CHAPTER I

INTRODUCTION

1.1. Research Background

SARS-CoV-2, the virus that causes COVID-19 spreads easily through person to person contact by symptomatic and asymptomatic individuals. COVID-19 is thought to spread mainly through close contact from person to person, including between people who are physically near each other, within about 6 feet. (Centers for Disease Control and Prevention, 2020). The first reported case was in Hubei province of the People's Republic of China. This disease leads to fever, coughing, and dyspnea in the context of viral pneumonia. Due to the rapid increase in the numbers of cases, the World Health Organization (WHO) classified the situation as a Public Health Emergency of International Concern (PHEIC) in January 2020 and later on 11 March 2020, as a pandemic. Despite the race of vaccines, there are currently several COVID-19 mutations detected in Indonesia, such as; B117 (UK), B135 (South Africa), and B1617 (India), and these variants could reduce vaccines efficacy.

Before the pandemic in year 2017 and 2018, the country recorded a low physician to patient ratio, much below the standard recommended by WHO. The WHO recommended 10 physicians and above for every 10,000 population or 1:1000 physicians to population ratio to ensure equitable access to healthcare workers within strengthened health system. Physicians as defined by WHO, include generalists and specialist medical practitioners in the given national and/or subnational area. According to data by WHO, Indonesia only had 3.77 physicians

per 10,000 population ratio and 4.27 per 10,000 population in 2018. The ratio of specialist doctor is also considered low, with 0.13 per 1,000 population ratio. According to Tim Mitigasi IDI, this figure is the second lowest in South East Asia. In contrast, developed countries such as United States of America had 26.12 physicians per 10,000 population and China 19.8 per 10,000 population. Based on data by Badan Pengembangan dan Pemberdayaan Sumber Daya Manusia Kesehatan Kementerian Kesehatan Republik Indonesia (PPSDMK Kemenkes)/Board for Development and Empowerment Human Health Resources by Indonesian Ministry of Health, as per 31 December 2019, there were 107,707 physicians in Indonesia, including dentist and specialist dentists. Without dentists and specialist dentists, there were 90,448 general practitioners, specialist doctors, and sub-specialist doctors. Number of populations by the end of 2019 was 268,074,600 people which leads to an approximately 4 physicians for every 10,000 population.

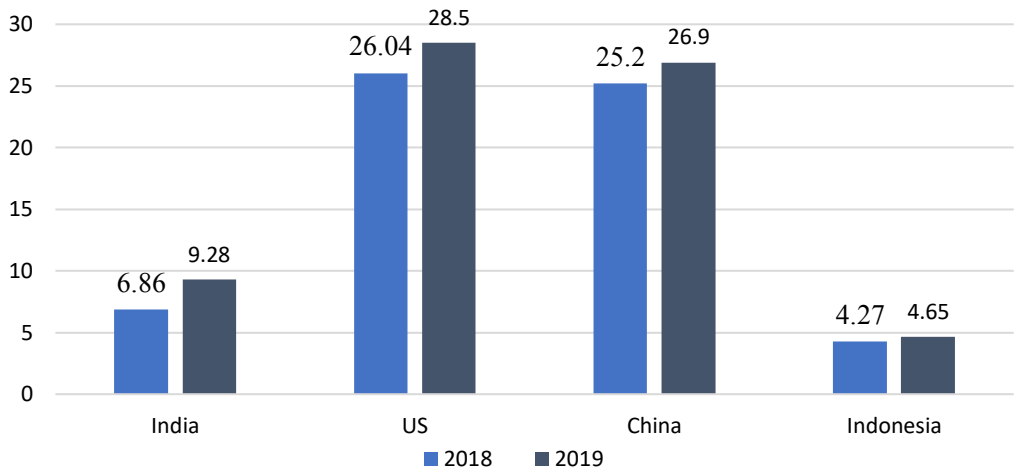

Figure 1.1 Number of Physicians every 10,000 Population as per 31 December 2019
Source: Badan Pusat Statistik (2021)

In April 2020, government of Indonesia implemented the large-scale social restriction policy, also known as Pembatasan Sosial Skala Besar (PSBB) to limit people's movement and anticipate shortage of hospital beds during COVID-19 pandemic. However, Bed Occupancy Rate (BOR) in Indonesia has been increasing to a staggering rate of 63,66%, with most major cities such as Jakarta and Banten at 80%. This number is above the recommended 60% BOR standard set by WHO. Healthcare workers all around the country are overwhelmed with the surge of daily new cases per day. Healthcare workers are at particular risk during pandemics and epidemics of a highly virulent diseases with significant morbidity and case fatality rate. As per 26 January 2021, Tim Mitigasi Pengurus Besar Ikatan Dokter Indonesia (PB IDI), also known as The Mitigation Team of Indonesian Medical Doctor Association, records that COVID-19 infection is responsible to 647 deaths of healthcare workers. This figure comprises of 317 doctors, 27 dentists, 221 nurses, 84 midwives, 11 pharmacists, and 15 medical laboratory workers.

