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Comparative Study: Use Of 0.9% Normal Saline Irrigation Liquid and 10% Povidone-Iodine in The Process of Laparatomy Sectio Caesarea Operation in Hospital

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Abstract
Introduction: *Operating Area Infections (IDO) is part of Healthcare-Associated Infections (HAIs) which is a global problem and reaches at least 9% (3%-21%) of 1.4 million clients worldwide. This figure was reported by the World Health Organization (WHO) from the results of a survey in 14 countries covering 28,861 clients in 47 hospitals. Based on the results of a survey every year, millions of people undergo surgical treatment so that surgical intervention covers about 13% of the total life or DALYs (Disability-Adjusted Life Years).* ***Objective:*** *irrigation fluids normal saline 0.9% and povidone-iodine with the wound healing process after laparotomy sectio caesarea.* ***Methods:*** *The design used in this study is an expost facto comparative, namely research that compares the presence of one or more variables in different samples with a retrospective approach.* ***Results and Discussion:*** *The results of the research analysis showed that there were significant differences between the two irrigation fluids, but according to several theories and research, the differences were due to differences in composition and characteristics of the irrigation fluids that had been used. However, the irrigation fluid can still be used for intraoperative irrigation.* ***Conclusion:*** *This study shows that there is a statistical difference between the two types of irrigation fluids, namely normal saline 0.9% and povidone iodine on the wound healing process by having different characteristics and fluid composition*

Keywords: Normal Saline Irrigation Fluid; Povidone-Iodine; Laparotomy Sectio Caesarea;

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Introduction

Surgery is one of the therapies that can relieve disability and reduce the risk of death from this common condition. Based on the results of a survey every year, millions of people undergo surgical treatment so that surgical intervention covers about 13% of the total life or DALYs (*Disability-Adjusted Life Years)*. This surgical procedure is necessary to save lives, but unsafe surgical treatment can cause great harm. Reported mortality rates after surgery reach 0.5-5%, with complications after inpatient surgery reaching 25%. Therefore, an international working group of experts convened to review and improve surgical care safety, surgical wound infection prevention, safe anesthesia, safe surgical team and surgical care measures (WHO, 2020).

Operating Area Infections (IDOs) are part of *Healthcare-Associated Infections (HAIs)* which are a global problem and reach at least 9% (3%-21%) of 1.4 million clients worldwide. This figure was reported by *the World Health Organization* (WHO) from the results of a survey in 14 countries covering 28,861 clients in 47 hospitals. According to the Ministry of Health of the Republic of Indonesia in 2011, the incidence of SSI in government hospitals in Indonesia was 55.1%

Surgical operations that have a high enough infection rate, namely clean contaminated operations, namely *laparotomy* reach 5% – 11% (Linda Tietjen., Débora Bossemeyer & Noel Mc Intosh, 2011). One of the operations performed is a *laparotomy*.operation *laparotomy* is an operation performed on the abdomen to examine the organs and help diagnose and cure diseases in the abdominal or abdominal area (Naja, M.K., 2016). Operation *laparotomy* is generally performed by making an incision on the part of the body to be treated, then an incision is made and ends with closure and suturing of the wound (R Sjamsuhidajat., Karnadihardja W., Prasetyono TOH & Rudiman R 2010). Furthermore, stated by Ekaputra, E. (2013), *laparotomy* as one of the major surgical procedures, by making incisions in the layers of the abdominal wall in order to obtain parts of the abdominal organs that are experiencing problems and will be treated such as due to hemorrhage, perforation, cancer and obstruction.is *Laparotomy surgery* often performed by digestive and obstetric surgery (Smeltzer & Bare, 2002).

Laparotomy *surgery performed by obstetrician* surgeons increases the most every year, namely the *Sectio Caesaria (SC)* proposed by WHO which shows that in a country there are about 5-15% of CS deliveries per 1000 births in the world. In line with this, in Indonesia itself the incidence of SC also continues to increase both in government hospitals and in private hospitals. The Indonesian Demographic and Health Survey (IDHS), showed an increase in SC operations in Indonesia from 1991 to 2007 which was 1.3-6.8%.

Another thing was also stated by the IDHS, that cesarean delivery in the city was much higher (11%), while in the village it was (3.9%). Riskesdas in 2013 also stated that the CS delivery rate was (9.8%) out of a total of 49,603 births during 2010 to 2013, with the highest proportion in DKI Jakarta (19.9%) and the lowest in Southeast Sulawesi (3.3%). (Sihombing Noviati., Saptarini Ika & Putri Dwi Sisca Kumala, 2017).

