"Operating Room Effectiveness": Phenomenological Qualitative Study In Hospital

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Abstract.
This study investigates the experience of health and medical personnel in hospital operating rooms and to evaluate the effectiveness of activities in operating rooms and ventilation conditions in hospitals. This study was designed as a qualitative research based on Heidegger's Hermeneutic Phenomenology Approach. The research method was carried out on health and medical personnel working in the operating room (OR) as observers. The research data were collected using an open and unstructured interview form. This form includes items that question the operating room design and operating room ventilation conditions. Data analysis used the Miles & Huberman method with the stages of data reduction, data display, and conclusion or verification. The research findings were obtained from seven informants (health and medical personnel) consisting of three men and four women. Age ranged from 30 to 45 years. Two themes and twelve sub-themes were determined as a result of data analysis. The research themes are (1) the effectiveness of operating room layout and (2) the effectiveness of operating room ventilation. This study concludes and provides important information about the physical requirements of the hospital operating room and the effectiveness for working professionally experience workers in the operating room (OR). It is understood that the room layout in the hospital is very good in helping smooth preoperative and postoperative handling. And operating room ventilation already supports good air circulation and is easy to control its use. But still found another room that causes noise. Hospital management must consider the type of activity, use of equipment, and/or other sources of noise, whether in the operating room building, ventilation of the operating room without a positive pressure system. So, the hospital must be able to pay attention to air humidity and pay attention to the state of the ventilation system and air filtration in the operating room so as to reduce the risk of preoperative and postoperative wound infections.

Keywords: *Operating Room Effectiveness, Operating Room Layout, Operating Room Ventilation, Medical and Health Personnel.*

I. INTRODUCTION

The challenge in the health industry is to provide better care to the community with the utilization and use of limited resources, but must be able to increase the effectiveness and efficiency of hospital operations. To meet the demand for quality and low-cost health care, health care providers must focus on increasing efficiency in the ever-changing healthcare environment, both in the health system and in hospital management [1]. Room installation services in hospitals are one part of medical support services in hospitals. Hospital operating room is one of the most important factors in the implementation of medical services in health care facilities. The operating room is a special unit in a hospital that functions as a critical service area that prioritizes aspects of the sterility zoning hierarchy, therefore failures in surgery should not be caused by planning and physical design factors of buildings and utilities that do not meet technical health requirements [2].Health and Medical Workers have an important role to play in operating theatre (OR) while working in a hospital. Each unit in OR must be dynamic, active and challenging work based on multidisciplinary teamwork covering specific activities and roles. For this reason, each hospital must be able to streamline the proximity of functionally different areas in the operating room (OR) which can affect the pattern and disruption of the circulating nurse workflow (CN) [3]. So, a good operating room (OR) must be able to provide circulation to medical and health personnel so that patient care can be arranged during the perioperative period so that it can be dynamic and in accordance with clinical knowledge, assessment and reasoning of skilled medical and health personnel [4]. The responsibility of circulating medical and health personnel is most important in the operating room (OR) in order to be able to manage nursing rules to be able to run intraoperatively and to serve patients whose protective reflexes are impaired during surgery or other invasive procedures [4][5][6].

The safety condition of the hospital operating room (OR) environment is very necessary for patients and medical and health workers, thus requiring efficient Heating, Ventilating and Air-Conditioning (HVAC)

installations [7]. Another requirement that is no less important is to continue to pay attention to the ventilation conditions in the operating room. Ventilation must be strictly filtered and controlled ventilation, air exchange and circulation provide fresh air and prevent accumulation of anesthetic gases in the room, twenty-five air exchanges per hour are required in the operating room recommended, must have a microbial filter in the airways in the room surgical removal of anesthetic gases. Air filter filter, practically only removes dust particles, if the air in the operating room is not circulated, the need for a scavenger system for gas (Gas suction) is absolute, especially to avoid the collection of anesthetic gases which is a dangerous risk to the health of the surgical team members [8] [9]. Installation of heating, ventilation and air conditioning (HVAC) that can control indoor air quality and aseptic conditions, and secure healthy, safe and appropriate indoor thermal conditions (i.e., temperature, humidity, air quality and airflow) for surgeons and staff medical, and of course to the patient.The indoor air temperature should be kept within the recommended range to ensure acceptable conditions. Indoor air temperature should be uniform in the room. In the operating room (OR), special care is required to account for different internal loads (eg surgical lamps) with proper design of air-conditioned supply and exhaust ventilation and supply air flow temperature. The desired indoor air temperature is usually 20ºC - 24ºC, following various regulations and international standards for operating room conditions (Table 1).

