

5.1. Analysis of Service Process and Identified Risk

In this sub-chapter, the analysis of service processes and identified risk will be done. This analysis is done to give further understanding about the detail of the identified risk and the step in each sub-process of the medical service in *RSUD Dr. Soewandhie*.

5.1.1. Analysis of Registration Process

The first sub-process(A1) for new patient is the staff will be filling the registration and medical form by interviewing the patient, there are 5 risks identified in the A1 sub-process and they are mainly came from human and technical source such as computer, printer, and the human factor. The next sub-process(A2) is the staff will be printing medical identity card and patient's primary index, the medical identity card is being used as the patient identification in the future and the patient's primary index is a record of patient's medical assessment. In this sub-process there are 3 risks and mainly came from technical source and one project source which is lack of card because of lack of planning for card procurement. The next sub-process(A3) is for registered patient, the staff will be accepting and assessing the medical identity card, there are 2 risks that may occur in this sub-process. The last sub-process in this process is A4 which is the patient will be bringing the medical form to the emergency installation, and there are 2 risk came from human source that may occur in this sub-process.

Figure 5. 1 Graph of risk in registration process

It can be seen from the graph 5.1 above, most of the risk came from A1 because the sub-process needs several tools as the input to the process.

5.1.2. Analysis of Triage Process

The first sub-process (B1), which is to give physical assessment to the patient needs several tools such as tensimeter and thermometer, and the availability and the competency of the medical personnel are needed here. There are 8 risks that may occur during this sub-process and mainly came from human and technical source. The next sub-process(B2), which is to give diagnosis to the patient has 4 risks. The second sub-process depends on the first sub-process(B1) and thus the B1 sub-process has higher number of risk.

5.1.3. Analysis of Resuscitation Process

The resuscitation process is crucial for the emergency patient because of the patient's life may depends on the first treatment for the situation. This process mainly depends on the needs of the patient itself, when the patient is unconsious and because of lack of body liquid and nutrition for the body, the first sub-process (C1) is conducted, this sub-process is to give infusion treatment to the patient, and there are 10 risks that may occur during this sub-process because anything wrong that happens during this sub-process may harm the patient itself. The second sub-process(C2) is to give heart and oxygen treatment to the patient with disorder in the patient's vascular system. The main tools in this sub-process is DC shock, ECG to check the patient's heartbeat, and oxygen regulator and hose. There are 10 risks for this sub-process mainly came from the human and technical factor.

5.1.4. Analysis of Dead on Arrival Treatment Process

The dead on arrival treatment process mainly consists of medical examination by using ECG to detect heartbeat, diagnosis of cause and time of death, and the filling of death records by doctor, then the body will be sent to the morgue by using gurney. In this process there are total of 8 risks that may occur, 2 from first sub-process (D1) , 2 from second sub-process(D2) and 4 from third sub-process(D3). In this process, the risk mainly came from human source and technical souce. The number of risk in this process is relatively low because the patient has been deceased from the beginning.

5.1.5. Analysis of Emergency Treatment Process

The emergency treatment process will be given to the high emergency and medium emergency patient, the patient will be placed at the emergency room. In this process, several medical equipment is needed including syringe, infusion liquid, and gurney. The main complaint about this process from the medical personnel is the room that can only be filled by several people, and the number of patient is too high, the medical personnel is also in shortage in some cases.

The first sub-process(E1) is the medical personnel will be giving treatment and observation to the patient every 15 until 30 minutes, there are 10 risks in this sub-process and mainly came from human and project source, this is because the planning for the supplies in this sub-process is important. The second sub-process(E2) is to determine whether the patient will be inpatient, repatriated, or referenced, in this sub-process corelates to the NDR and GDR rate of the hospital, if the doctor makes a wrong decision, it will affect the NDR and GDR of the hospital, but only 2 risks identified in this sub-process, it's because this sub-process depends on the first(E1) sub-process. The third sub-process is giving medicine to the patient, in this sub-process the competency of the doctor and medical personnel is highly affecting, and there are 7 risks for this sub-process mainly came from the human source.

5.1.6. Analysis of Payment Process

In the payment process, the main tools which are needed by the staff is a computer, printer, and information system as a software. This process was also mainly done by companion or the family of the patient for the emergency

installation. There are not much risk that may happen in this process other than financial risk that the patient may be exposed to such as failed to pay and unable to claim from BPJS.

5.1.7. Analysis of Overall Process

In the emergency installation service process, the main source of risk is human, high human competency is needed in this service process, not only that, capable medical tools may also being used to help medical personnel in this process to diagnose or treat the patient.

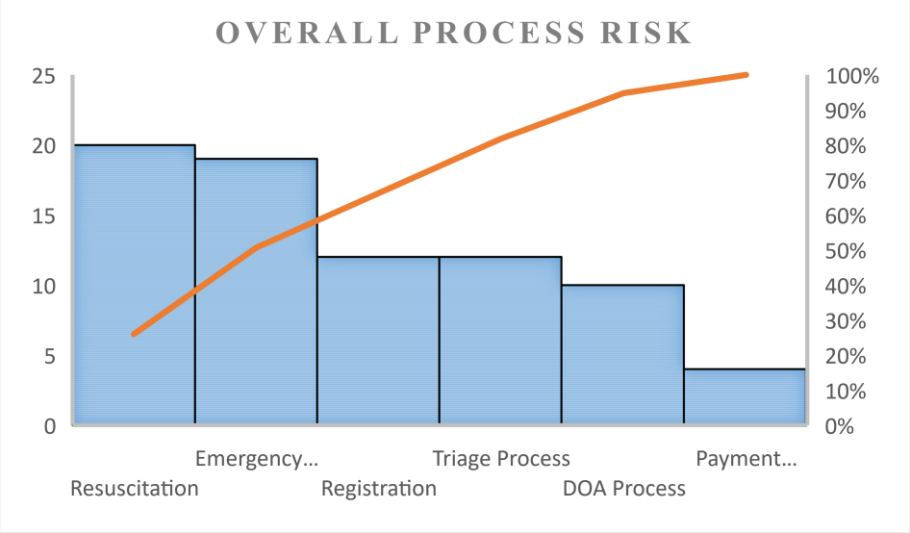


Figure 5. 2 Overall process risk

It can be seen from the graph above, the highest number of risk is in resuscitation and emergency treatment process, this is because these two process is important and may affect the life of the patient.

5.2. Analysis of Risk Assessment and Evaluation

After identifying the risk in each sub-process by brainstorm and interview, the total of 75 risks have been identified from overall process in emergency installation of *RSUD Dr. Soewandhie*, in this sub-chapter the analysis of risk assessment and evaluation toward the identified risk will be provided.