Wounds that arise from the surgical process are acute wounds that occur suddenly in the skin area with the wound healing time adjusted to the estimate if there are no complications, so that surgical wound management must be carried out properly so that the wound healing process can be as expected, and how to treat the wound. . Based on this, so that the wound healing process can match expectations and the estimated time, the researchers conducted a study on possible barriers to the wound healing process.

This is in accordance with the research of Barung, Sapan, Sumanti, & Tubagus (2017), which suggests barriers to wound healing due to surgical wound infections, where these barriers are one of the main complications of surgery that can increase morbidity, mortality, and hospitalization costs. This causes the wound healing time to be longer or the wound takes longer to heal. Wounds that take a long time to heal will be accompanied by a decrease in the patient's immune system, so the wound can be susceptible to exposure to microorganisms that can cause infection.

Microorganisms that cause surgical wound infections can come from the body or from outside the body. The surgical wound infection is a complication of surgery that can arise during hospitalization or when the patient returns home. Furthermore, the risk factors that cause surgical wound infection are multifactorial, which are divided into 1) preoperative factors (hospitalization, use of prophylactic antibiotics, and skin disinfection before surgery); 2) intraoperative factors (duration of surgery, wound contamination, wound hemostasis and tissue damage); 3) postoperative factors (blood sugar, wound care and observation); and 4) the patient's own factors (preoperative infection factors, diabetes, long-term steroid use, smoking and malnutrition) (El-Neemany & Martens, 2017).

Another study conducted by Morison, M. J (2004), also suggested the inhibiting factors for wound healing, namely: 1) local factors present in the area where the wound is located so that it can slow down wound healing such as hypoxia, dehydration, excessive exudate, lowering of temperature. , necrotic tissue, excessive crusting, presence of foreign bodies, and repeated trauma; 2) general pathophysiological factors such as the physiological effects of naturally occurring aging; 3) Psychosocial factors; 4) Effect of cytotoxic drugs, radiotherapy and steroid therapy; and 5) Improper wound management, especially the type of fluid used for wound irrigation. Wound irrigation is considered as one of the most useful surgical site infection prevention methods for many surgeons as many as 97% of surgeons perform wound irrigation during surgery (APSIC, 2018).

The use of wound irrigation fluid or wound washing fluid used during *intra-operative* can also be an inhibiting factor, so that it can interfere with the wound healing process in the body. This is because the antiseptic content in the wound wash or wound cleanser can not only kill germs, but can also kill leukocytes, and kill pathogenic bacteria and *fibroblast* for the formation of new skin tissue (Thomas et al., 2009).

Wound washing *intra-operative* should be an important concern. There are several types of irrigation fluids that can be used, such as: *normal saline 0.9%, povidone-iodine 10%, sterile water, tap water, commercially available products (eg: foams, soaps, wipes and solutions with surfactants), hydrogen peroxide, polyhexamethylene biguanide*

(PHMB) 0.1%, octenidine, hypochlorous acid 0.01% (Wolcott & Fletcher, 2014) *nd super oxidized solution and normal saline 0.9%* (Gutierrez AA (2006). everal types of fluids that can be used, each has advantages and disadvantages in its use. However, of the several types of fluids, which are generally often used in every hospital for *intraoperative use* are *povidone-iodine* 10% and *normal saline 0.9%*

AHCPR (*Agency for Health Care Police and Research*) in 2001, which suggested that the recommended cleaning fluid is *normal saline* 0.9%, because the fluid is a physiological fluid and will not harm the wound (Potter, P. A 2006). However, research conducted by Gitarja, W. S (2008), found that *povidone-iodine* will cause the wound to dry up and the wound is considered to have healed even though it can eventually cause blackened scars and scar tissue, the liquid is corrosive and damaging. Fibroblast tissue which is needed in the wound healing process.

In contrast to these studies, WHO stated that there was insufficient evidence to recommend or not recommend the use of irrigation of *0.9% normal saline* to the incision wound prior to closure for the purpose of preventing SSI (operative site infection). However, based on the WHO guidebook, it was stated that based on the results of a meta-analysis of seven *randomized control trials* (RCTs) it was found that *10% povidone-iodine* was more effective than *0.9% normal saline* with OR: 0.31; 95% CI: 0.13-0.73; P=0.007. Therefore, consideration of using water *10% povidone-iodine* prior to wound closure is recommended especially for clean and clean-contaminated wounds, but concerns remain regarding allergic reactions and adverse metabolic events due to iodine uptake.