Table 1. Recommended Indoor Conditions for Operating Rooms

Temperature[a] (ºC)	Relative Humidity (%)	Ventilation	Source/References
19-24	40-60	Positive air pressure in the surrounding room and equipped with a minimum of 20% fresh air for the recirculation system. Clean air by filtering particles with a size of 0.5 microns with a HEPA filter. The cold air produced by the cooling system is distributed throughout the room to get the same conditions in every part of the room. Total air exchange is at least 4 times per hour when the room is not in use, and 20 times per hour when there is operation.	Indonesian Health Ministry [8]
20-23	30- 60	Positive pressurization. Minimum 15 ACH, of which at least 3 ACH should be outdoor air. Filter all recirculated and fresh air through min 90% efficient filters. In rooms not engineered for horizontal laminar airflow, introduce air at the ceiling and exhaust air near the floor.	American Institute of Architects [10]
17-27	45-55	Positive pressurization. Minimum 25 ACH with minimum 5 ACH of outdoor air	ASHRAE [11]
20-24	30-60	Positive pressurization (at least 2.5 Pa). Primary Supply Diffusers, non-aspirating. Minimum 20 ACH with minimum 4 ACH of outdoor air	ASHRAE [12]
22–26[b]	50-60	Positive pressurization. The air changes should be 60 $m^3/m^2/h$, if the room height is 3 m, or else 20 air changes per hour	German Institute for Standardization [13]
18-24	50-60	Positive pressurization with 15% excess air. Air flow rates 70–85 m^3/h. Airflow can be reduced down to 30% of the full load conditions during off-use hours	Technical Chamber of Greece [14][15] Hellenic Health Ministry [16]

Significant variations in hospital facilities may occur due to different facilities, especially due to differences in HVAC installations. The Gunung Jati Cirebon Regional General Hospital is not fully air-conditioned (central HVAC), the Gunung Jati Cirebon Regional General Hospital is a Type B criterion [17].

The operating room (RO) at this hospital is often used by specialist doctors; Obstetrics & Gynecology specialists, Ophthalmologists specialists, Otorhinolaryngology specialists, Oral & Maxillofacial specialists and an anesthesiologist. The high level of use of the operating operating room in the past three years can be seen from the annual average of surgical operations by specialist surgeons (Table 2).

Table 2. AVG Specialist Doctor's Surgical Activities by Years

Surgical Medical Specialist	2019	2020	2021
General Surgeon	27 cases	36 cases	38 cases
Obstetri & Ginekologi Surgey	48 cases	72 cases	80 cases
Ophthalmologis Surgey	16 cases	20 cases	21 cases
Oral & Maxillofacial Surgery	-	20 cases	30 cases

Based on a preliminary survey and interviews conducted by researchers with staff at the Gunung Jati Regional General Hospital, Cirebon, the operating room (OR) at this hospital has never had an evaluation related to spatial planning and ventilation, in addition to the results of initial interviews with operating room staff. It was found that the existing operating room layout was not in accordance with its function and safety. Whereas the operating room (OR) is the financial center of any hospital, maximizing the efficiency of the operating room will have important implications for cost savings, patient satisfaction, and morale of the medical team [18][19]. In other words, if at the time of lighting/lighting at work, setting air temperature at work, noise at work, air circulation in the workplace, color and decoration at work and safety and comfort at work increase, employee job satisfaction will increase. also increased [20]. Meanwhile hospitals are increasingly interested in building and maintaining green buildings to improve their medical services and only a few are seriously serious about it. This paper focuses on indoor thermal conditions for OR, including temperature, humidity, and ventilation, providing general HVAC design guidelines. It also summarizes findings from the investigation at the Gunung Jati Regional General Hospital Cirebon, which included an audit of the HVAC installation along with complementary measurements of thermal conditions in the operating room (OR). To analyze the effectiveness of the room layout and the effectiveness of operating room ventilation at the Gunung Jati Regional General Hospital, Cirebon.

