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RELATIONSHIP BETWEEN DURATION OF OPERATION AND AMOUNT OF BLEEDING WITH THE INCIDENCE OF *POST OPERATIVE HYPOTHERMIA* IN PATIENTS WITH SPINAL ANESTHESIA

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Abstract
Hypothermia is a state when the body temperature is less than 36 ◦ C. Postoperative hypothermia can cause increased risk of bleeding, myocardial ischemia, longer post-anesthesia recovery. Length of surgery and amount of bleeding are the causes of postoperative hypothermia in patients. The study is a quantitative non-experimental with a cross sectional correlation approach. The sampling method used non-probability sampling technique with purposive sampling. The instruments in this study were observation sheets, armlets, gauze and suction tubes. This study used Spearman rank correlation bivariate test (α=0.05). The results of the Spearman rank correlation test obtained p-values of 0.001, 0.002, and 0.057 on the variable length of surgery with postoperative hypothermia (temperature when arriving in the RR, 30 minutes in the RR and transferred to the hospitalization) and the amount of bleeding p-value 0.000, 0.000 and 0.173 with postoperative hypothermia (temperature when arriving in the RR, 30 minutes in the RR). Conclusion There is a relationship between the length of surgery and the amount of bleeding with the incidence of postoperative hypothermia (temperature when arriving at the RR and 30 minutes in the RR) in patients with spinal anesthesia in the RR and there is no relationship between the length of surgery and the amount of bleeding with the incidence of postoperative hypothermia (temperature when transferred in admitting) in patients with spinal anesthesia in the RR of Lavalette Hospital Malang .

Keywords: Amount of Bleeding, Hypothermia, Length of Operation, Recovery Room

INTRODUCTION

Surgery is a treatment performed using invasive techniques. Surgery is performed with an incision made in the area of the body to be treated and the open wound is stitched closed. Surgical procedures are broadly divided into two, namely minor surgery and major surgery. Minor surgery is a surgical procedure that is often performed with local anesthesia such as removal of benign tumors, skin cysts, circumcision, nail extraction, wound care. Major surgery is a major surgical procedure and surgery that is often performed in many surgical procedures (Alfarisi, 2021) .

Spinal anesthesia is a regional anesthesia performed by administering anesthetic drugs with an anesthetic needle in the subarachnoid area. Spinal anesthesia causes the sympathetic nerves to be blocked. This causes vasodilation

which results in heat transfer from the central to the peripheral parts and causes hypothermia. A complication that is often experienced by patients in the recovery room due to spinal anesthesia is hypothermia (Tubalawony and Siahaya, 2023) .

Hypothermia is a condition when the body temperature is less than 36 ° Celsius. Hypothermia is categorized into 3, namely mild hypothermia, moderate hypothermia and severe hypothermia (Allene, 2020) . One way to measure body temperature can be done using an infrared sensor. The infrared sensor will find out the measurement results by bringing the sensor closer to the object to be measured (Ardiyanto, Arman and Supriyadi, 2021) . Hypothermia in post-operative patients can increase the risk of bleeding, myocardial ischemia, longer post-anesthesia recovery, impaired wound healing, and increased risk of infection (Widiyono, Suryani and Setiyajati, 2020) . *Post-operative hypothermia* is also one of the causes of surgical wound infections which can cause patients to receive longer treatment (Siswoyo, Imam S and Siyoto, 2020) .

Hypothermia prevention guidelines are carried out by monitoring the patient's body temperature and providing active warming interventions during the *perioperative period* . Active warming interventions have been developed effectively, such as the use of *forced-air warming* , warming mattresses and providing irrigation and warm infusions to patients (Xu *et al.* , 2023) . Although these guidelines exist, surveys in various countries have shown that compliance with *perioperative* patient temperature management guidelines is still low.