Currently, many surgeons are currently using *normal saline 0.9%* instead *of 10% povidone-iodine*. Many methods have been developed to assist wound healing, including *intraoperative* use to treat wounds, one of which is normal *saline* 0.9% *povidone-iodine*. So far, for the use of irrigation fluids, there are still pros and cons so that further research is needed, especially to prove which irrigation fluid is more effective in the wound healing process (APSIC, 2018).

Based on the results of an initial survey conducted by researchers at one of the hospitals (RS) in the city of Bandung, namely Bhayangkara TK II Sartika Asih Hospital, Bandung, data were obtained that the four doctors (2 general surgeons and 2 obstetricians and gynecologists) were in the hospital. They have different wound irrigation or wound washing techniques *intra-operatively*. Some used *povidone-iodine* 10% *normal saline* at the hospital, which is a POLRI referral hospital in West Java with C accreditation. In addition to this, researchers also found a problem, namely the absence of Standard Operating Procedures. (SOP) regarding what irrigation fluid should be used in *laparotomy surgery* which caused differences in the use of irrigation fluid for the four doctors. In addition, the results of a survey to other hospitals in the city of Bandung with a type C accredited hospital, namely Pindad Hospital, irrigation used during *intraoperative* all used *0.9% normal saline* and had a specified SOP so that the use of irrigation fluid had been determined. This study aims to determine the difference between

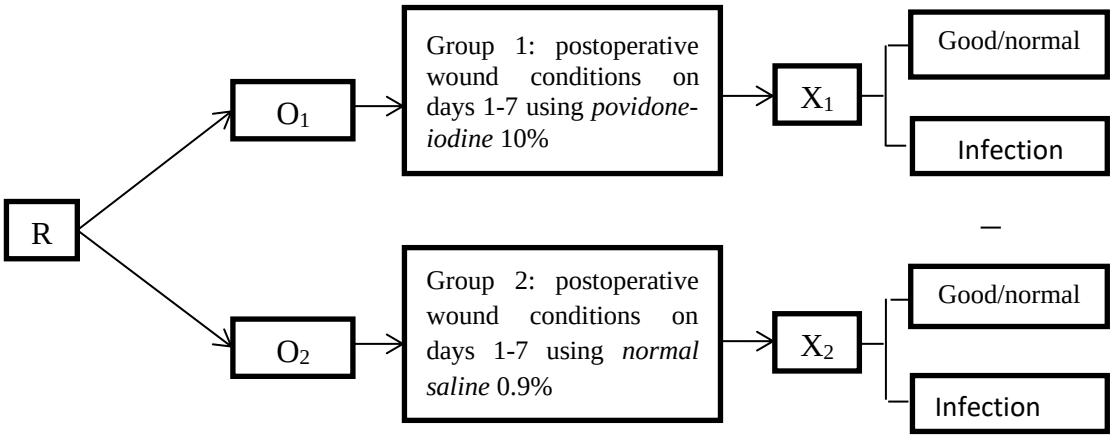
the use of *normal saline* 0.9% saline and *povidone-iodine* with the wound healing process after *laparotomy sectio caesarea*

Method

The design used in this research is an *ex post facto* comparative, namely research that compares the existence of one or more variables in different samples with a *retrospective* (Sugiyono, 2011). Data retrieval using This study uses secondary data studied from *the medical records* of Bhayangkara Hospital TK II Sartika Asih Bandung in 2019, from patient characteristics data including *perioperative* with researchers wanting to know the condition of the wound on day 5-7 postoperative *laparotomy,* which was irrigated on during *intra-operative* closure *subcuticular* with the use of different fluids, respondents were divided into two groups, namely group one using *povidone-iodine* and the second group using *0.9% normal saline*.

In this study, in *laparotomy*, infection will be identified at this time and then associated with risk factors, namely irrigation fluid used *intra-operatively* before closure of the surgical wound.

Schematic of Comparative Study Design



Description:

R : Respondent
O_1 : Use of wound irrigation using *povidone-iodine* 10%
O_2 : Use of wound irrigation using *normal saline* 0.9%
X_1 : Observation of *post-operative* l*apparatus* after using *povidone-iodine* 10%
X_2 : Observation of *post-operative laparotomy* after *normal* 0.9%

Population and Sample

The population in this study were patients with post-operative *laparotomy* SC in 2019, totaling more than 618 patients from 2 doctors or doctors in charge of patients (DPJP) who were at Bhayangkara TK II Sartika Asih Hospital Bandung. sampling technique in this study uses a *non-probability sampling* technique, namely a sampling technique that does not provide equal opportunities / opportunities for each member of the population to be sampled, using the census technique or the total population is a

sampling technique where all members of the population are sampled all (Sugiyono, P.D. 2018).