II. LITERATURE REVIEW

Operating Rooms Layout Design

The design of the operating room requires an in-depth understanding of the role of clinical stakeholders in the critical care process, technology, and equipment used during treatment as well as the various technical aspects of the health care development process itself, which is why the operating room (OR) is a high risk for doctors. and other clinicians if it is not made and managed properly [21]. The operating room is the site of surgical intervention because patients cannot be treated with drugs [22]. The operating room should be separated for aseptic and septic intervention (aseptic: free of germs and infection; septic: composed of germs and toxins and must meet sterilization conditions) [22, 23]. The performance of the surgical intervention in the operating room requires the comfort conditions of the room to be maintained at certain conditions stated in the health standards.

The service area and the availability of inpatient operating room beds should be arranged according to the expected surgical intervention load from the hospital [8][10][22][23]. In a hospital architectural layout, operating rooms should be located away from intense circulation of people, care must be taken to protect against possible outside noise and the negative effects of possible rooms having doors opening to the outside, suitable for the direction of sterile airflow for patient transfer. and sterile materials as well as for the disposal of dirty materials, and provides the opportunity for the establishment of the necessary mechanical systems that will meet the heat loss and heat gain loads most efficiently [8][10][22][23]. The operating room unit has dirty, semi-sterile and sterile rooms (Figure 1) [8][10][22][23]. In these spaces the direction of traffic must always be smooth from a semi-sterile room to a sterile room and from a sterile room to a semi-sterile room and vice versa to a dirty room.

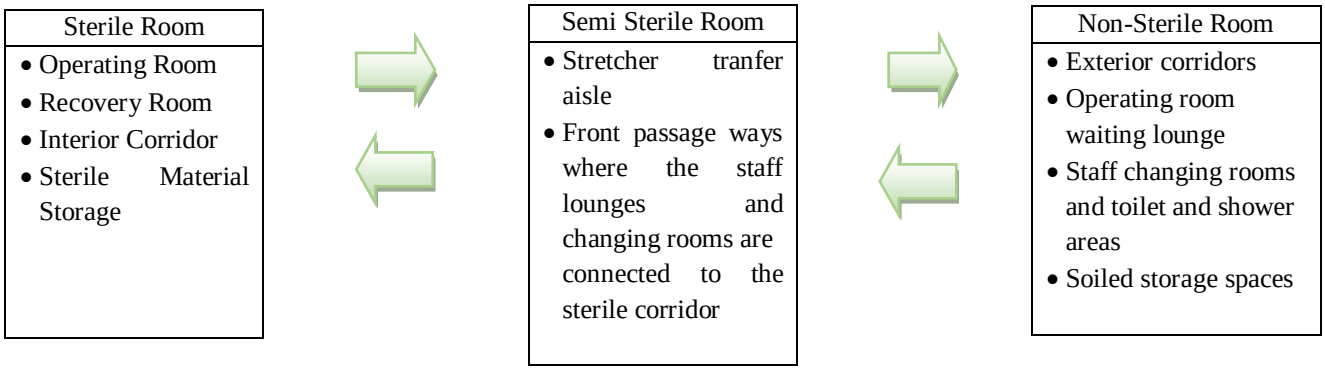

Fig 1. Operating room spatial passage construction

Most hospital infections can be prevented by proper engineering design and regular maintenance of HVAC installations in order to contribute to reducing risks to healthcare and medical personnel and patients. Infection is influenced by several factors, including the type of surgery and the environment in which the procedure takes place, ventilation or air conditioning systems, asepsis, sterile supplies and equipment and even building work in and around the hospital [7].

Operating Rooms Ventilation

In the 18th century the new operating room was separated from other rooms for learning and demonstration purposes [24]. Since then, there have been significant developments in operating room ventilation in relation to design concepts in operating room layout, pressure and ventilation, in particular the development of ultra-clean ventilation (UCV) [25]. In maintaining the safety and health of occupants from air contamination and infection, the role of operating room ventilation plays an important role in controlling it [7][8].To secure the operating room environment so that it becomes a safe and healthy room, good ventilation is needed so that it can; (1) reduce the concentration of bacteria, viruses and dust to an acceptable level, so that the indoor air meets the aseptic level according to health guidelines. for patients and room occupants; (2) eliminates anesthetic gases and odors released during surgery, which may disturb occupants permanently or temporarily; (3) provide optimal and comfortable working conditions for occupants to facilitate their demanding work during operation [7][8]. The Air Handling Unit (AHU) used to serve the OR can be one (single) or two (double) stage that is without or with a Terminal Unit (TU).To serve the operating room must meet strict rules so that the room becomes clean by determining the type and number of filters used in the AHU.