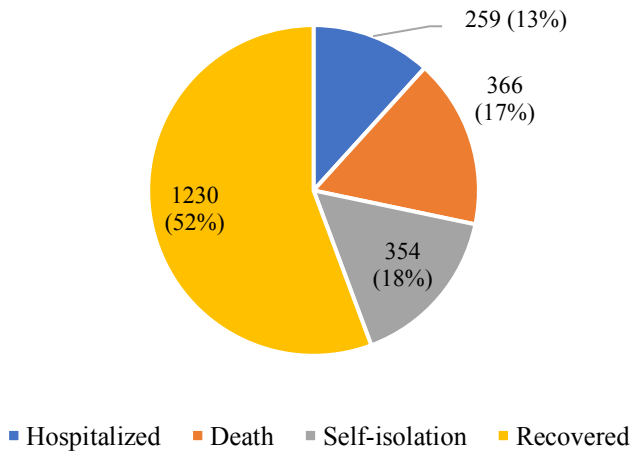

Figure 1.2 Number of COVID-19 Cases among Physicians in Indonesia on 10 February 2021
Source: SIMIDI Tim Mitigasi IDI (2020)

The above table is a reminder that a deeper research on the protection of physicians has the urgency and importance that hospital management need to look into, both in the form of physical and mental well-being. Physicians who are infected with SARS-CoV-2, are enforced to take leave from work to be treated or to do self-isolation. According to Indonesian Medical Doctor Association, as per 10 February 2021 there were 236 physicians hospitalized, 325 on self-quarantine, and 317 reported death cases due to COVID-19. More healthcare workers exposed to the disease means less there are to handle the surge of active cases. According to a research conducted by Labrague and Los Santos (2020), COVID-19 has caused fear, psychological distress, lower job satisfaction, decreased health perceptions, and increased turnover intention among frontline nurses in the Philippines. As excessive fear may intensify pre-existing mental health issues and provoke anxiety (Colizzi et al., 2020), it will eventually affect healthcare workers' health and job outcomes, such as patient care quality.

Labrague and Los Santos (2020), has also found that hospital nurses who perceived fear to COVID-19 have low job satisfaction, are mentally distressed, and are thinking of leaving their jobs and their profession as nurses. Mounting studies concluded that nurses who provided direct COVID-19 patient care appeared to be more stressed, overworked, psychologically disturbed, and less fulfilled in their job compared with nurses in other areas of assignment (Zerbini et al., 2020). In cases where there is an outbreak of infectious disease it is common to hear reports of stress among healthcare workers and how this leads to work decisions. For instance, the Ebola outbreak in West Africa caused fear and terror among frontline workers,

which made them arrive to a difficult decision of choosing their own safety over their job (Kollie et al., 2017)

One of the assumed reasons why more and more physicians are exposed to COVID-19, as reported by Indonesian Medical Doctor Association, is due to shortage of medical equipment such as Personal Protective Equipment (PPE) available to healthcare workers. According to COVID-19 Pandemic Protection Manual (2020), the Medical Doctors Association has defined that the enforcement of PPE availability to healthcare workers should be made a priority. It is also emphasized that all healthcare workers need to follow the proper PPE usage guideline. The Directory General of Pharmaceutical and Medical Equipment at Indonesian Ministry of Health defines medical equipment as instruments, apparatus, devices, equipment, implants, in-vitro reagent, software, materials used in singularity or combination to prevent, diagnose, treat, and relieve a disease, recover, restore organ functions, prevent fertility, disinfect devices, in-vitro testing of human body specimen, and may contain a regulated drug component through pharmacology, immunology, and metabolism process to achieve the desired functionality. Medical equipment is one of the most important components beside healthcare workers and pharmaceutical drugs in healthcare industry. Medical equipment's staggering advancement is crucial in the means of achieving Sustainable Development Goals (SDGs), whereas the role of medical equipment sustains the longevity of the population of all ages.

Based on the data provided by the Badan Pusat Statistik (BPS) / Central Bureau of Statistic, the import value of medical products in Indonesia in 2020 (January to November 2020) is around $1,384,102,461 USD or around 20 trillion

rupiah. The Ministry of Trade and Central Bureau of Statistic forecasted imported medical products market to reach 131 trillion rupiah in value by 2030. Indonesia's incumbent President Joko Widodo is targeting to decrease the importing of foreign goods and enforcing local manufacturers to produce local medical equipment. Due to this pandemic, this may not be the case anymore when that importing medical equipment is prioritized to fulfill the urgent needs of COVID-19 related medical equipment, as classified by Indonesian Customs such as SARS-CoV-2 PCR testing devices, thermometers, PPE, and ventilators. The prioritizing of fulfilling the needs of COVID-19-related medical equipment may put research and development of locally manufactured devices on hold.