The sample in this study were 440 respondents, namely *post-laparatomy SC* who had wounds and were irrigated *povidone-iodine* 10%*normal saline* at the time *of intraoperative* with the inclusion criteria of *SC laparotomy* taken. From the data contained in the *medical record*, he has good general condition, normal vital signs, does not have a history of surgery for more than five hours, is not anemic, has normal weight and has no comorbidities at the time *of pre-operative*. Sampling taken from *medical records* is data from respondents who came after *post-operative* days 5-7 or at the time of the first control. The sample, consisting of 2 different DPJPs and 2 DPJPs performed wound irrigation intra-operatively, some used *0.9% normal saline* and some used *povidone-iodine* during wound irrigation before skin closure.

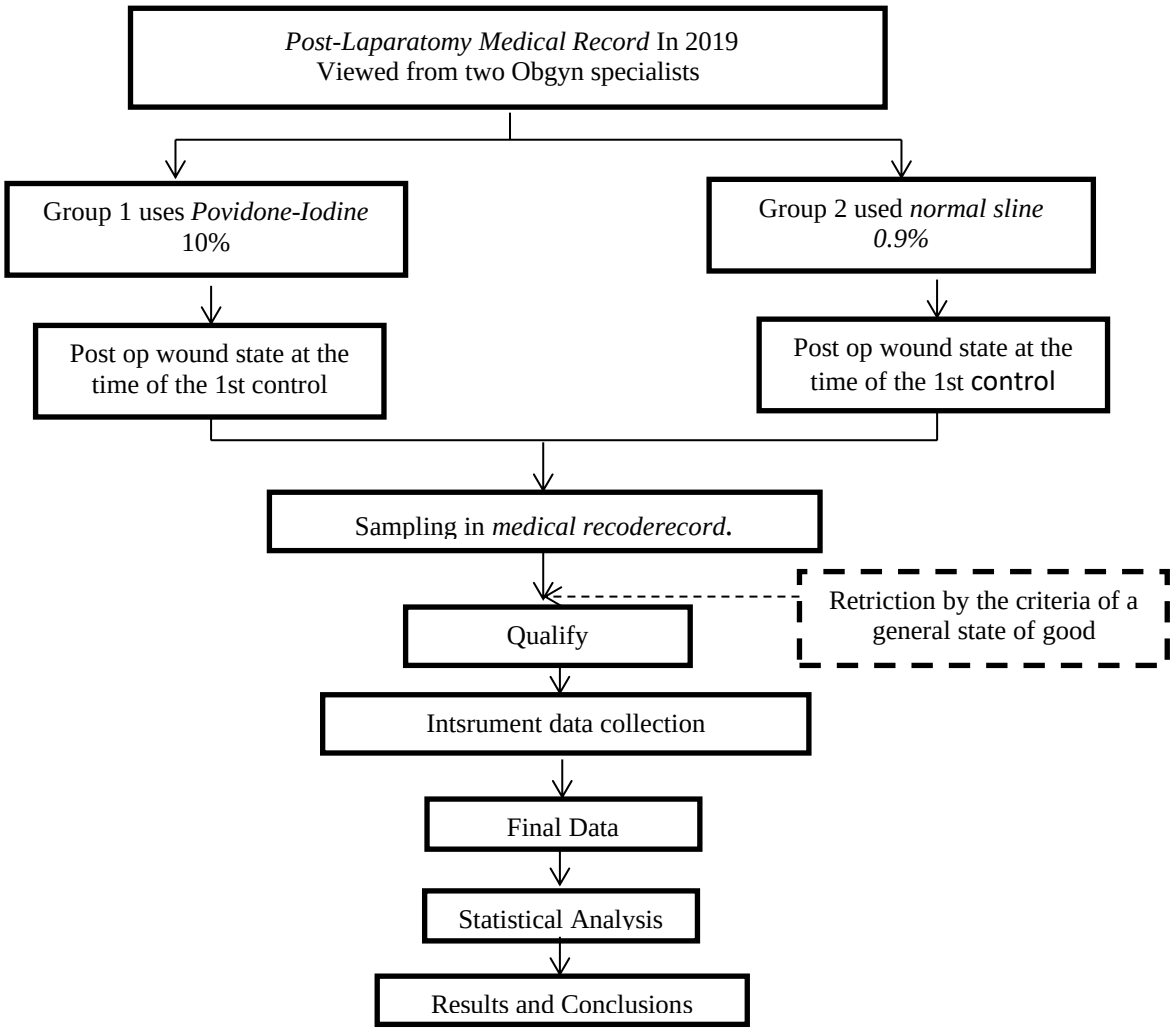
This research was conducted at Bhayangkara TK II Sartika Asih Hospital, Bandung