The filter shall include (1) filters for removing solid and liquid particles (viscous impingement and dry filters are available in renewable, cleanable and disposable variations, fibrous, electrostatic and air washers); (2) filters to remove gases and vapors (e.g., activated carbon and chemical filters); (3) filters to remove bacteria (e.g., ultraviolet or germicidal lamps). Control of microbial contaminant concentrations in the Operating Room is typically accomplished through the use of High Efficiency Particulate Air Filters (HEPA), Ultraviolet Germicidal Irradiation (UVGI), and strict hygiene procedures.In the operating room, three layers of filters should be used [7]. The first stage filter B2, the prefilter, is placed right after the AHU air intake to filter outside air. The prefilter (30–50% efficiency) can capture large dust particles and solid particles (>0.3 mm) and increase the overall effectiveness of the filter. If properly cared for, the prefilter can reduce the growth of bacteria on the main filter. The second stage filter C, is a thin filter (95% efficiency) that can capture particles with a diameter of less than 0.3 mm. They are placed at the air outlet of the AHU and can also serve to contain moisture (droplets) or microorganisms that may be carried in the air from the cooling coil. The third stage filter S (special filter), even has a higher efficiency of about 99.97%. This type of filter is placed as close to the Operating Room as possible, to clean the air of any particles that may have escaped from the previous filter or may have been drawn from the AHU itself or the ducts. An automatic damper is placed before the filter to isolate it when the AHU is not operating and to prevent backflow of air from the OR to the AHU [7].

The Evaluation Operating Rooms Effectiveness

Hospital finances are obtained from the continued use or turnover of existing patients from the operating room [18][19]. The operating room as one of the most expensive units makes one of the factors that limit productivity to obtain the ideal space function, because it must be supported by infrastructure, human resource management, dynamics of scheduling, process flow, technology problems, and limitations in information management.Several things hinder the achievement of high performance in the operating room such as: variability of patient problems; different types of interventions; unexpected events that occur in any surgical practice [19][26]; and ineffective process management that plagues the industry, such as ineffective uptime controls, low efficiency in room cleaning and preparation, weaknesses in inventory control and material handling, and ineffective queue management.

Continuous improvement of operating room efficiency and effectiveness is realized by reducing operating time; training of doctors, residents, and other employees; anesthetic choice; efficient scheduling; and monitor the overall performance of the operating room. A combination of actions such as those listed above is essential for continuous improvement and the achievement of health system goals.In this research, it is mentioned that the efficiency of the mechanical system in general in the context of the efficiency of spatial planning and ventilation of the operating room. However, starting from the location within the hospital building all installations and waste control and management must be planned while the operating unit is being constructed. Because there are regulations and directives for hospitals in Indonesia, the research that has been carried out during the study has been evaluated specifically for regional general hospitals so that access to real data can be provided.

III. METHODS

This qualitative research is based on Heidegger's Hermeneutic Phenomenology approach [27]. In the study, analysis of data obtained by the analytical method of Miles and Huberman [28] was used to reveal how health and medical personnel were influenced by their experiences on the effectiveness of using operating theaters in hospitals. Data obtained from the experience of informants and researcher comments are used and included in this method. However, there will be shallowness of the study if the phenomenological approach is not integrated and deepened with the hermeneutic method. So the use of the hermeneutic phenomenology method in this case is to obtain answers or in-depth information about a person's opinions and feelings that make it possible to get things that are implied about attitudes, beliefs, motivations, and individual behavior [29].Health and medical personnel who work in the operating room at the Gunung Jati Regional General Hospital Cirebon from July to August 2022 are the research samples used as informants to obtain research data. The criteria for participation are the status of health and medical personnel who are willing to be interviewed. Data was collected through in-depth interviews and observations (observation). Health and medical personnel were interviewed about their clinical experiences to find out how comfortable they were and how they felt in the operating room and how they were affected in the end. The contents of the questions in the interview form and the research objectives were explained to them prior to the interview. In-depth interviews were conducted with seven hospital personnel who agreed to participate in this study. Instrumental questions include nine questions regarding the design of the operating room and five questions on ventilation [9][22].