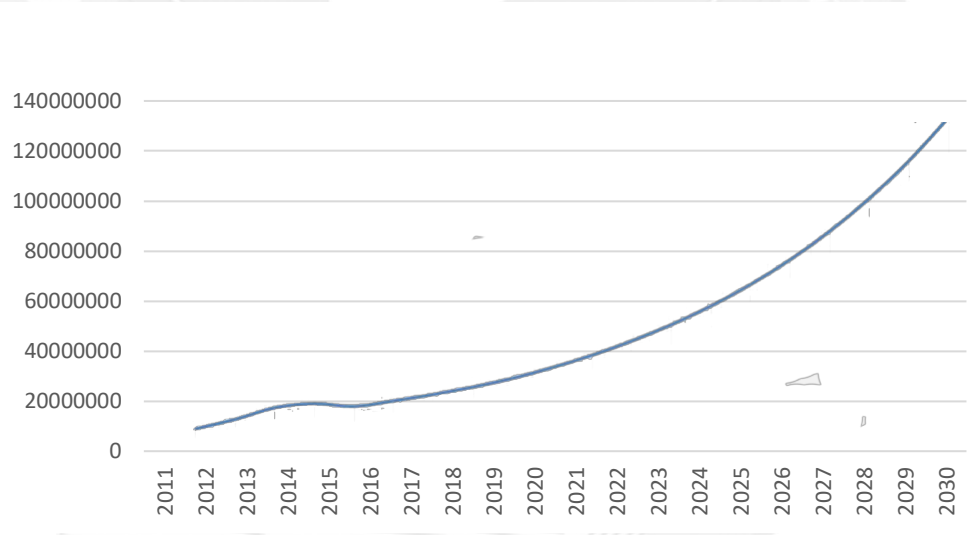

Figure 1.3 Annual Imported Value of Medical Products Forecast Graph (in thousands of IDR)
Source: Badan Pusat Statistik / Ministry of Trade

As per February 2021, Indonesian Ministy of Health records 136.045 active distribution license of medical equipment. According to data from MoH, 89,4% of the distribution license are licenses of Alat Kesehatan Luar Negeri (AKL) / imported medical equipment and only 10,6% are Alat Kesehatan Dalam Negeri (AKD) / locally manufactured medical devices. The Directory General of

Pharmaceutical and Medical Equipment at Indonesian Ministry classified medical equipment as in-vitro diagnostic medical device, active medical device, active therapeutic medical device, active diagnostic medical device, inactive medical device, invasive medical appliances, and non-invasive medical appliances. In-vitro diagnostic medical device refers to reagents, calibrator, instrument, apparatus used in-vitro for specimen testing, including blood or tissue donor originating from the human body. Active medical device is operated using electrical energy source, for example any medical device that uses a software. Active therapeutic medical device refers to support, change, replace, or fix the biological function and structure for therapy or disease/injury/wound relieve. Active diagnostic medical device gives information to detect, diagnose, and monitor physiological condition and health status. Inactive medical device is operated without electrical energy sources. Invasive medical appliances penetrate into the human body systemically or partially. Non-invasive medical appliances doe nnot penetrate into the human body. Personal Protective Equipment (PPE) is classified as non-invasive medical appliances.

Personal Protective Equipment and infection control guidelines from WHO are based on the assumptions that the primary mechanism of transmission of SARS-CoV-2 is direct and indirect droplet spread as well as fomite transmission (Cook, 2020). WHO defines several medical equipment as mandatory PPE for COVID-19. The equipment comprises of mask (for healthcare workers), mask (for patients), protective goggles, face shield, non-sterile gloves, sterile surgical gloves, heavy duty apron, disposable apron, isolation gown, surgical gown, bio-hazard bag, and particulate respirators.

Powered Air-Purifying Respirators (PAPR) is classified by customs according to its HS code as “breathing appliances and gas masks, excluding protective masks having neither mechanical part nor replaceable filters”. PAPR functions by removing aerosols (droplet and solid particles) from the air through the use of filters, cartridges, or canisters. PAPR can be described as respirators that protect the user by filtering out contaminants in the air and use a battery-operated blower to provide the user with clean air through a tight-fitting respirator, a loose-fitting hood, or a helmet. Traditional PAPR used in healthcare settings have a full facepiece and loose-fitting hoods, attached to waist-mounted belt batteries. PAPR uses the high efficiency particulate air (HEPA) filters and provide a higher level of protection than disposables respirators. PAPR was believed to offer more protection to healthcare workers than surgical mask. PAPR has been widely used in countries such as The United States, United Kingdom, Singapore, South Korea, and many other countries by their healthcare workers.

Due to the COVID-19 pandemic in early 2020, the Central Bureau of Statistic recorded a surge in import value of PPE. The value of imported PPE increased about 140% from 163 million to a striking 392 million US dollars. This data is acquired by accumulating the import value of each PPE according to their unique HS (Harmonized System code). HS code is an international classification system standardized between countries to classify physical goods. According to Buku Tarif Kepabeanan Indonesia (BTKI) or the Indonesian customs tariff book, products that are categorized as COVID-19 PPE comprise of masks, respirators, protective suits, gloves, protective shoes, face shields, goggles, and hood. According to its HS code, the value of imported masks includes the value of medical

mask, such as surgical masks, N95 mask, and KN95 mask as well as face masks made out of textile. Respirators refer to all gas masks with mechanical parts or replaceable filter, such as Powered Air-Purifying Respirators. Protective suits refer to protective gowns made of plastic, disposable surgical gown, protective suit to prevent radiation, and reusable surgical gown. Gloves include those made of plastic and latex. Protective shoes refer to all shoes covering made of plastic and latex. All face shields made of transparent plastic are classified into the same HS code and all eyes covering in the form of goggles are classified into the same code. Hoods refer to hair nets for surgical purposes.

Table 1.1 Personal Protective Equipment Annual Import Value

Year	Import Value (USD)
2018	$ 171,676,291
2019	$ 163,914,461
2020	$ 392,359,700

Source: Badan Pusat Statistik, Modified (2021)

By looking at the table presented above, there's clearly a surge in demand of PPE as overall by 2020 compared to 2019. The table shows a Compounded Annual Growth Rate (CAGR) of 139% in 2020 to 392 million USD, while in 2019 the import value was relatively stagnant. Among 392 million USD, the most imported PPE type in 2020 is masks.