5.2.1. Analysis of Risk Rating

Based on table 4.4 it can be seen that every risk had been scored based on its severity and occurrence, the severity score came from the potential impact while the occurrence was based on the probability of the risk will happen.

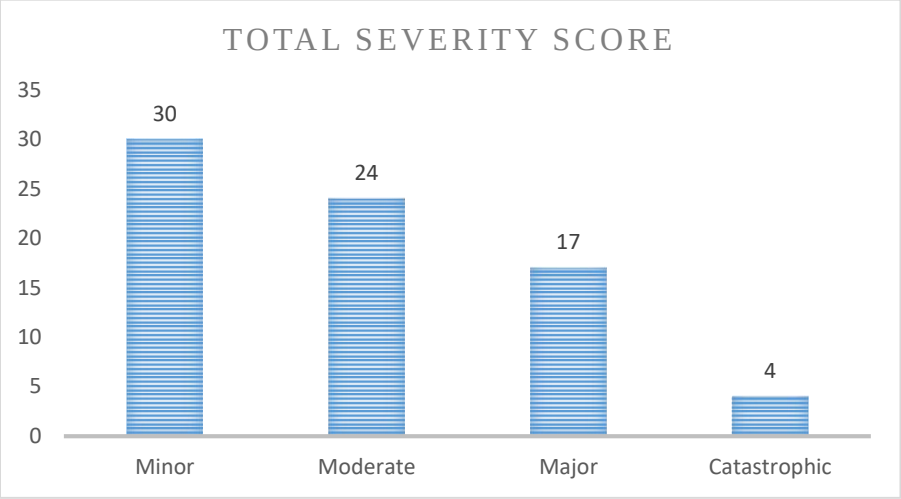


Figure 5. 3 Total severity score

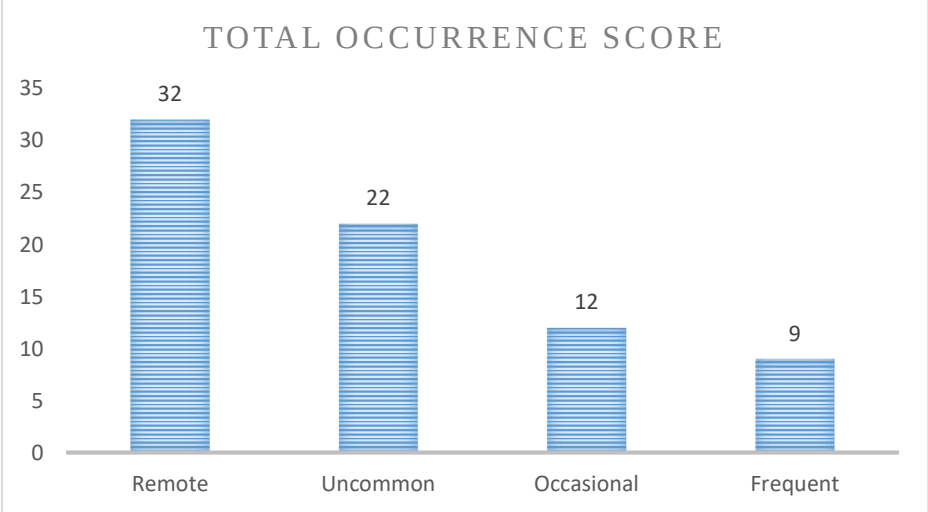


Figure 5. 4 Total occurrence score

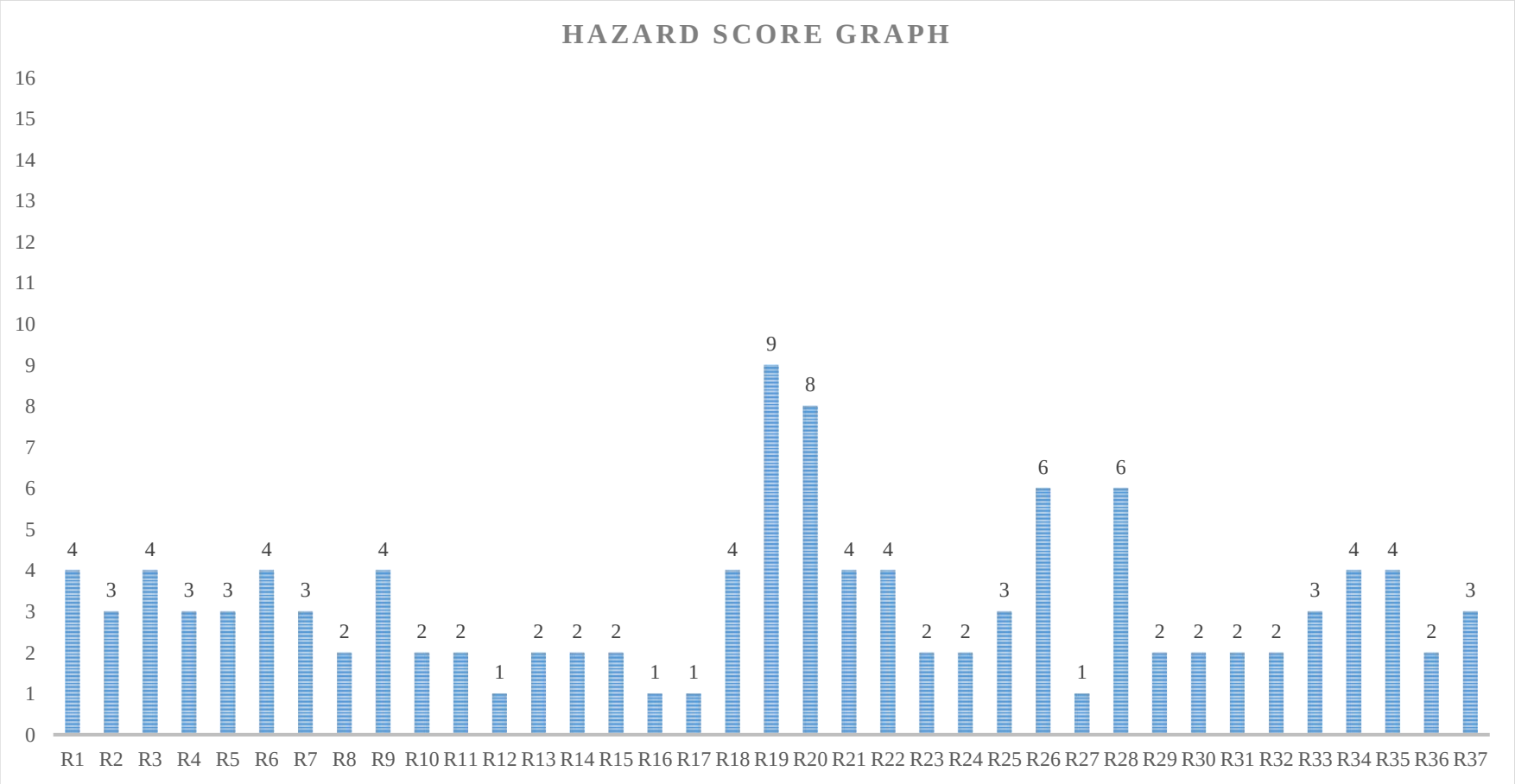


Figure 5. 5 Hazard score graph (1-37)