The physical requirements of the operating room which consist of the design of the operating room must include: a quiet room for the patient to wait for anesthetic action which is equipped with an anesthetic induction facility, an operating room that is directly related to the induction room, a recovery room, sufficient space for store equipment, linen, pharmaceutical drugs including narcotics, room/place for collection/disposal of equipment and linen used for surgery, the operating room should be quiet and sterile, in the operating room two treatment rooms are required, namely elective action and cito action. Then the requirements for operating rooms with controlled room ventilation and ensuring the distribution of air through filters, ventilation using central or semi-central air conditioning with 98% sterile and equipped with filters. Ventilation must be with a positive pressure system / total pressure [9].Considering the evaluation problem in this study, the performance assessment of the suitability of operating room layout and operating

room ventilation can be considered as a matter of Operating Room Effectiveness Decision Making. First, the object of evaluation is the operating room layout and the second is the ventilation system in the OR. Then, the core of this evaluation system is the evaluation indicators that are in accordance with the aspects selected in this study; There are nine aspects for operating room layout, seven aspects and five aspects for operating room ventilation. The weight distribution of these indicators makes decision making persuasive and evaluation benchmarks can come from national standards or other methods. In accordance with the characteristics of the indicators, the evaluation value can be obtained through on-site measurements, data collection and calculation and questionnaire surveys. Finally, comprehensive evaluation results will be obtained through a multi-criteria evaluation method. Figure 2 shows the components of the assessment framework.

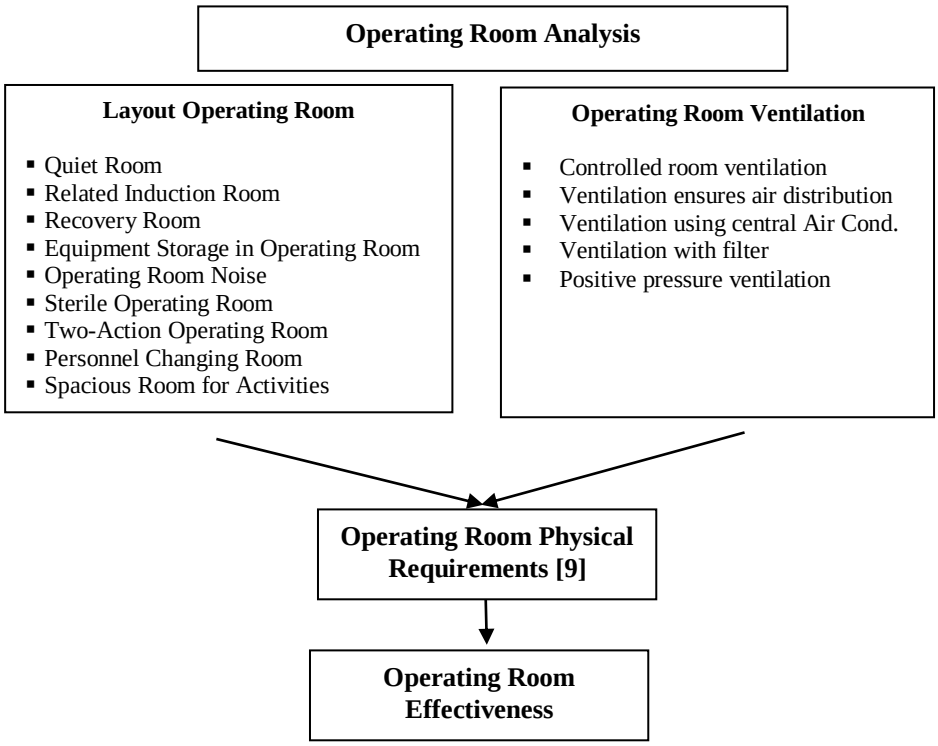

Fig 2. Evaluation framework

IV. RESULT AND DISCUSSION

Table 2. Distribution of Informant Characteristics

Informan	Age	Gender	Jobs Position
1	32	Male	Doctor
2	29	Male	Nurse
3	32	Female	Nurse
4	29	Female	Nurse
5	33	Female	Nurse
6	45	Male	Hospital Leader
7	42	Female	Head of Medical Services