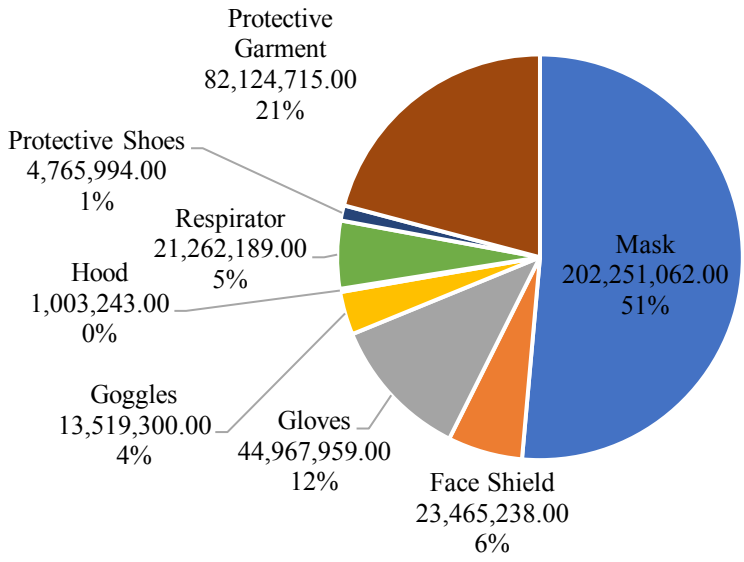

Figure 1.4 PPE Import Value in 2020 (in USD)
Source: Badan Pusat Statistik, Modified (2021)

Imported face masks dominated the PPE import market in 2020. Face masks contributed about 51% of the total PPE value imported in 2020 worth 202,251,062 USD. Second biggest contributor to the total PPE import value is protective garment worth 82,124,715 USD. In contrast, the value of imported respirators in 2020 was only 21,262,189 USD, contributing about 5% of the total. The value of imported respirators falls behind gloves worth 44,967,959 USD (12%) and face shield worth 23,465,239 USD (6%). Goggles with 13,519,300 USD value was imported in a year, contributing to 4% of the total imported PPE value. Additionally, protective shoes and hoods contribute to about 1% respectively to the total PPE import market.

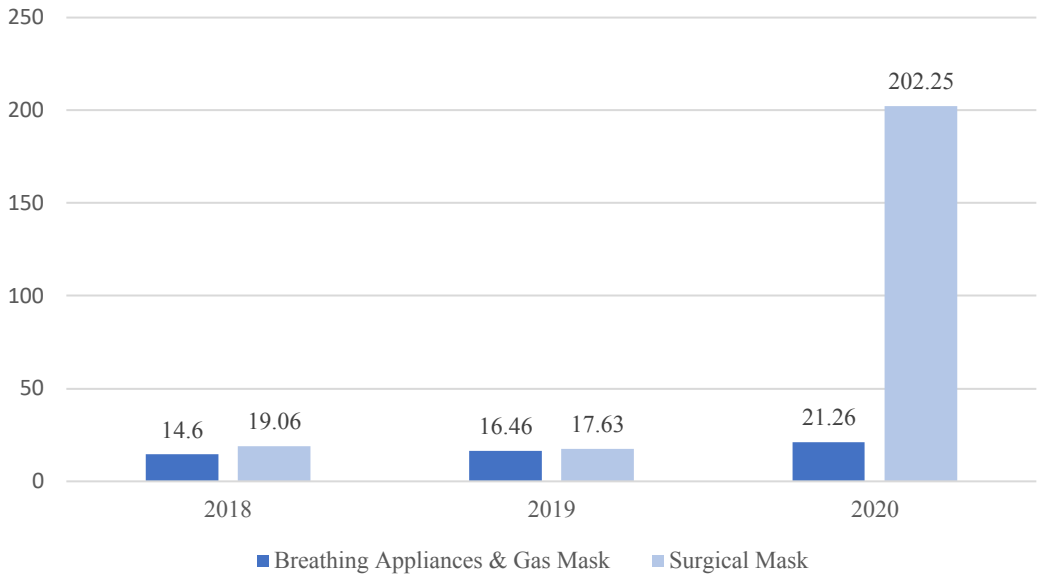

Figure 1.5 Number of Imports for Mask vs Respirators (in Million US$)
Source: Badan Pusat Statistik (2021)

Based on the figure presented above, a noticeable increase in value of imported masks from year 2019 to 2020. The value of imported face masks in 2019 was stagnant compared to 2018. Due to shortage of face masks in the beginning of the pandemic in 2020, the value surged over ten folds (1,047%) to 202,251,062 USD. On the contrasting side, the value of imported respirators showed 12.7% growth from 2018 to 2019. During the pandemic in 2020, a growth of 29% was reported. The value of imported respirators was 21,262,189 USD. This is concerning in contrast to the amount of growth shown in imported face masks, since rerespirators are one of the most renowned PPE used by frontline workers during an infectious outbreak.