Table 1

Operational Definition

Research Variables	Operational Definition	Measuring Instruments	Measuring Results	Scale
Dependen				
Post *laparatomy* infection	The presence of a wound healing process Inflammatory Phase 0-3 days, which includes hemostatics, the release of histamine and other mediators from damaged cells, as well as the migration of white blood cells (polymorphonuclear leukocytes and macrophages) to the place of such damaged tissues. 1) Destructive phase (1-6 days), which includes cleaning of dead and devitalized tissues by polymorphonuclear leukocytes, as well as macrophages.	Medical *record* documentation	0 = The healing process is good and if there are no complaints, as well as from the IDO form owned by the doctor's hospital states there is no infection 1 = The healing process is hampered, if one of the following signs and symptoms of infection is found: color / rubor (redness), calor (heat), tumor (swelling), and dolor (pain), functio laesa (loss of function) (Rote, 2018). As well as from the IDO form owned by the hospital and the doctor stated that there was an infection.	Ordinal
Independen				
Use of*normal saline* 0.9%	The use of *normal saline* fluid 0.9% is used for irrigation at the time of intra-operative, this liquid is a physiological fluid that is effective for wound treatment by maintaining moisture, keeping granulation dry, but *Normal Saline* 09% is an electrolyte whose salt content is quite high	Medical *record* documentation	0 = Good Healing Process, marked with a good record in the medical record. 1 = The Healing Process is Hampered, characterized by the presence of a postoperative infection record in the medical record.	Nominal
The use of *povidone-iodine* 10%	The use of *povidone-iodine* 10% in use for irrigation at the intra operative moment, providone iodum is an iodophor of a complex iodine with polyvinyl pyrrolidone.	Medical *record* documentation	0 = Good Healing Process, marked with a good record in *the medical record.* 1 = The Healing Process is Hampered, characterized by the presence of a postoperative infection record in the *medical record.*	Nominal

Research Flow



Results and Discussion

Differences in the Use of *Normal Saline* 0.9% and *Povidone-iodine* 10% With Wound Healing Processes after *Laparotomy* SC.

The results of this study discuss the univariate analysis of *the percentage* of the incidence of infection, both in wounds that receive *normal saline* 0.9% *intra-operatively* and in wounds that received *povidone-iodine* 10% *intra-operatively*. Furthermore, in the analysis of bivariate data, the researchers discussed the differences in the use of irrigation fluids given *intra-operatively*.

Variable Frequency Distribution of Fluids

Data analysis in this section describes the variable frequency distribution of fluids used for *intra-operative* and the state of the wound at the first control at 5-7 postoperative days.

Table 2
Frequency Distribution of Irrigation Fluid Use During *Intra-operative SC* on postoperative wound conditions with N= 440.

Type of fluid	Wound Condition		Total
	Good	Infection	
***Normal Saline* 0.9%**	133	7	140
	95.0%	5.0%	100%
***Povidone -Iodine* 10%**	264	36	300
	88.0%	12.0%	100%

Based on Table 2, a small percentage of the incidence of infection occurred in patients with *povidone-iodine* as many as 36 respondents (12%). The same thing also happened in patients with *normal saline irrigation of 0.9%*, it was known that only a small proportion had infection, namely as many as 7 respondents (5%).

Differences in the Use of *Normal Saline* 0.9% and *Povidone-iodine* Wound Healing the *Laparotomy* SC

Data analysis in this section will describe the significant differences between the fluid variables used for *intraoperative* and the wound condition at the time of control. The first is the 5-7th postoperative day.

Table 3
Differences in the use of *normal saline 0.9% saline and 10% povidone-iodine* process of wound healing *after* the *laparotomy* with N= 440.

Type of Fluid	Wound Condition				Total		p-Value
	Good		Infection				
	F	%	F	%	F	%	
Normal Saline 0.9%	133	95	7	5	140	100	0.026
Povidone-Iodine 10%	264	88	36	12	300	100	
Total	**397**		**43**		**440**		

Table 3 based on the results of statistical analysis of the *Chi-square test*, shows that there is a significant comparison between the two types of anesthesia used for surgery, namely general narcotic anesthesia and spinal anesthesia for postoperative side effects with a value (*p-value* = 0.026).