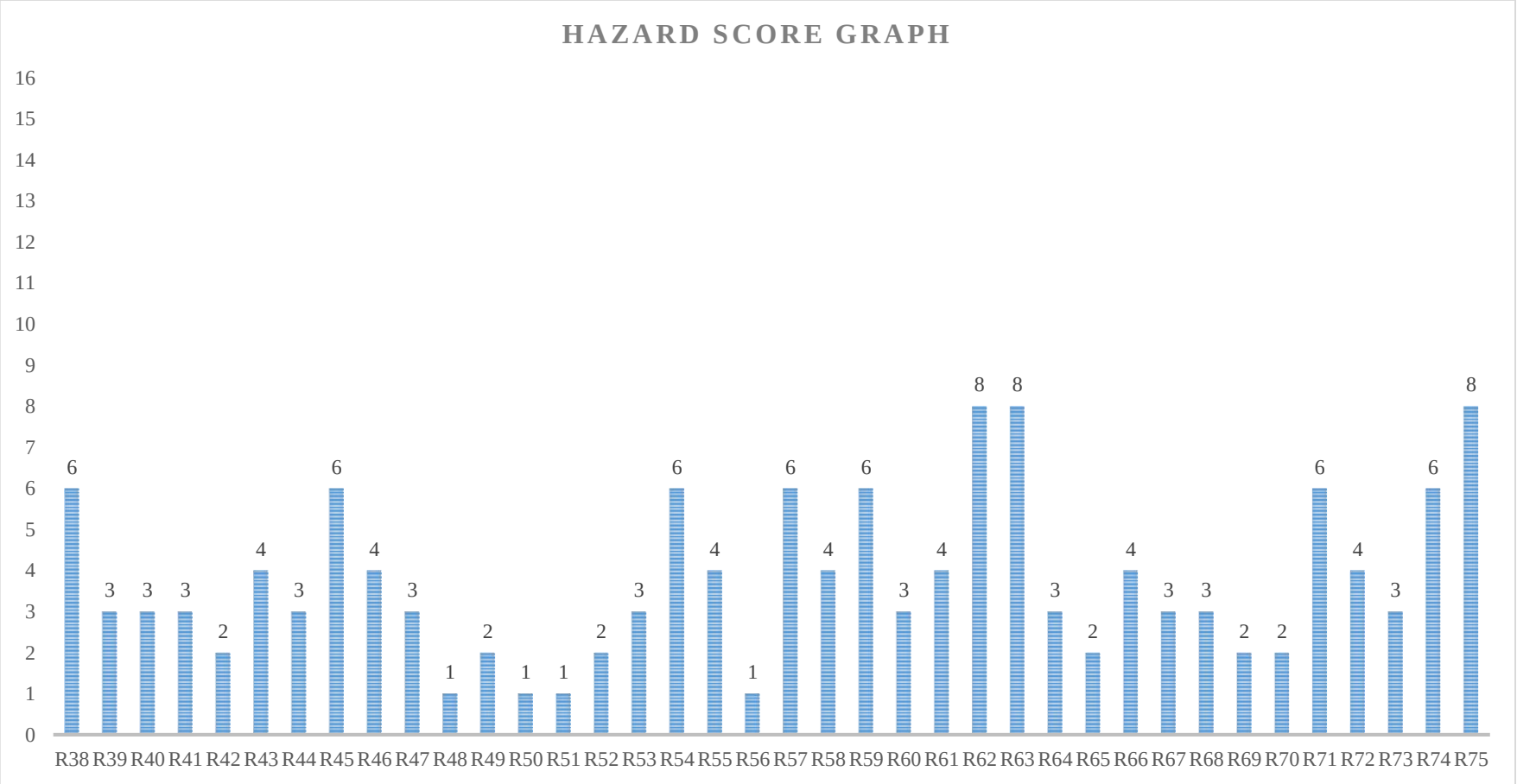


Figure 5. 6 Hazard score graph (38-75)

It can be seen from figure 5.3 that the number of minor risk is 18, moderate is 20, major is 17, and 4 for catastrophic. While from figure 5.4 that the score for occurrence for remote risk is 32 risks, uncommon risk is 22 risks, occasional risk is 12, and 9 frequently happened risk. From graph 5.5 and 5.6 it can be seen that there are only 5 risks with high hazard score (8 and above) which are R19, R20, R62, R63,and R75.This may happened because the risk that may happen in hospital could determine the patient's condition in the future, so there are already some fail safe mechanism or standard operation procedure to limit the probability the risk may happen.

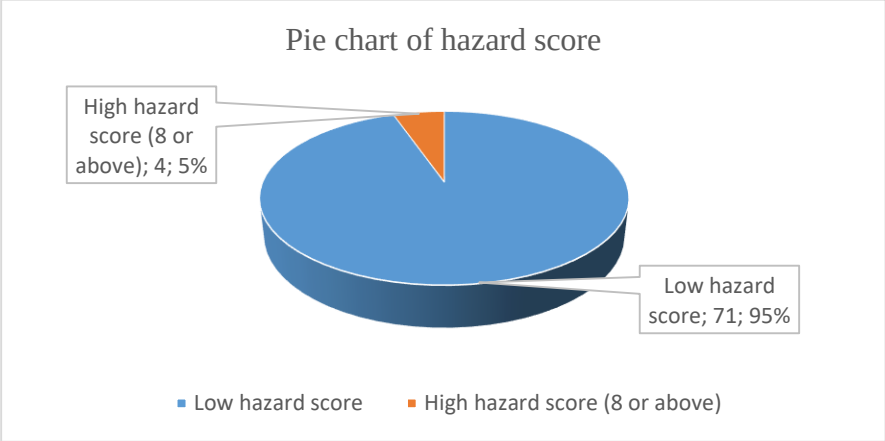


Figure 5. 7 Pie chart for hazard score

The pie chart in figure 5.7 shows that there are only 5% of risk that had high hazard score, and the other 95% of the risk had lower than 8 hazard score. The risk with high hazard score will directly be analyzed whether the risk has control measure or not, while the risk with low hazard score will be analyzed whether the risk is critical or not.