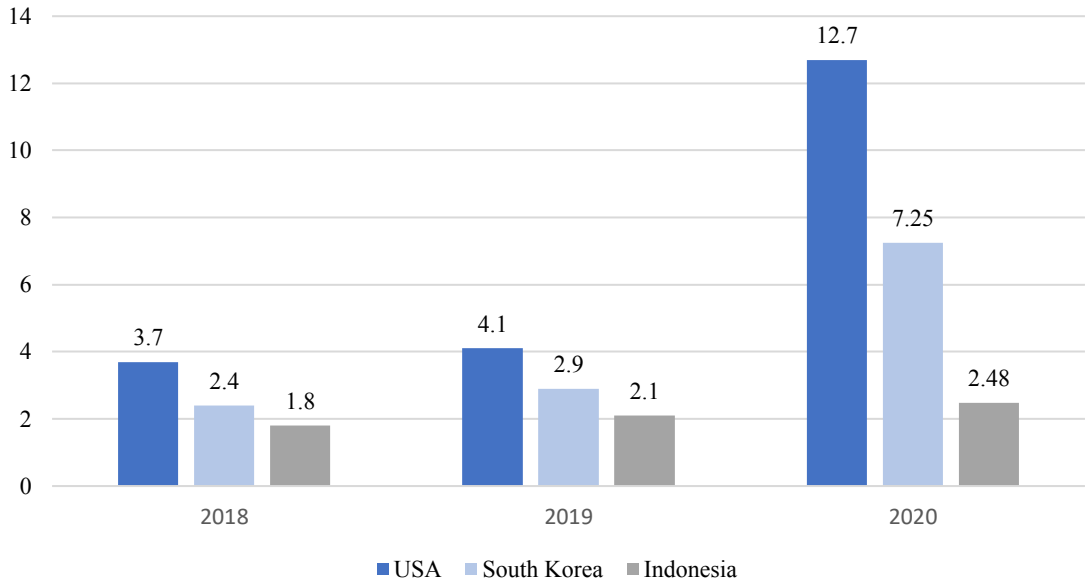

Figure 1.6 Annual Sales of Otos PAPR (in million USD)
Source: Otos Co., Ltd. (2021)

Otos Co., Ltd. is one of the leading manufacturers of PPE in South Korea. They are specialized in protective eyewear, welding safety spectacles, welding helmet and PAPR for over 40 years. Otos Co., Ltd. has been exporting PPE, mainly for industrial use to 38 countries. According to the overseas sales manager of Otos Co., Ltd., the company has been receiving massive PAPR demand for medical use domestically as well as countries from outside South Korea during the pandemic in 2020. Looking at the figure presented above, the sales of PAPR in South Korea has grown by 435% from 2.9 million USD to 7.25 million USD. Out of the 38 export countries, The United States of America contributes to most of their sales since 2018. During the pandemic in 2020, the demand of PAPR has surged resulting in 210% growth in sales compared to the preceding year. Otos Co., Ltd. owns the biggest market share of PAPR in South Korea, while in United States they are competing with local manufacturers such as 3M and Honeywell. The demand for PAPR from both South Korea and USA was driven by the alarming need to

immediately overcome the shortage of PPE for frontline workers during the pandemic. Hospitals in both South Korea and USA were overwhelmed by the number of active cases per day, urging the government to source local and imported PPE to prioritize the safety of their frontline workers as their human capital. However similar phenomenon does not occur in Indonesia. Unlike South Korea and United States, the sales growth of PAPR in Indonesia only rose by 18% in 2020 from 2.1 million USD to 2.48 million USD. Meanwhile in 2019 sales of PAPR also had a similar growth. This was perceived as a peculiar situation by PAPR manufacturers during pandemic. Aside from Otos Co., Ltd., other PAPR manufacturers, Drager, also reported almost no sales growth in 2020 for PAPR. According to the sales manager of Drager company, PAPR are still intended for industrial use.

Powered Air-Purifying Respirators is widely used for industries with hazardous environment, such as construction, heavy metal, manufacturing, transportation, chemical, and biological. While in healthcare industry, PAPR was mainly used only during outbreak or pandemic such as the Ebola Outbreak (CDC, 2018) and 2009 Influenza H1N1 Pandemic (Tompkins & Kerchberg, 2010), hence, the use of PAPR in healthcare industry may not be popular compared to the uses in other industries, especially in Indonesia. As Indonesia is now facing the COVID-19 pandemic, the use of PAPR will be relevant as this COVID-19 pandemic is lives risking, especially to Indonesian physicians. One of the assumptions is that the use of PAPR might not be popular among physicians in Indonesia, it is important to educate these physicians the product knowledge of PAPR. Other assumption is the demand of PAPR exists among physicians, however they are facing difficulties to

acquire the equipment. When this is the case, necessary actions must be taken by hospital management to bridge the gap. Eventually, this research aims to deep dive the intention to use PAPR by physicians.

The Food and Drug Administration defines Personal Protective Equipment (PPE) as protective clothing, helmets, gloves, face shields, goggles, facemasks, respirators, or other equipment designed to protect the wearer from injury or the spread of infection or illness. PPE is generally utilized in medical services settings, for example, medical clinics, specialist's workplaces and clinical labs. At the point when utilized appropriately, PPE goes about as a barrier between infectious materials, for example, viral and bacterial foreign substances and your skin, mouth, nose, or eyes (mucous membranes). The barrier can possibly obstruct transmission of foreign substances from blood, body liquids, or respiratory discharges. PPE may likewise secure patients who are at high danger for contracting contaminations through a surgery or who have medical condition, for example, an immunodeficiency, from being exposed to substances or possibly infectious material brought in by guests and healthcare workers. At the point when utilized appropriately and with other disease control practices, for example, hand-washing, utilizing liquor-based hand sanitizers, and covering coughs and sneezes, it limits the spread of infection from with one individual then onto the next. Powerful utilization of PPE incorporates appropriately eliminating and disposing contaminated PPE to prevent exposing both the wearer and others to contamination.