Table 3. Distribution of the Informant's Answers

Themes	Subthemes	Informan Respons						
		1	2	3	4	5	6	7
ness Of Operating Room Layout	Is the operating room quiet for patients waiting for anesthesia procedures equipped with anesthesia induction facilities?	+	+	+	+	+	+	+
	Is the operating room directly related to the	+	+	+	+	+	+	+

	induction room?							
	Does the hospital have a recovery room	+	+	+	+	+	+	+
	Is the traffic in the operating room relieved	-	+	+	+	+	+	+
	Is the operating room sufficient to store equipment, linen, pharmaceutical drugs including narcotics?	+	+	+	+	+	+	+
	Is there a collection/disposal place for used equipment and linen after surgery?	+	+	+	+	+	+	+
	Is the noise level in the operating room still appropriate (50-64 db)?	+	+	+	+	+	+	+
	Is the changing room in the operating room spacious and clean?	+	+	+	+	+	+	+
	Are there any restrictions on the operating room (sterile and non-sterile zones)?	+	+	+	+	+	+	+
Effectiveness of ventilation in operating room	Is operating room ventilation controlled?	+	+	+	+	+	+	+
	Does Operating Room Ventilation Use Central Air Conditioning?	-	-	-	-	-	-	-
	Does the Operating Room Ventilation already have a Positive Pressure System?	-	-	-	-	-	-	-
	Is there air circulation in and out of the operating room?	+	+	+	+	+	+	+
	Are the temperature and humidity in the operating room up to standard? (20-25ºC & 50-70%)	+	+	+	+	+	+	+

Operating Room Layout Effectiveness

The results showed that the operating room was quiet for patients to wait for anesthesia, which was equipped with anesthesia induction facilities and had pre and postoperative rooms. This situation shows that the operating room is good, this can be seen with a quiet operating room for a patient waiting for anesthesia, equipped with anesthesia induction facilities. This study also found that the operating room is directly related to the induction room. The induction room is a room used to perform anesthesia. However, if the operating room area is not possible, anesthesia can be performed in the operating room. The results of the study showed that all informants stated that space quiet operation where the patient is waiting for anesthesia which is equipped with an anesthetic induction facility as stated in the following informant's statement:

"Yes…. the operating room is quiet for patients to wait for anesthesia and the operating room is equipped with anesthesia induction facilities and the operating room consists of pre and post surgery rooms". (Informant 1).

"*The operating room is very quiet for patients to wait for anesthesia and is equipped with anesthesia induction facilities and the operating room consists of a pre- and post-operative room*". (Informant 2).

"*Of course, calm down…. the operating room is quiet for patients to wait for anesthesia and the operating room is equipped with anesthesia induction facilities and the operating room consists of pre and post surgery rooms*". (Informant 7).

The operating room that is connected to the induction room proves that the operating room layout has been effective in its utilization, the operating room that is connected to the induction room will create a more systematic operation, meaning that if the patient has been anesthetized in the induction room, he is immediately taken to the operating room for surgery. The results showed that all informants stated that the operating room was related to the induction room as expressed in the following statement:

"*The operating room is directly connected to the induction room.*" (Informant 1)

"*Oh… directly related*". (Informant 4).

"*The operating room is directly related to the induction room*". (Informant 5).

In this study it was found that the entrance to the operating room or the door that connects the induction room and the operating room uses a sliding door with a rail above that can be opened and closed automatically, the door is opened and closed using a foot switch, but in a state of electric propulsion. the door is broken, the door can be opened manually, the door is closed during surgery or between surgeries, the

door is equipped with observation glass: double glass fixed windows, the door width is 1200 - 1500 mm, the door uses a swing door so that it opens inward and automatic door closer and cleaned after every operation.

In the study, it was found that the operating room had a recovery room. The operating room recovery room is located adjacent to the operating room and is easily accessible by the anesthesiologist or surgeon so that it is easy to bring it back to the operating room when needed. Surgical patients placed in the recovery room are continuously monitored for the effects of normal or mild anaesthesia. In the recovery room, which requires high-quality care that can quickly assess the patient by looking at the heart and respiratory status indicators. So that this condition is in accordance with the policy of the Indonesian Ministry of Health that surgical patients who are placed in the recovery room continuously can be easily monitored. The ideal location of the recovery room is adjacent to the operating room and easily accessible by the anesthesiologist or surgeon so that it is easy to bring it back to the operating room when needed, and is easily accessible to the radiology department or the room must be sufficient and equipped with back-up lights if at any time it occurs. power outages [9]. The ideal recovery room layout is one that is easily accessible to both the doctor and the operating patient [3][30]. So that it can increase the effectiveness of the operating room and make it easier for health service providers.The terrace operating room is free and makes it easier for traffic for health handling activities. The hospital operating room building (facility) is free from traffic within the hospital location, in this case traffic through the hospital operating room section is not allowed and the operating room complex is a separate zone from other rooms in the home operating room building (means) sick people and staff working in the operating room complex must be arranged so that the path they pass from one “sterile” area to another does not pass through an “infectious” area.