5.2.2. Analysis of Criticality Analysis

In this analysis, the analysis of criticality analysis of the risk will be provided. Criticality analysis was conducted to determine whether the risk with lower hazard score than 8 will make the sub-process fail when the risk happen.

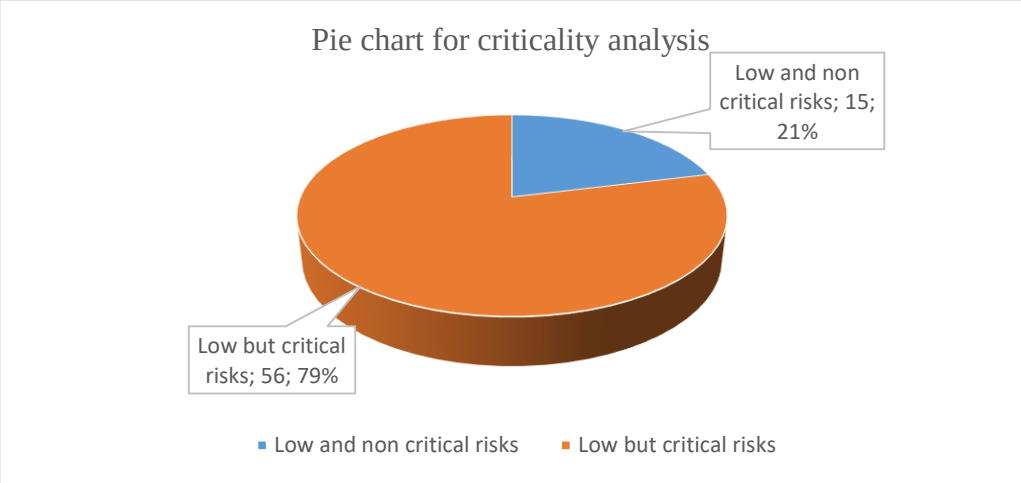


Figure 5. 8 Pie chart for criticality analysis

From the pie chart from figure 5.8 above, it can be seen from the total of 71 risk that had low hazard score, 56 of them are critical while 15 others are not. This means while the risk had low severity or occurrence, the risk will make the sub-process fail when it happens. Without the identification of risk or risk management as a system, some risk will not be identified, this shows the importance of risk management in the business process as a whole.

5.2.3. Analysis of Control Measure Analysis

In this analysis, the analysis of control measure analysis of the risk will be provided. Control measure analysis was conducted to understand whether there are effective control measure to the risk or not. This analysis was also done to find a flaw in the control measure for the risk. In this research there are total of 60 risks that being analyzed whether if there are effective control measure to the risk or not.

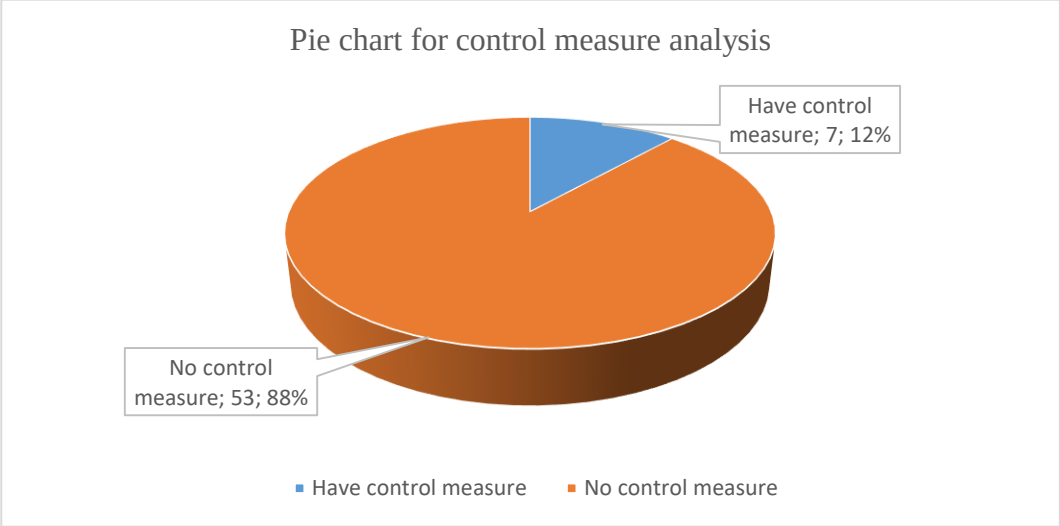


Figure 5. 9 Pie chart of control measure

Based on the graph in figure 5.9 above, it can be seen that 88% of the risk that may occur in the emergency installation service process, did not have effective control measure. This shows that while the risk that may happen had low hazard score, the management of the risk solely relies on the ability of the medical personnel to handle the risk. This also shows that the hospital has limited resource whether its human or technology in order to effectively create a control measure for its risks.

5.2.4. Analysis of Detectability Analysis

In this analysis, the analysis of detectability analysis of the risk will be provided. Detectability analysis was conducted to understand whether there are early warning system or whether the risk is detectable before it happens or not. This analysis was conducted towards 53 of the risks that had no effective control measure.

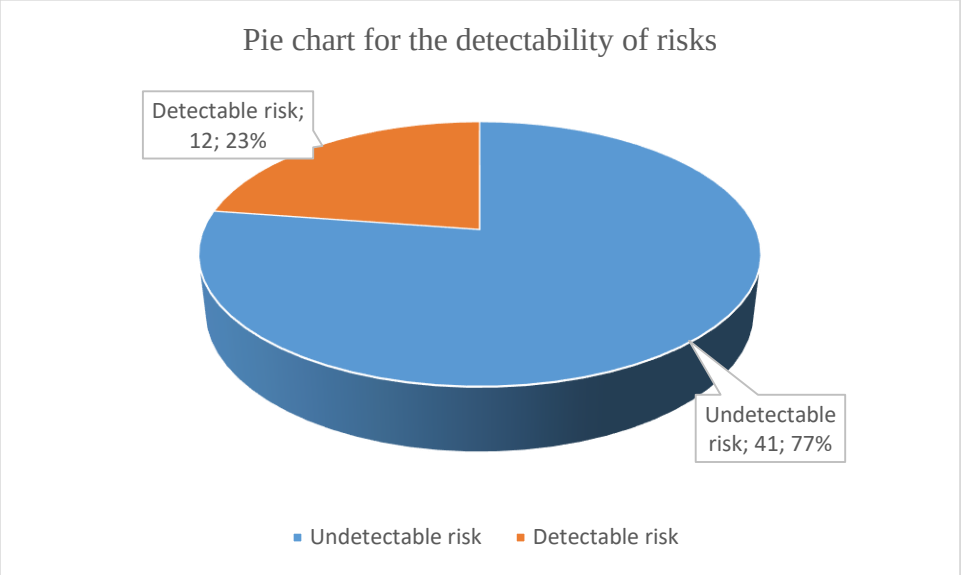


Figure 5. 10 Pie chart for the detectability of risks

Based on the pie chart in figure 5.10 above, it can be seen that there are 41 undetectable risk, it reaches 77% of the total 53 no control measure risk. This shows that there are still a lot of improvement that can be done towards the risk whether by mitigate the risk (adding effective control measure), or to develop early warning system towards the risk if possible.