Discussion

Percentage of Fluid Variable Frequency Distribution The

Percentage results of the fluid variable frequency distribution in this study, showed that the two types of fluids used for irrigation, both *normal saline* 0.9% and *povidone-iodine* 10% had a percentage of the incidence of infection only a small part of each. each total population that causes infection based on the standard infection prevention and control (PPI) which states the standard of infection must be below 2% per month. This is seen based on *medical records* during the first control day 5-7 postoperatively. However, when viewed from the number of respondents adjusted to the total number of respondents for each treatment, respondents with *povidone-iodine* experienced the most infections compared to *0.9% normal saline*.

It is also supported by Wolcott & Fletcher (2014) who suggested that composition *of 0.9% saline* has low toxicity to wounds, and has limited ability to reduce bacterial load. In line with this, Potter & Perry (2005) lso suggested that *normal saline* 0.9% is an isotonic solution that is safe for the body, does not cause irritation, protects granulation tissue from dry tissue conditions, maintains moisture around the wound, in addition to the use of fluids. This can minimize the risk of postoperative infection in the wound healing process. It is well known that postoperative infection is one of the most common hospital infections and contributes substantially to postoperative morbidity and mortality. In addition, postoperative infections can increase the cost of care and length of stay in the hospital (Barung, Sapan., Sumanti, & Tubagus, 2017).

Preventive measures to prevent postoperative infection are needed, starting from *perioperative* one of which is by paying attention to the use of irrigation fluids to be used *intraoperatively. Wound* irrigation of *intraoperative* subcutaneous soft tissue before skin closure is an easy and economical option to reduce postoperative infection rates and has been widely used in clinical practice. However, there is currently no definite recommendation regarding the use of *normal 0.9% saline* for *intraoperative* because research results supporting its use are lacking. Furthermore, regarding *normal saline* 0.9% in the WHO guidelines, it was stated that there was not enough evidence found to recommend or not recommend the use of irrigation of *0.9% normal saline* to incisions before skin closure for the purpose of preventing SSI. Moreover, *the National Institute for Health and Care Excellence* (NICE) SSI prevention guidelines oppose the application of wound irrigation (APSIC., 2018).

However, doctors and nurses use *normal saline* 0.9% to keep the wound surface moist so as to promote the development and migration of epithelial tissue. Carefully cleaning the wound with *normal* 0.9% saline is a common method of wound healing and debridement of wet or dry wounds. Unlike the case with *normal saline* 0.9% for *intraoperative wound irrigation,* the type of *10% povidone-iodine* solution which is an antiseptic-based solution has been recommended but still needs to be used with caution due to the high level of toxicity to the skin (APSIC., 2018).

Based on some of these differences, the researchers conducted research, with the type of analytical research being *ex post facto* comparative. This aims to determine the difference in the use of *normal saline 0.9%* and *povidone-iodine* 10% *intra-operatively*. The data taken in this study are secondary data seen from the medical *record* of the patient's first control, namely on the 5-7th day after *laparotomy surgery* SC. However, the researcher felt that he had limitations, namely not being able to directly see the wound at the time of the first control patient so that the results obtained were only the results of reports in the *medical record*. This is due to the COVID-19 pandemic, so researchers cannot freely observe and assess the *post-operative*. Another limitation of this study is that researchers have difficulty in conducting a more in-depth discussion due to the limitations of the latest literature.

Differences in the use of *normal* saline 0.9% and *Povidone-iodine* Wound Healing Process the *Laparotomy* SC

Results of statistical analysis using *Chi-square*, showed that there was a significant difference between the two types of fluids used for *intra-operative* namely *normal saline 0.9%* and *povidone-iodine* 10% with the incidence of postoperative infection on day 5-7 at the time of the first control with a value (p. = 0.021) this shows that there are differences in wound irrigation using *0.9% normal saline* and *povidone-iodine* due to different fluid characteristics.

Characteristics of *normal saline 0.9%* is a physiological solution with the body so it does not cause irritation and supports the growth of granulation. However, *normal saline 0.9%* is not an antiseptic so it cannot kill bacteria found in wounds, so its use is usually on clean wounds (Lilley., Collins, & Snyder 1999). Laparotomy wound irrigation *usually* uses *0.9% normal saline* . However, there is no adequate data regarding the impact of using this fluid on the prevention of SSI. The results of the RCT did not show a significant difference between irrigation with *normal saline* and no irrigation (OR: 1,09; 95% CI: 0,44-2,69; P=0,85).