The correct selection and utilization of respiratory PPE is of the utmost importance in the current COVID-19 pandemic. This is especially true for health care workers exposed to high-risk aerosol generating procedures including

otolaryngologists, ophthalmologists, neurosurgeons, maxillofacial surgeons, and laparoscopic surgeons. N95 respirator are appropriate for respiratory protection. However, high-risk aerosol-generating procedures may create aerosolization of high viral loads that represent increased risk to health care workers. In these situations, enhanced respiratory protection with filters certified as 99,100, or HEPA (High Efficiency Particulate Air) may be appropriate (Howard, 2020).

Respiratory PPE recognized by Centers for Disease Control and Prevention (CDC) in the healthcare setting includes surgical masks, N95 respirators, elastomeric respirators, powered air-purifying respirators (PAPR), and controlled air purifying respirators (CAPR). Surgical masks sit on the face and are loose fitting. N95 respirators form an airtight seal around the mouth and nose. Elastomeric respirators are half or full-face masks made of soft rubber, which allows them to be cleaned, disinfected, and reused by multiple providers. Their filtration capacity is determined by the filter attached, it ranges from N95 to P100 level particle capacity. PAPR are composed of a face mask or hood and separate motor/fan/filter unit. They create highly filtered air flow through the hood to protect the wearer from aerosolized particles. CAPR is similar to a PAPR in that it uses active filtered air flow within a hood or face mask to protect the wearer. However, unlike PAPR, the motor, fan, and filter are moved into the headpiece itself and does not have a separate unit on a belt or pack.

Table 1.2 Differences between Types of Personal Protective Equipment

Type of PPE	Regulatory Group	Filtration Capacity	Duration of Use	Fit Testing Required	Primary Intent	Protection from Aerosols
Surgical mask	FDA	3-μm particles	Single use	No	Blocks large-particle droplets, splashes, sprays, and splatter	No
N95 respirator	NIOSH	95% of 0.3-μm particles	Single use	Yes	Efficient filtration of airborne particles down to 0.3 -μm.	Yes
Elastomeric respirator	NIOSH	Up to 99.97% of 0.3-μm particles	Reusable	Yes	Efficient filtration of airborne particles with reusable equipment with exchangeable filter cartridges.	Yes
PAPR	NIOSH	99.97% of 0.3-μm particles	Reusable	No	Filters air and creates powered positive outflow of air from within a hood or mask	Yes
CAPR	NIOSH	99.97% of 0.3 -μm particles	Reusable	No	Filters air and creates powered positive outflow of air from within a hood or mask	Yes

Source: Howard (2020)

The Occupational Safety and Health Administration (OSHA) provides a functional definition of a PAPR as "an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering. The National Institute for Occupational Safety and Health (NIOSH) explains the components in a PAPR—a facepiece, hood, a breathing tube, a cartridge or canister with filter; and a blower. Powered Air-Purifying Respirator is a positive pressure respirator that uses a blower to force the ambient air through a filter to a hood or

mask. Powered Air-Purifying Respirator (PAPR) helps protect the user (head and face) from certain contaminants and gas, such as welding fume, harmful dust, harmful odors, organic/inorganic chemistry, acids, ammonia, and respiratory infectious pathogen, or virus. PAPR produces clean and fresh air after purifying the contaminated external air by using particular filter, odor filter, or gas filter. PAPR is widely used in hospital settings, pharmaceutical manufacturers, laboratories, paramedics, first responders, manufacturing, firefighters, and fabricators (welders, grinders).

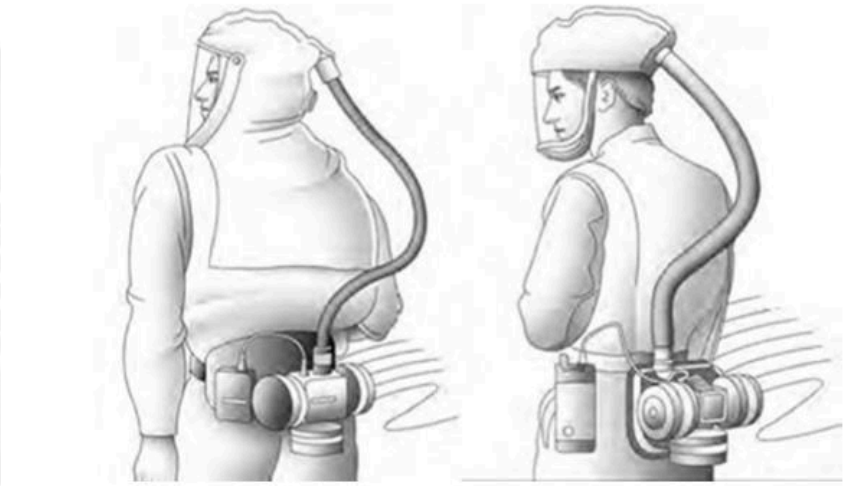

Figure 1.7 Powered Air-Purifying Respirator
Source: OSHA (2009)

The components of PAPR, as described by one of its manufacturers, are:

i) Hood

Hood acts as a face shield that has cold and chemical resistance.

ii) Hose and Airflow Tester

The hose is a breathing tube usually made out of polyurethane. It acts as a tunnel for clean air to pass from the blower to the hose. Airflow tester is a

tube that contains a small ball to determine the flow of the air coming out of the blower.