5.3. Analysis of Mitigation Plan

After understanding which risk that has to be mitigated, the next step is to design mitigation plan for the risk. This mitigation plan may differs from one another according to the score of severity and occurrence, or the ability of the company, and risk appetite of the company. In this research, the plan for the mitigation is based on *Basics of FMEA*(2009) and analyzing whether the risk was able to be mitigated.

Table 5. 1 General mitigation plan (source: *Basics of FMEA 2009*)

Severity	Occurrence	Mitigation type
High	High	Avoid/Transfer
High	Low	Reduce severity/Avoid
Low	High	Reduce occurrence
Moderate	Moderate	Reduce severity and occurrence
Low	Low	Control/Accept

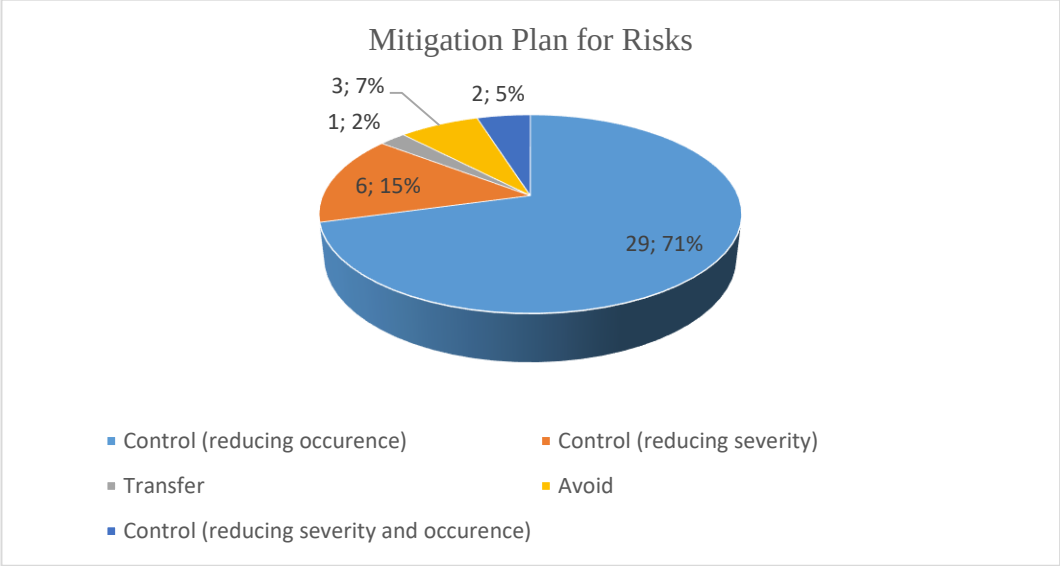


Figure 5. 11 Pie chart of mitigation plan

From the pie chart in the figue 5.11 above, it can be seen that the most used mitigation type is to reducing occurrence of the risk with the total number of 29 plans was developed, and reducing severity with the total number of 6 plans. The limitation for this mitigation plan is that several risk with high severity score cannot be mitigated by using fail safe mechanism, thus the other way to mitigate the risk is to make sure that the risk never occur.

There are some difference between potential cause of the risk and the mitigation plan of the risk, this is because there are some limitation to mitigate the risk such as the risk came from the external of the hospital and the hospital may has limited resource in order to mitigate the risk, such as R5 with the mitigation of providing manual form, the mitigation plan was designed because the software system is not the responsibility of the emergency installation, so the emergency installation is unable to control the software system. The next risk is R49, the mitigtation plan was design because the lack of resource in funding makes the hospital unable to increase the size of morgue.

The mitigation plan is also designed based on the standard needed by the emergency installation for example, R15 because there is standard of time limitation of 5 minutes each patient for the condition examination, so reducing severity is not the option to be chosen and R18, R46, R47, and R48's mitigation

plan to design checklist, the check list is based on the standard operation procedure that has to be done in examining the patient.

5.4. Analysis of Dashboard Design

In this chapter, the risk register dashboard as one of the output of this research will be provided. The dashboard of risk register was made as a tool to help *RSUD Dr. Soewandhie* update their risk register in the future. *RSUD Dr. Soewandhie* needs an intuitive dashboard, user friendly, and may help them to monitor and report the risk that may occur in the hospital. The dashboard of risk register that has been developed in this research will be provided below.