WHO does not have sufficient evidence to recommend or discourage the use of irrigation of*0.9% normal saline* prior to closure of incisions for the purpose of preventing HAIs. Moreover, the HAIs prevention guidelines from *the National Institute for Health and Care Excellence* (NICE) oppose the application of wound irrigation (APSIC., 2018). owever, in contrast to Potter & Perry (2005) said that *normal saline 0.9%* is an isotonic solution that is safe for the body, does not cause irritation, protects granulation tissue from dry tissue conditions, maintains moisture around the wound and helps wounds undergo the wound healing process. operation. Nurses use *normal saline 0.9%* to keep the wound surface moist so that it can promote the development and migration of epithelial tissue. Carefully cleaning the wound with *normal 0.9% saline* is a common method of wound healing and debridement of wet or dry wounds.

Unlike the case with the characteristics found in *povidone-iodine* 10% *which* is bacteriostatic at a level of 640μg/ml and bactericidal at a level of 960 g/ml. In 10%

povidone-iodine has 1% iodine which is able to kill bacteria in 1 minute and kill spores within 15 minutes. The mechanism of action *of 10% povidone-iodine* begins after direct contact with the tissue, the elemental iodine will be released slowly with the activity of inhibiting bacterial enzyme metabolism so that it interferes with bacterial multiplication which causes bacteria to become weak. complex compound of *iodine* with *povidone*. *Povidone-iodine 10%* has a composition of not less than 9.0% and not more than 12.0% iodine, calculated on the basis of the dried substance.solution *10% povidone-iodine* reacts acidly to litmus paper. The solubility of *10% povidone-iodine* is soluble in water and in ethanol, practically insoluble in *chloroform*, in carbon tetrachloride and in ether, in hexane, in acetone (Depkes RI, 1995).

Iodine that is absorbed or enters the bloodstream can cause systemic effects by causing tissue anoxia shock. Excessive use of iodine can inhibit the process of wound granulation, so that the side effects of *10% povidone-iodine* when used on large damaged skin surfaces (eg burns) because iodine can be absorbed and increase serum levels so that it can cause *acidosis, neutropenia and hypothyroidism*. (Tjay, T. H. 2007).

WHO guidelines showed that *10% povidone-iodine* was more effective than *0.9% normal saline* in a meta-analysis that included seven RCTs (OR: 0.31; 95% CI: 0.13-0.73; P =0.007). Therefore, consideration of using *10% povidone-iodine* prior to wound closure is recommended especially for clean and clean-contaminated wounds, but with the requirement that the patient's condition has a history *of 10% povidone-iodine* or not. Meanwhile, the C*enters for Disease Control* (CDC) recommends considering intraoperative irrigation of deep or subcutaneous tissues using a liquid-based iodophor solution for the prevention of *SSI*, but with weak recommendations. In addition, according to *the National Institute for Health and Clinical Excellence (NICE)* provides guidelines that irrigation of *10% povidone-iodine* can reduce the incidence of *SSI*.

Therefore, to prevent SSI, *10% povidone-iodine* is only recommended for use on intact skin, and so they do not recommend the use *of 10% povidone-iodine* for surgical incisions prior to closure to prevent *SSI*. The clinical signs of iodine toxicity were not reported in the studies cited by WHO, but there are still concerns regarding allergic reactions and adverse metabolic events due to iodine uptake.

This is in line with research conducted by Mahomed et al., (2016) that irrigation using *10% povidone-iodine solution* may lead to an increased risk of postoperative readmission of intravenous antibiotics. The disadvantages of *10% povidone-iodine* are that it has a broad spectrum of antimicrobial activity, is cytotoxic to healthy cells and granulation tissue in higher concentrations and often irritates the skin. Therefore, a *10% lack of povidone-iodine* is good to use only for external skin disinfection so that bacteria do not rise to the incision wound.

According to Singh, S (2010), the side effects that arise with the use *of 10% povidone-iodine are* irritation, toxic reactions to skin fibroblasts, lungs, keratinocytes, and osteoblasts, sunburn and discoloration of the skin after using *povidone- Iodine 10%*.

In addition, WHO raised concerns about the potential toxic effects of *10% povidone-iodine* on fibroblasts, mesothelium, and tissue healing. (APSIC., 2018).

Wound healing is a form of business process to repair the damage that has occurred. The main component in the wound healing process is collagen in addition to epithelial cells. The collagen requires fibroblasts which are the cells responsible for synthesizing collagen. Furthermore, related to wound healing, it naturally goes through several phases, namely: 1. Acute inflammatory phase (0-3 days), which includes hemostasis, release of histamine and other mediators from damaged cells, and migration of white blood cells (leukocytes). polymorphonuclear and macrophages) to the site of the damaged tissue; 2. The destructive phase (1-6 days), which includes cleaning of dead and devitalized tissue by polymorphonuclear leukocytes and macrophages; 3. The proliferative phase (3-24 days), which occurs when new blood vessels, strengthened by connective tissue, infiltrate the wound; 4. The maturation phase (24-365 days), which includes the *reepithelialization*, wound contraction and connective tissue reorganization (Morison, M.J. 2004). In connection with this, if the wound healing process is longer or not like the process, the possibility of the wound healing process is hampered.