This is in accordance with the Indonesian Ministry of Health that the hospital operating room building must meet accessibility requirements [9], this means that the operating room, preparation area etc., and the traffic area adjacent to it must be accessible. The relationship between rooms must have basic requirements for the relationship between rooms in the surgical installation building (facilities) namely the hospital operating room building (facility) must be free from traffic within the hospital location, in this case traffic through the hospital operating room section is not allowed. Pharmacy rooms and other rooms to support the effectiveness of each station in order to provide services [32]. And good communication is needed so that the operating procedure can run well. The ideal recovery room layout is one that is easily accessible to both the doctor and the operating patient. So that it can increase the effectiveness of the operating room and make it easier for service providers [31].In this study, it was also found that the operating room has its own room which is sufficient to store equipment, linen, pharmaceutical drugs including narcotics. The space for storing sterilized instruments and instruments is in a closed drum and stored in the instrument cabinet. Other materials such as sterile gauze and sterilized cotton can also be stored in this room. Supplies are arranged neatly on shelves whose lowest point is no more than 8 inches (20 cm) from the floor and the highest point is no less than 18 inches (45 cm) from the ceiling. Inventories are routinely checked for expiration dates and packaged in an integrated manner. The operating room has a storage area for cleaning equipment and a space for placing dirty items in closed containers originating from rooms inside the building (means). The Hospital Operating Room will subsequently have a medical waste disposal area outside the Hospital Operating Room building and a linen room with the function of storing linen, including operating towels and surgical clothes for officers/doctors in the Hospital Operating Room.The results of the study which showed that all informants stated that the operating room had its own room which was sufficient to store equipment, linens, pharmaceutical drugs including narcotics, as described below:

“*The operating room has a separate room for storage equipment and pharmacy*.” (Informant 2).

"*Yes…. the operating room is sufficient to store equipment, linen, pharmaceutical drugs including narcotics*”. (Informant 3).

"*Has a separate room for equipment storage and operating room pharmacy*". (Informant 4).

"*The operating room has its own room for storage of equipment, linen, pharmaceutical drugs including narcotics*". (Informant 6).

The average operating room noise is in the range of 50-64 dB. This indicates that the noise is classified as poor, because the operating room noise index According to the Indonesian Ministry of Health, the maximum noise index in the operating room is 45 dB with an exposure time of 8 hours [9]. Therefore, the hospital must pay attention to the comfort level of noise in the hospital operating room, must consider the type of activity, use of equipment, and/or other noise sources both in the hospital operating room building and outside the hospital operating room building.The operating room changing room is quite spacious and is always cleaned every day. The dressing room at Gunung Jati Hospital, Cirebon is used for doctors and medical staff to change clothes before entering the operating room environment. In the changing room, there is a wardrobe/locker with a key held by each officer and a cupboard/place to store the sterilized clothes for doctors and nurses. The changing rooms are separated for men and women and are also equipped with toilets.

Effective Use of Operating Room Ventilation

The results showed that the operating room ventilation was well controlled, but ventilation in the operating room did not use central air conditioning, and the operating room ventilation was not under positive pressure and the operating room humidity temperature was in the range of 50-70%. This situation indicates that the operating room ventilation is still not good. It is said to be not good because the relative humidity that must be maintained is 45% to 60%, with positive air pressure in the operating room. Room temperature is maintained around 190 - 240 Celsius. Even though it is equipped with humidity and temperature controls, the air conditioning unit can still be a source of microorganisms that come through the filters [9]. Based on this situation, ventilation in the operating room can be continuously controlled. Air circulation will provide fresh air and prevent the accumulation of anesthetic gases in the room. Air conditioners used in the operating room can increase comfort for health and medical personnel and patients. Air conditioner in addition to functioning as air conditioning can also function as a regulator of air circulation in the operating room. This is because there is no ventilation connecting the operating room with the outside environment. This air conditioner must have special attention, namely its function as an air filter. So, care must be taken so that outside air is not carried into the operating room.