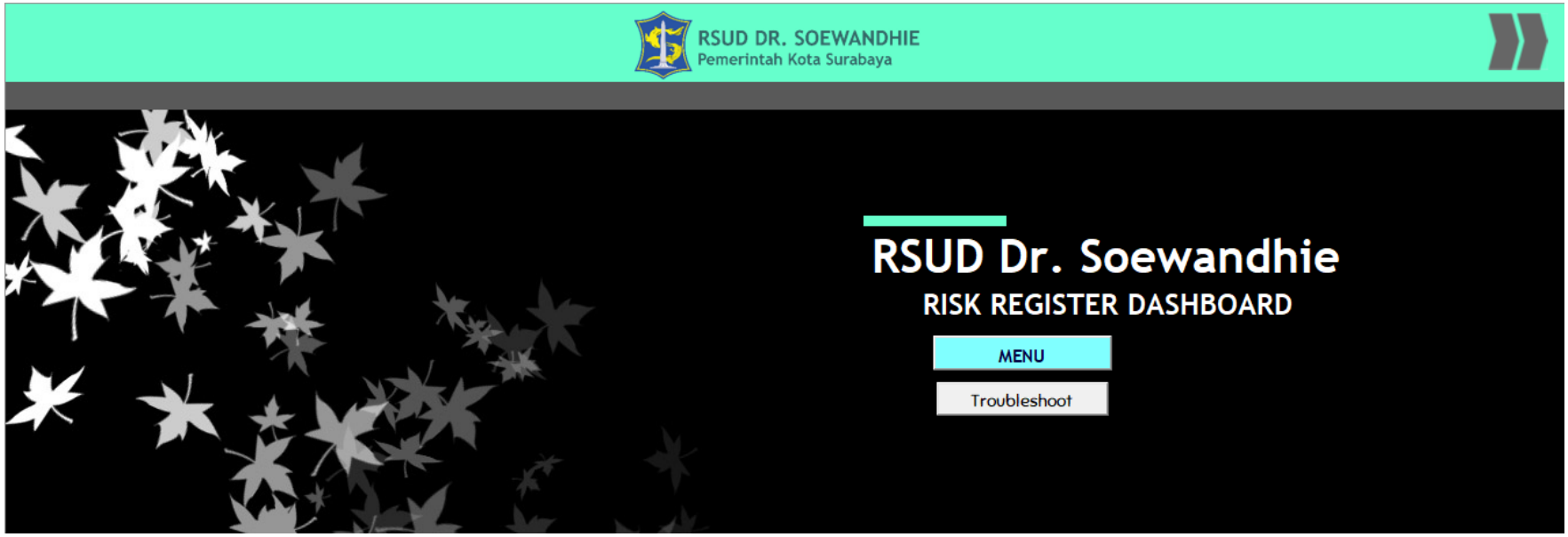
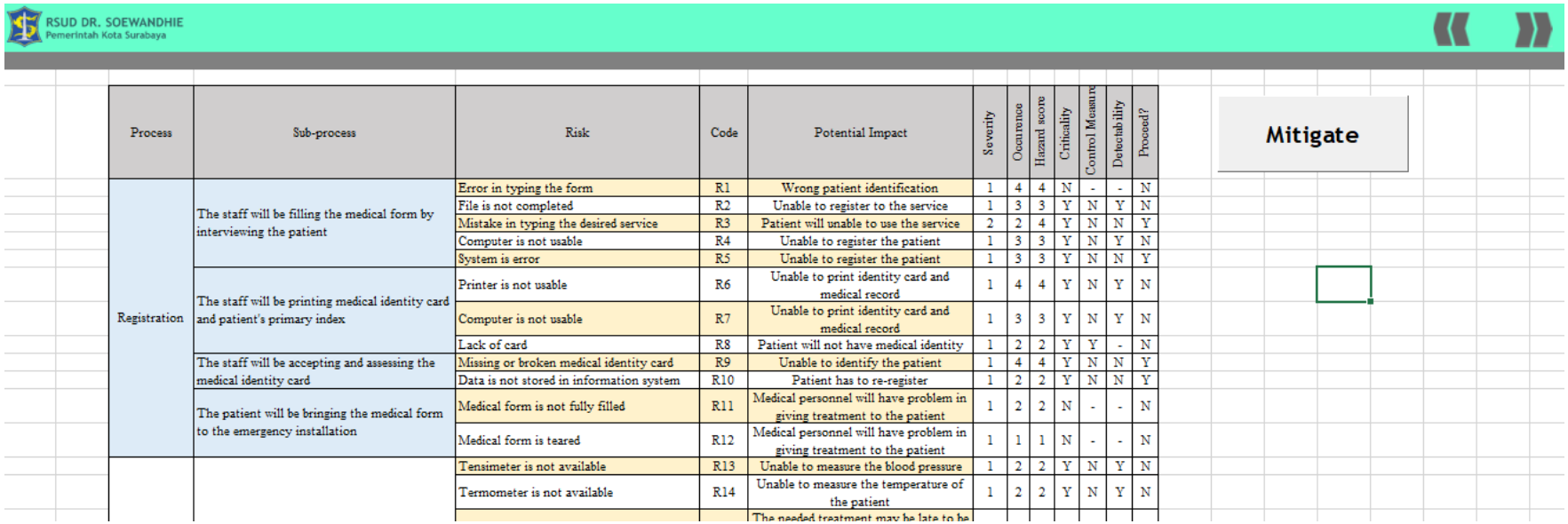


Figure 5. 12 Front page of dashboard

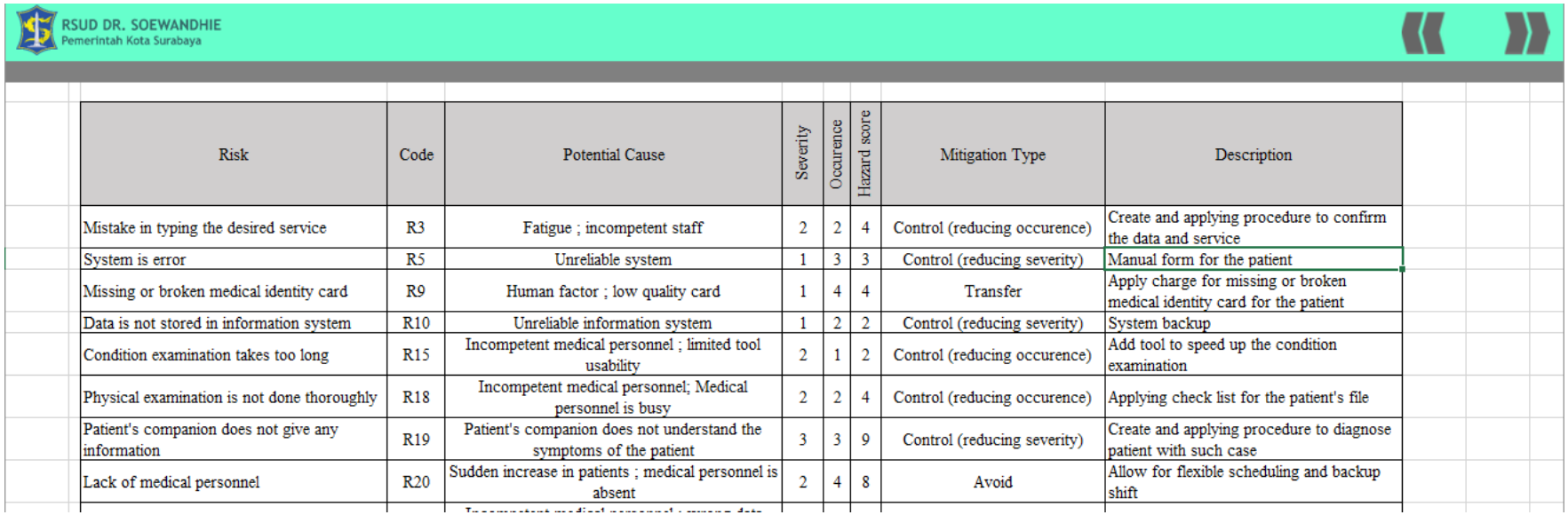
Figure 5. 13 Company's profile dashboard