World Health Organization (WHO) data is performed around 11% to overcome diseases or health problems. It is currently reported that surgical procedures are a public health problem. Based on Basic Health Research (Riskesdas) data in 2018, it was reported that in Indonesia there were at least 1.2 million patients undergoing surgical procedures from 2013 to 2018. Surgery ranks 11th among all treatments or treatments in all hospitals (Ministry of Health of the Republic of Indonesia, 2018) .

postoperative patients are caused by several factors, including the length of surgery and the amount of bleeding (Liu and Qi, 2021) . Reports have been found that patients with spinal anesthesia experience shivering, around 33-56.7%. (Tubalawony and Siahaya, 2023) .

The duration of surgery is one of the triggering factors that causes hypothermia in *postoperative patients* . A surgical process that takes a long time will prolong the anesthesia given. This can cause more anesthetic drugs to enter the body. The long anesthesia process will also cause the body to be exposed to cold temperatures in the operating room for a long time. Referring to the Minister of Health Regulation Number 2 of 2023 Implementing Regulation of Government Regulation Number 66 of 2014 concerning Environmental Health, the operating room temperature must be between 22-27 degrees Celsius. *The Association of PeriOperative Registered Nurses* (AORN) recommends that the operating room temperature be in the range of 20-24 ° C (Curless *et al.* , 2021) . This causes patients undergoing surgical procedures to be at risk of hypothermia. The longer the

operation, the greater the chance of *intraoperative hypothermia* , this increases the risk of *Post Anesthesia Shivering* (Tubalawony and Siahaya, 2023) .

The amount of bleeding is another factor that causes *postpartum hypothermia. operative* . According to research conducted by Liu & Qi, (2021) showed that patients who experience hypothermia can occur when the amount of intraoperative bleeding is more than 300 ml. From the results of a preliminary study conducted at Lavalette Hospital Malang, the average amount of bleeding in obstetric and gynecological surgery patients such as TAH BSO is approximately 1500 cc, and *cesarean section procedures* are 250 cc.

Treatment given to postoperative hypothermia patients is done by providing oxygenation, maintaining the patient's nutritional and fluid balance. Prevention of hypothermia can also be done with passive external warming techniques, such as replacing wet clothes or cloth with dry clothes or cloth and providing warming blankets (Fitrianingsih, Sukmaningtyas and ..., 2020) . Optimal monitoring and proper management of post-anesthesia patients can be preventive measures to reduce the occurrence of post-anesthesia complications in patients.

RESEARCH METHODS

This study is a quantitative study with a *Cross Sectional research design. The population in this study were postoperative* patients with spinal anesthesia at Lavalette Hospital Malang. Determination of the sample in this study using the theory of Gay and Dieh for correlational research requires at least 30 respondents. totaling 35 people who meet the inclusion criteria.

Sampling using *non-probability sampling technique* with *purposive sampling* and each member of the population has an equal opportunity to be a sample. In addition, for data collection in this study using arlogi, suction tube gauze, thermometer and observation sheet.

This study was conducted at Lavalette Hospital Malang which was carried out on March 25 - May 4, 2024. After going through data processing which included *editing* , *coding* , *scoring* , *tabulating* , *data entry* , *cleaning,* the data was then analyzed univariately for each variable, while bivariate analysis was carried out using the *Sperman Rank statistical test* using SPSS)

RESEARCH RESULTS AND DISCUSSION

1. Respondent Characteristics

Table 1. Respondent Characteristics

Characteristics	F	%
Gender		
Man	10	28.6
Woman	25	71.4
Age		
17-25	4	11.4
26-35	7	20

36-45	7	20
46-55	10	28.6
56-65	4	11.4
66-75	3	8.6
Work		
Doesn't work	1	2.9
housewife	17	48.6
Project Laborer	1	2.9
Farmer	1	2.9
Self-employed	5	14.3
Teacher	1	2.9
Private sector employee	4	11.4
BUMN employees	1	2.9
Student	1	2.9
Student	1	2.9
Retired	2	5.7
Type of Operation		
Urology	3	8.6
Digestive	9	25.7
Orthopedics	2	5.7
Obstetrics and Gynecology	19	54.3
Plastic	2	5.7
Operation History		
There isn't any	22	62.9
There is	13	37.1
Total	**35**	**100**