According to the Indonesian Ministry of Health that ventilation plays an important role in environmental infection control in the operating room [9]. In a room that does not have horizontal laminar airflow, the clean air purifier is placed on the ceiling, and the air intake is near the floor. The operating room door must always be closed. The door is opened only when medical personnel, equipment, or patients are about to pass through. The concept of air management and control or ventilation in the operating room at this hospital does not use central air conditioning. In accordance with the requirements for operating room ventilation, ventilation or supervision, a separate air conditioner equipped with a bacterial filter should be used, for each operating room separate from other rooms [9]. Installation of air conditioning at least 2-meters from the floor and the flow of clean air entering the operating room comes from top to bottom. There is no positive pressure for ventilation in the operating room at this hospital. This shows that the operating room ventilation has not met the requirements, because positive room pressure is used to protect people in the room. The pressure in the operating room is higher than the corridor with an air exchange frequency of 20-25 times per hour. The temperature and humidity of the operating room must be in the range of 50-70% by measuring the humidity of the air, as revealed by the following informants:

"*The operating room temperature and humidity are in the 50-70% range*" (Informant 1).

"*Being in the range of 50-70% by measuring the humidity of the air*". (Informant 2).

"*Being in the 50-70% range*". (Informant 3).

"*Being in the range of 50-70% by measuring the humidity of the air*". (Informant 5).

To maintain or achieve humidity according to standards and the room because it is not yet under positive pressure in the operating room at this hospital, a portable dehumidifier is added in the room, but the device turns out to be aesthetically disturbing to the appearance and layout of the room. Whereas the Indonesian Ministry of Health requires the operating room to have positive pressure obtained by supplying air from the diffuser located on the ceiling into the room, the air is expelled through the return grille which is at ± 20 cm above the floor surface [9]. Microorganisms in the air can enter the room, unless positive pressure

in the room is maintained.The importance of ventilation in the operating room in order to reduce the risk of spreading nosocomial disease in hospitals. Ventilation is one of the main roles in the spread of nosocomial diseases, therefore ventilation must be considered [7][19][33]. The results of this study are not in accordance with other studies that standard ventilation in the operating room must be owned by every hospital, because good ventilation will definitely filter and control air exchange so that circulation occurs by providing fresh air and preventing the collection of anesthetic gases in the room. operating room ventilation should be positive pressure system [24][25].The pressure in the operating room is higher than the corridor with a frequency of air exchange of 20-25 times per hour. The operating room temperature and humidity are in the range of 40-60% by measuring the humidity of the air. According to the researchers, to prevent the proliferation and growth of microorganisms in the operating room, it is necessary to regulate temperature, relative humidity, cleanliness by means of ventilation air filtration, positive and negative room pressure and air distribution in the room. Considering that there are medical actions that require the air system to not stop to protect patients and medical equipment, the operating room must always be conditioned by the air system, and the air conditioning system must have sufficient reserves to anticipate damage or during maintenance actions. the air conditioning system in the operating room must remain usable [24][25].

V. CONCLUSION

This study provides significant information about the importance of using good ventilation and in accordance with health standards in hospitals and it is also important to pay attention to the use, position and design of the layout of the rooms in the hospital in order to suit and facilitate medical activities. The findings from observations and interviews with informants obtained that the operating room at the Gunung Jati Regional General Hospital, Cirebon was good, the patient was comfortable and calm while waiting for anesthesia, then the operating room was connected to the induction room, and already had a recovery room, the operating room has a traffic area that is easy to pass, then has a storage area for equipment and a dressing room. The operating room is quite spacious, but the noise level in the operating room is still found above the operating room noise index of 50-64 db.

Then the ventilation of the operating room of the Gunung Jati Cirebon Regional General Hospital is good, where the ventilation is controlled. The humidity temperature is already in the range of 50-70%. However, they still do not use central air conditioning, and do not have ventilation with a positive pressure system.This research is important to be input to the hospital manager must be able to increase comfort in the operating room to avoid disturbing noise levels in the area adjacent to the operating room, operating room managers must consider the type of activity, use of equipment, and/or other noise sources both in the operating room building. It is advisable to ventilate the operating room with a positive pressure system and pay attention to air humidity at a value of 40-60%. And must continue to pay attention to the state of the ventilation system and air filtration in the operating room so as to reduce the risk of preoperative and postoperative wound infections.

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