Process	Sub-process	Risk	Code	Potential Impact	Severity	Occurence	Hazard score	Criticality	Control Measure	Detectability	Proceed?
Registration	The staff will be filling the medical form by interviewing the patient	Error in typing the form	R1	Wrong patient identification	1	4	4	N	-	-	N
		File is not completed	R2	Unable to register to the service	1	3	3	Y	N	Y	N
		Mistake in typing the desired service	R3	Patient will unable to use the service	2	2	4	Y	N	N	Y
		Computer is not usable	R4	Unable to register the patient	1	3	3	Y	N	Y	N
		System is error	R5	Unable to register the patient	1	3	3	Y	N	N	Y
	The staff will be printing medical identity card and patient's primary index	Printer is not usable	R6	Unable to print identity card and medical record	1	4	4	Y	N	Y	N
		Computer is not usable	R7	Unable to print identity card and medical record	1	3	3	Y	N	Y	N
		Lack of card	R8	Patient will not have medical identity	1	2	2	Y	Y	-	N
	The staff will be accepting and assessing the medical identity card	Missing or broken medical identity card	R9	Unable to identify the patient	1	4	4	Y	N	N	Y
		Data is not stored in information system	R10	Patient has to re-register	1	2	2	Y	N	N	Y
	The patient will be bringing the medical form to the emergency installation	Medical form is not fully filled	R11	Medical personnel will have problem in giving treatment to the patient	1	2	2	N	-	-	N
		Medical form is teared	R12	Medical personnel will have problem in giving treatment to the patient	1	1	1	N	-	-	N
		Tensimeter is not available	R13	Unable to measure the blood pressure	1	2	2	Y	N	Y	N
		Termometer is not available	R14	Unable to measure the temperature of the patient	1	2	2	Y	N	Y	N
				The needed treatment may be late to be							

Figure 5. 14 Risk register dashboard

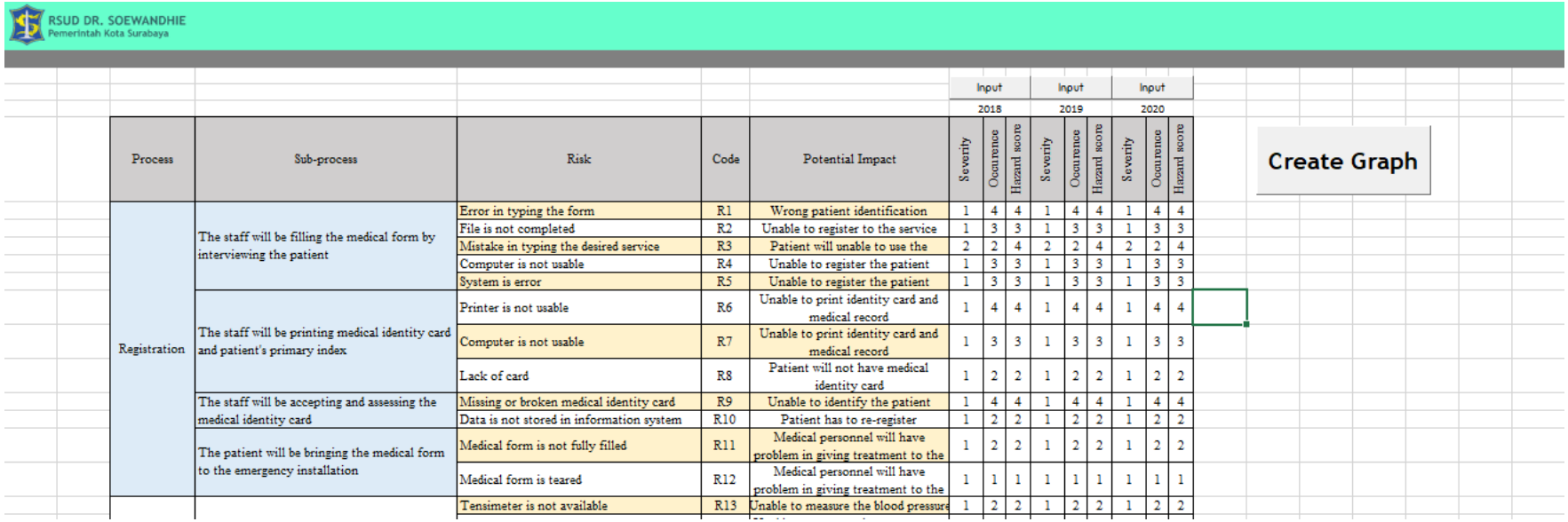
Based on figure 5.14 above the risk register dashboard for updating the risk is provided, the user may be able to add and develop another risk assessment and update the risk register in the future. The time provided for this risk register is from 2018 to 2020, and the hospital may add another year if needed in the future. After registering the risk analysis which consists of risk scoring, criticality analysis, control measure analysis, and detectability analysis, the hospital may able to click the ”Mitigate” button to show the mitigation list for the risk.



Risk	Code	Potential Cause	Severity	Occurence	Hazard score	Mitigation Type	Description
Mistake in typing the desired service	R3	Fatigue ; incompetent staff	2	2	4	Control (reducing occurence)	Create and applying procedure to confirm the data and service
System is error	R5	Unreliable system	1	3	3	Control (reducing severity)	Manual form for the patient
Missing or broken medical identity card	R9	Human factor ; low quality card	1	4	4	Transfer	Apply charge for missing or broken medical identity card for the patient
Data is not stored in information system	R10	Unreliable information system	1	2	2	Control (reducing severity)	System backup
Condition examination takes too long	R15	Incompetent medical personnel ; limited tool usability	2	1	2	Control (reducing occurence)	Add tool to speed up the condition examination
Physical examination is not done thoroughly	R18	Incompetent medical personnel; Medical personnel is busy	2	2	4	Control (reducing occurence)	Applying check list for the patient's file
Patient's companion does not give any information	R19	Patient's companion does not understand the symptoms of the patient	3	3	9	Control (reducing severity)	Create and applying procedure to diagnose patient with such case
Lack of medical personnel	R20	Sudden increase in patients ; medical personnel is absent	2	4	8	Avoid	Allow for flexible scheduling and backup shift

Figure 5. 15 Risk mitigation dashboard

From figure 5.15 above, the risk mitigation dashboard has been shown. The risk mitigation page is used to update the mitigation type and the description of the risk mitigation in the future.