There are several factors that can inhibit wound healing, namely: 1) Local adverse factors at the wound site that can slow wound healing, including hypoxia, dehydration, excessive exudate, temperature drops, necrotic tissue, excessive crusting, presence of foreign bodies, and trauma repetitive; 2) Pathophysiological factors also affect the condition of wound healing, often complex, but some delays in wound occur due to the lack of available substances needed for the wound healing process, such as oxygen, amino acids, vitamins and minerals; 3) Intact wounds in healthy young adults are a good barrier against mechanical trauma and infection, as well as the efficiency of the immune system, cardiovascular system and respiratory system which allows wound healing to occur faster so that age contributes to delayed healing; 4) Lifestyle and psychosocial factors can affect wound healing. For example, smoking, alcohol, drug abuse, eating habits, obesity, malnutrition and levels of mobilization and activity. In addition, depression and mental illness can also affect the achievement of goals; 5) The therapy used by the patient also affects the delay in wound healing such as: Cytotoxic drugs, radiotherapy and steroid therapy in some circumstances can slow wound healing.

Cytotoxic drugs such as vincristine have a very pronounced effect on wound healing because they interfere with cell proliferation. Long-term steroid therapy can also slow healing; and 6) In addition to therapeutic drugs used, unwise use of antiseptics can also cause problems in slowing wound healing, inappropriate use of topical antibiotics and other wound care medicinal ingredients, as well as careless wound dressing techniques are causes of delayed healing that can be avoided. Therefore, this study was conducted on the 5-7th *post-operative* because the wound was still kept clean, so that during control it could be known whether there was an infection or not.

Correspondingly, the infection can be a factor inhibiting wound healing. Based on the data obtained from *the medical record*, the researchers then analyzed using the *Chi-*

square and it was found that there was a significant difference between the two types of fluids used for wound irrigation during *intra-operatively*, namely *normal saline 0.9%* and *povidone-iodine.* 10% with the incidence of postoperative infection on 5-7 days at the time of the first control with a value (p. = 0.021).

Everal other studies have suggested factors that can affect wound healing, namely age, anemia, *personal hygiene* followed by nutritional status (nutrient consumption) and comorbidities, (Vianti, 2015), (Chen, Han, Wang, & Li, 2017), (Damayanti, 2014), (Puspitasari., Ummah & Sumarsih, 2011), (Rivai., Koentjoro & Utarini, 2013), (Per-angin., Isnaniah, & Rizani, 2014), (Gelaw., Aweke, & Astawesegn, 2017).

This study used secondary data, namely *medical records,* then analyzed and found a significant difference between the two types of irrigation fluids, namely *normal saline 0.9%* and *povidone-iodine* 10%. The results of the analysis are supported by several theories/opinions/research which suggest that there are differences in composition between the two types of liquids, and have advantages and disadvantages. In connection with this, so that it can cause a healing effect on different postoperative wounds. It can be concluded that both fluids can be used for *intraoperative* with different characteristics that affect the *post-operative*.

The results of the research analysis showed that there were significant differences between the two irrigation fluids, but according to several theories and research, the differences were due to differences in the composition and characteristics of the irrigation fluids that had been used. However, the irrigation fluid can still be used for *intraoperative purposes*.

Furthermore, in this study there are still research limitations related to the inhomogeneity of the concentrate and components of the two irrigation fluids, this research was also not carried out directly. Therefore, the condition of the wound cannot be directly assessed and the researcher cannot explore other things related to the patient such as lifestyle

Conclusion

This study showed that there was a statistical difference between the two types of irrigation fluids, namely *normal saline 0.9%* and *povidone iodine* on the wound healing process by having different characteristics and composition of the fluid with a p-value of 0.021. The use of irrigation for *normal saline* 0.9% is a physiological solution with the body so that it does not cause irritation and supports the growth of granulation. However, *normal saline 0.9%* is not an antiseptic so it cannot kill bacteria found in dirty wounds so it is only good for clean wounds. However, for *povidone-iodine*, which is bacteriostatic, it has 1% iodine which can kill bacteria in 1 minute and kill spores in 15 minutes. However, excessive use of iodine can inhibit the wound granulation process. Due to the different compositions and characteristics of SC wound irrigation, it is better to use *povidone-iodine* first for 1 minute then irrigated with *0.9% normal saline.*

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