Based on table 1, it is known that most of the respondents are female, namely 25 respondents (71.4%) of the total 35 respondents. In terms of age characteristics, almost half of the respondents are in the age range of 46-55 years (28.6%) of the total 35 respondents. Characteristics based on work are known that almost half of the respondents work as housewives with a total of 17 respondents (48.6%) of the total 35 respondents. In terms of characteristics based on type of surgery, it is known that most of the operations performed are obstetric and gynecological surgery, 19 respondents (54.3%) of the total 35 respondents. Characteristics based on surgical history are known that most respondents have no surgical history with a total of 22 respondents (62.9%) of the total 35 respondents.

2. Data on Operation Duration, Amount of Bleeding and *Postoperative Hypothermia*

Table 2. Data on Operation Duration, Amount of Bleeding and *Postoperative Hypothermia*

Variables	n	Min	Max	Mean
Operation Time in minutes	35	5	140	58.54
Amount of Bleeding in cc	35	10	400	127.14

Postoperative hypothermia at ^{0}C:	35	-	-	-
Temperature Arriving at RR		33.9	35.6	34,309
Temperature 30 Minutes in RR		34.3	35.9	34,814
Temperature Transferred In Hospitalization		35.2	36.8	35,626

Based on table 2, it is known that the score of the length of operation in minutes from 35 respondents with a minimum length of operation of 5 minutes, a maximum length of operation of 140 minutes, an average length of operation of 58.54 minutes. The amount of bleeding is known that the score of the amount of bleeding in cc from 35 respondents with a minimum amount of bleeding of 10 cc, a maximum amount of bleeding of 400 cc, and an average amount of bleeding of 127.14 cc.

Post Operative Hypothermia is known that the *Post Operative Hypothermia score* (Temperature When Arriving at RR) in minutes from 35 respondents with a minimum temperature of 33.9 ^{0}C, a maximum temperature of 35.6 ^{0}C and an average temperature of 34.309 ^{0}C. *Post Operative Hypothermia* (Temperature When 30 Minutes in RR) in minutes from 35 respondents with a minimum temperature of 34.4 ^{0}C, a maximum temperature of 35.9 ^{0}C, and an average temperature of 34.814 ^{0}C. *Post Operative* Hypothermia (Temperature When Transferred to Inpatient) from 35 respondents with a minimum temperature of 35.2 ^{0}C, a maximum temperature of 36.8 ^{0}C, and an average temperature of 35.626 ^{0}C.

3. The relationship between the length of surgery and *postoperative hypothermia* in patients with spinal anesthesia at RR RS Lavalette Malang

Table 3. Relationship between length of surgery and *postoperative hypothermia* in patients with spinal anesthesia at RR RS Lavalette Malang

	p-value	***r***
Long term operation relationship:		
Temperature when arriving at RR	0.001	-0.544 *(correlation coefficient)*
Temperature when 30 minutes in RR	0.002	-0.502 *(correlation coefficient)*
Temperature when transferred to inpatient care	0.074	-0.306 *(correlation coefficient)*

Spearman rank statistical test has been performed and obtained *a p-value* = 0.001 <0.050, so the conclusion H1 is accepted, there is a relationship between the length of surgery and *postoperative hypothermia* (When arriving at the RR) in patients with spinal anesthesia at the RR of Lavalette Hospital Malang with a correlation value of 0.544, meaning that it has a strong relationship with a negative correlation direction where the longer the patient's surgery, the higher the *postoperative hypothermia* (When arriving at the RR) in patients with spinal anesthesia at the RR.

The duration of surgery with temperature when 30 minutes in RR obtained *p-value* = 0.002 <0.050, then the conclusion H1 is accepted there is a relationship between the duration of surgery with *postoperative hypothermia* (When 30 minutes in RR) in patients with spinal anesthesia in RR RS Lavalette Malang with a correlation value of 0.502 meaning it has a strong relationship with a negative correlation direction where the longer the patient's surgery, the higher the *postoperative hypothermia* (When 30 minutes in RR) in patients with spinal anesthesia in RR.