Process	Sub-process	Risk	Code	Potential Impact	Input 2018			Input 2019			Input 2020		
					Severity	Occurence	Hazard score	Severity	Occurence	Hazard score	Severity	Occurence	Hazard score
Registration	The staff will be filling the medical form by interviewing the patient	Error in typing the form	R1	Wrong patient identification	1	4	4	1	4	4	1	4	4
		File is not completed	R2	Unable to register to the service	1	3	3	1	3	3	1	3	3
		Mistake in typing the desired service	R3	Patient will unable to use the	2	2	4	2	2	4	2	2	4
		Computer is not usable	R4	Unable to register the patient	1	3	3	1	3	3	1	3	3
		System is error	R5	Unable to register the patient	1	3	3	1	3	3	1	3	3
	The staff will be printing medical identity card and patient's primary index	Printer is not usable	R6	Unable to print identity card and medical record	1	4	4	1	4	4	1	4	4
		Computer is not usable	R7	Unable to print identity card and medical record	1	3	3	1	3	3	1	3	3
		Lack of card	R8	Patient will not have medical identity card	1	2	2	1	2	2	1	2	2
	The staff will be accepting and assessing the medical identity card	Missing or broken medical identity card	R9	Unable to identify the patient	1	4	4	1	4	4	1	4	4
		Data is not stored in information system	R10	Patient has to re-register	1	2	2	1	2	2	1	2	2
	The patient will be bringing the medical form to the emergency installation	Medical form is not fully filled	R11	Medical personnel will have problem in giving treatment to the	1	2	2	1	2	2	1	2	2
		Medical form is teared	R12	Medical personnel will have problem in giving treatment to the	1	1	1	1	1	1	1	1	1
		Tensimeter is not available	R13	Unable to measure the blood pressure	1	2	2	1	2	2	1	2	2

Figure 5. 16 Reporting page

In the figure 5.16 above, the reporting page of the risk register is provided. The reporting page can be used to update the scoring of each risk in each year and by clicking “Create Graph” the graph of severity score, occurrence score, and hazard score for each risk in 3 years of data can be seen, the example of graph report based on bar chart whill be shown in figure 5.17.

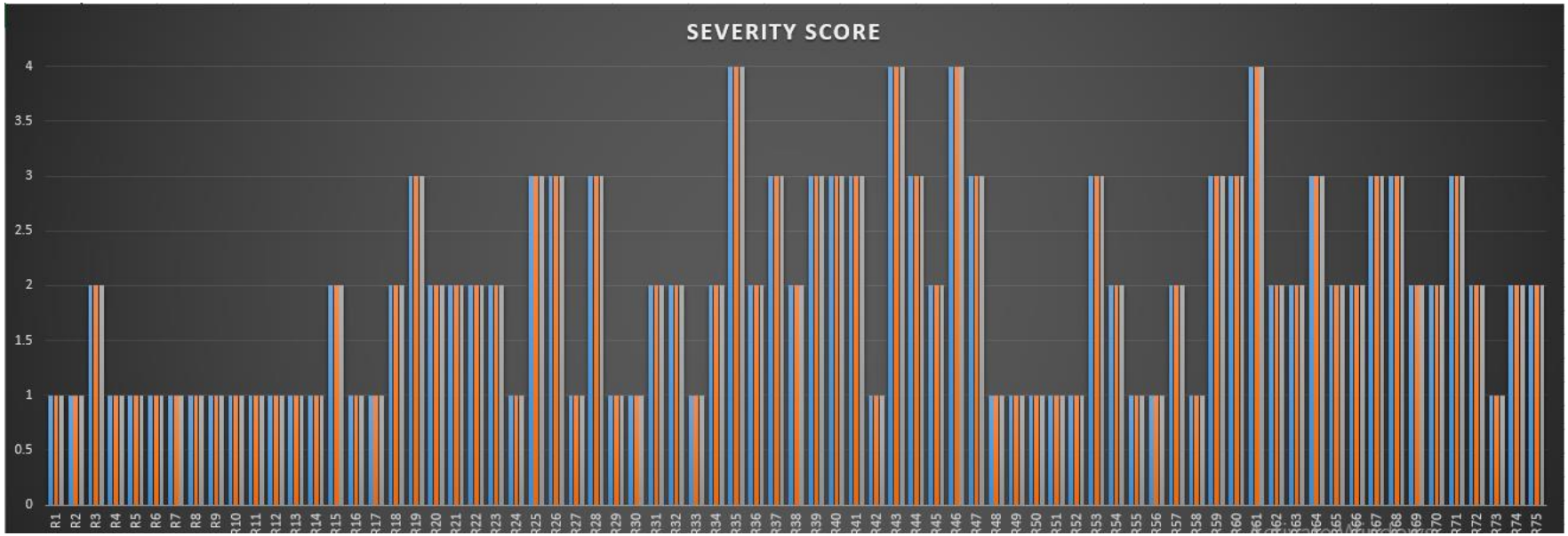


Figure 5. 17 Example of scoring graph

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CHAPTER VI
CONCLUSION AND SUGGESTION

In this chapter the conclusion for this research will be given, the conclusion will be provided to answer the objective of this research and the suggestion will be given for further improvement.

6.1. Conclusion

The conclusion that have been drawn for this research are:

1. There are 6 processes and 16 sub-processes that have been identified in the emergency installation service and 75 risks that have been identified in the emergency installation service process of *RSUD Dr. Soewandhie* by conducting interview and analysis towards the graphical representation of the service process.
2. The hazard score of identified risk based on the severity and occurrence of the risk resulted in 5 high hazard score risk, the criticality analysis resulted in 56 critical risks towards the process, the control measure analysis resulted in 53 risks that did not have effective control measure, and detectability analysis resulted in 41 risks that have to be mitigated.
3. Risk mitigation plan was designed to 41 risks which are needed to be mitigated and resulted in 29 reducing occurrence mitigation plan, 6 reducing severity mitigation plan, 3 avoid risk mitigation plan, 2 reducing severity and occurrence mitigation plan, and 1 transfer risk mitigation plan.

6.2. Suggestion

The suggestion for further research are:

1. The identified risks from this research were based on existing condition of the company. The regular update for the risk and the score will be needed to maintain its relevancy in the future.
2. Risk analysis in the corporate level is needed to be done so that the risk management system will be aligned from one to another.

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BIOGRAPHY

Arif Sujana or usually called Arif was born in Batam, March 1st, 1996. He has been living in Batam since he was born. He is the first child in his family. He was graduated from SD Kartini I Batam in 2008, SMPK Yos Sudarso Batam in 2011, and SMAK Yos Sudarso Batam in 2014. He also attended one of the best institutes in Indonesia, Sepuluh Nopember Institute of Technology majoring Industrial Engineering Department.

He was active in sport activity since elementary school. He has been focused on football in elementary school, thus change his focus to basketball and taekwondo in junior , in high school, he was focus in futsal and joined several competition including national competition. In his college, he was active in student organization activity mainly in *Himpunan Mahasiswa Teknik Industri* as staff and general secretary. Beside doing sports, he also joined as a trainer of LKMM in ITS and laboratory assistant of Industrial Management and System Development Laboratory in 2016-2018.

He got a lot of experiences of both hard skill and soft skill during his study. He has joined social activity, Leadership in Korea Education in Seoul, South Korea. He attended some soft skill training such as Managerial Skill of Student Training Basic Level and P3MTI. In hard skill side, he got training for AutoCad, MS. Project, Arena, and VBA. He can be found in this email: arifteo96@gmail.com.