iii) Blower

The unit blows filtered air into the welding helmet, hood, or headcovers. The blower usually has a danger warning system such as alarm sound, LED display, and flow control.

iv) High Efficiency Particulate Air filter

This filter that purifies dust and contaminants from the air. European Standard requires that a HEPA air filter must remove – from the air that passes through – at least 99.95% of particles whose diameter is equal to 0.3 micrometer.

v) Pre-filter

Carbon activated filter to extend the usage life of the more expensive HEPA filter. This pre-filter removes most of the larger dust, hair, PM10 (air particle with size smaller than 10 micrometer), and pollen.

vi) Shoulder straps

The shoulder straps carry the weight of the blower on the users' shoulder.

vii) Plastic cover

Plastic cover wraps the hose and protect it from dust.

viii) Battery and charger

Lithium battery and charger

vii) Belt

The belt holds the blower on the user's waist.

The role of PAPR has received much attention over the past decade in response to outbreaks of infectious pathogen (Middle East Respiratory Syndrome,

pandemic influenza, Ebola, etc.) associated with significant morbidity and mortality to both patients and healthcare workers (Liverman, Domnitz, & McCoy, 2015). Under OSHA regulations, PAPRs are indicated for high-hazard procedures since they are able to offer assigned protection factors (APFs) ranging from 25 to 1,000 value, which is more than the APFs provided by N95 respirators. The improved protection is largely provided by the positive pressure in the head covering or facepiece. PAPRs with loose-fitting hoods provide additional potential advantages in that they do not need to be fit tested and they can be used by health care workers for whom an acceptable seal cannot be achieved due to facial hair or other factors. The hoods of PAPRs can provide splash protection and some degree of eye protection, and some workers have reported that the airflow can keep the shield from fogging and can reduce heat buildup.

Both N95 respirators and PAPR are used in healthcare settings. N95 respirators are respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles (FDA, 2020). The edges of the respirator are designed to form a seal around the nose and mouth. N95 respirators, also called N95 masks are tested for fluid resistance, filtration efficiency, flammability, and biocompatibility. N95 masks, just like surgical masks are not to be shared, intended for extended use, and reused.

Information was presented from PAPR and N95 respirator research studies conducted in OSF Saint Francis Medical Center Peoria, Illinois during the H1N1 crisis. Due to the shortage of N95 respirators supplies, the health system turned to its PAPR program, that was taken place. The study found that all 2,400 employees

the healthcare workers want to be part of PAPR program because of the following findings:

i) They don't need to perform N95 respiratory fit test, which approximately takes around 20 minutes.

According to OSHA, a "fit test" tests the seal between the N95 mask and your face. The purpose of this test is to assure that the mask first and seals properly so potentially contaminated air cannot leak into the mask and so hazardous substances are kept out. A qualitative fit testing normally uses saccharin (sweet taste), bitrex (bitter taste), and isoamyl acetate (banana smell), and irritant smoke (cough trigger).

ii) PAPR is less restricting and more user-friendly, as they can breathe more freely and accommodate workers with facial hair.

iii) Patient is more comfortable when healthcare workers are wearing PAPR as they can see the whole face of the workers. Patients, especially pediatrics are easily frightened by healthcare workers who are wearing full PPE with their face covered.

The study also reported the biggest challenges to using PAPR, which are:

i) Each PAPR costs about $1,000 USD - $2,000 USD, which comes out of departmental equipment budget.

ii) It may difficult to keep track of PAPRs since it is a compact equipment and it can fit in a drawer or a file cabinet. Sometimes when PAPR is found, certain pieces can be missing. PAPR needs to be kept in a central location and accessible to be checked out as required.

iii) Takes around 2 hours to charge the battery.

iv) Healthcare workers need to be trained on how to properly disinfect the PAPR, while N95 masks are disposable.

There are numerous models and psychological theories suggested to explore behavioral change and assess human intention. The theories that are focused on human behavioral change might include Theory of Planned Behavior (TPB), Precaution Adoption Process Model (PAM), Theory of Reasoned Action (TRA), Transtheoretical Model (TM), Social Cognitive Theory (SCT), and Health Belief Model (HBM). Although these theories have been designed and proven to examine an individual behavioral change, many researches claimed that the HBM is the most suitable model to study health-related behavior (K. Glanz, 2008). According to Rimer and Glanz (2005), the main reason is because health motivation functions as the fundamental emphasis of the point, and HBM addresses problem behaviors that have raised health concerns. Therefore, the HBM is used in this research to predict Indonesian physicians' intention to use PAPR as PPE during the COVID-19 pandemic in Indonesia.

The Health Belief Model is a theoretical model designed to predict health-related behavior in terms of certain belief patterns. The model was first developed by Hochbaum and Rosenstock (1952) in order to understand people's failure to adopt disease prevention strategies. However, later HBM were also used for patients' responses to symptoms, as well as compliances with medical treatments. The HBM has been also used by some scholars to predict individual's intention to use Personal Protective Equipment (PPE). Abdollahzadeh and Sharifzadeh (2021) have used the HBM in predicting farmers' intention to use PPE to prevent pesticide adverse effects in Mazandaran Province. Wright et al., (2019) used the HBM to

predict wastewater workers' intention to use personal protective equipment in order to reduce the probability of accident caused by hazardous exposures to chemical contaminants in the Southeast Region of United States. While Dewi, Rahardjo and Murti (2019) conducted their study in Yogyakarta using the HBM to predict construction workers' intention to use PPE in maintaining a safe working environment.

Originally, the HBM had five constructs consist of Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, and Cues to Action. However, other constructs are also added as research about HBM evolved and one example is the Knowledge construct. The Knowledge construct is considered important, especially in measuring individual's intention to use PPE context in Indonesia. For example, Dewi, Rahardjo and Murti (2019) has added the Knowledge construct in HBM in order to predict construction workers' intention to use PPE in Yogyakarta and the construct found to have a direct relationship with Intention to Use PPE. The Knowledge construct was also added to HBM on another study by Ginandhani, Kurniasih and Rachman (2021) where they conducted the study to examine PLTU contractors' intention to use PPE in East Java. The study also found that Knowledge construct has a direct effect on intention to use PPE.

Knowledge acquired by physicians may have a correlation with perceived susceptibility. Several researches show that knowledge about a health behavior have a positive correlation with the perceived susceptibility and perceived severity of getting a disease. Prior researches also show that knowledge about a health behavior has a positive correlation with the perceived benefits and perceived barriers of enacting a health behavior. Based on the reasons stated regarding the

importance of Knowledge construct in measuring intention to use on PPE context, this research will also add the Knowledge construct to the HBM. Therefore, in this research, the Knowledge construct will serve as the independent variable, while Perceived Susceptibility, Perceived Severity, Perceived Benefits, and Perceived Barriers will serve as the mediating variables, and the Intention to Use will be the dependent variable. This research model aims to predict the usage intention of PAPR as PPE on physicians in hospitals in Indonesia, especially amid of COVID-19 Pandemic in Indonesia.

1.2. Research Questions

Based on the phenomenon that has been described above, then the research problems could be formulated in the forms of research questions as follows:

1. Does knowledge positively affect physicians' perceived susceptibility?
2. Does knowledge positively affect physicians' perceived severity?
3. Does knowledge positively affect physicians' perceived benefits?
4. Does knowledge negatively affect physicians' perceived barriers?
5. Does perceived susceptibility positively affect physicians' intention to use PAPR?
6. Does perceived severity positively affect physicians' intention to use PAPR?
7. Does perceived benefits positively affect physicians' intention to use PAPR?
8. Does perceived barriers negatively affect physicians' intention to use PAPR?

1.3. Objective of The Study

Based on the research questions above, the objectives of this research are:

1. To analyze and test whether knowledge positively affects physicians' perceived susceptibility.
2. To analyze and test whether knowledge positively affects physicians' perceived severity.
3. To analyze and test whether knowledge positively affects physicians' perceived benefits.
4. To analyze and test whether knowledge negatively affects physicians' perceived barriers.
5. To analyze and test whether perceived susceptibility positively affects physicians' intention to use PAPR.
6. To analyze and test whether perceived severity positively affects physicians' intention to use PAPR.
7. To analyze and test whether perceived benefits positively affect physicians' intention to use PAPR.
8. To analyze and test whether perceived barriers negatively affect physicians' intention to use PAPR.

1.4. Significance of The Study

This research aims at predicting physicians' intention to use PAPR as personal protective equipment during COVID-19. This research is expected to benefit readers, both academics and business practices.

1.4.1. Academic Aspect

The results of this study are expected to be a reference, an input for the development of management science of other researches who want to get a deeper insight on the use of PAPR as PPE during COVID-19 pandemic in Indonesia. Since there hasn't been lacking of studies about the use of PAPR in Indonesia, this study contributes to examine such notion in the Indonesian context, which has been under research.

1.4.2. Managerial Aspect

This research is expected to be an input for healthcare institutions from hospital to medical equipment suppliers, as an effort to improve the implementation of effective practice and to speed up improvements in work environment safety. This research offers methods to improve the understanding of adequate Personal Protective Equipment to physicians, especially during COVID-19. Medical equipment suppliers can also benefit from this research by understanding the customers demand.

Aside from healthcare institutions, this research can also be used as reference for the government and public health workers to have a better understanding about the needs of physicians to be equipped with sufficient PPE in fighting the pandemic.

1.5. Systematics Writings

The systematic writing consists of several chapters in details as follows:

CHAPTER I : INTRODUCTION

This chapter defines introductive backgrounds, key issues, research objectives, research benefits, and the structure of the research.

CHAPTER II : LITERATURE REVIEW

This chapter contains the theoretical foundations, which include the notion of Health Belief Model. In additions, several definitions regarding the conceptual variables used on this study is also discussed. Hypotheses that will be tested are also developed in this chapter.

CHAPTER III : RESEARCH METHODOLOGY

This chapter contains research methods on area and time of study data collection methods, types, and sources of data, analytical methods, types and sources of data, analytical methods, and operational definitions.

CHAPTER IV : RESEARCH RESULT AND DISCUSSION

This chapter contains the theoretical and analytical discussions that describe the perceived susceptibility, perceived severity, cues to action, perceived benefits and

perceived barriers of Powered Air-Purifying Respirator (PAPR) by physicians through statistical tests of the variables from the data that have been collected from the questionnaires.

CHAPTER V: CONCLUSIONS AND SUGGESTION

This chapter contains a cover which consists of the conclusions of the discussion that have been done in the previous chapter and suggestions for the next researches and companies, especially those who engage in hospital and healthcare equipment industry.