The duration of surgery with temperature when transferred to inpatient care obtained *p-value* = 0.002 < 0.050, so the conclusion H1 is rejected, there is no relationship between the duration of surgery and *postoperative hypothermia* (when transferred to inpatient care) in patients with spinal anesthesia at RR RS Lavalette Malang.

4. The relationship between the amount of bleeding and *postoperative hypothermia* in patients with spinal anesthesia at RR RS Lavalette Malang

Table 4. Relationship between the amount of bleeding and *postoperative hypothermia* in patients with spinal anesthesia at RR RS Lavalette Malang

	p-value	***r***
Relationship of bleeding amount:		
Temperature when arriving at RR	0,000	-0.733 *(correlation coefficient)*
Temperature when 30 minutes in RR	0,000	-0.647 *(correlation coefficient)*
Temperature when transferred to inpatient care	0.130	-0.261 *(correlation coefficient)*

Spearman rank statistical test has been performed and obtained *a p-value* = 0.000 <0.050, so the conclusion H1 is accepted, there is a relationship between the amount of bleeding and *postoperative hypothermia* (When arriving at the RR) in patients with spinal anesthesia at the RR of Lavalette Hospital Malang with a correlation value of 0.733, meaning that it has a strong relationship with a negative correlation direction where the greater the amount of patient bleeding, the greater the postoperative hypothermia (When arriving at the RR) in patients with spinal anesthesia at the RR.

The amount of bleeding with temperature when 30 minutes in RR obtained *p-value* = 0.000 <0.050, then the conclusion H1 is accepted there is a relationship between the amount of bleeding with *postoperative hypothermia* (When 30 minutes in RR) in patients with spinal anesthesia in RR RS Lavalette Malang with a correlation value of 0.647 meaning it has a strong relationship with a negative correlation direction where the more the amount of patient bleeding, the more

postoperative hypothermia increases (When 30 minutes in RR) in patients with spinal anesthesia in RR.

The amount of bleeding with temperature when transferred to inpatient care obtained *p-value* = 0.130 > 0.050, so the conclusion H1 is rejected, there is no relationship between the amount of bleeding with *postoperative hypothermia* (when transferred to inpatient care) in patients with spinal anesthesia at RR RS Lavalette Malang.

DISCUSSION

Relationship Between Length of Surgery and *Post Operative Hypothermia* in Patients with Spinal Anesthesia at RR RS Lavalette Malang

Based on the results of the analysis of the relationship between the length of surgery and the incidence of *postoperative hypothermia* in patients with spinal anesthesia at the RR of Lavalette Hospital, Malang, the p-value was obtained = 0.000 <0.050, so the conclusion H1 is accepted, there is a relationship between the length of surgery and postoperative hypothermia *(* When arriving at the RR) in patients with spinal anesthesia at the RR of Lavalette Hospital, Malang with a correlation value of 0.603, meaning that it has a strong relationship with a negative correlation direction where the longer the patient's surgery, the higher the *postoperative hypothermia* (When arriving at the RR) in patients with spinal anesthesia at the RR.

This study is in line with research conducted by Muntaha *et al.* , (2020) , showing that there is a relationship between the length of surgery and post-spinal anesthesia hypothermia with a *p Value* = 0.000 (p <0.05). This shows that the length of surgery can cause *post-operative hypothermia* in patients with spinal anesthesia because the longer the surgery, the longer the patient will be exposed to cold temperatures. Anesthetic drugs also cause vasodilation which causes the body to lose body heat.

In this study, it was found that the patient with the longest duration, which was 140 minutes when arriving at the RR, experienced hypothermia with a temperature of 34 ^{0}C and the patient with the fastest duration of surgery, which was 5 minutes when arriving at the RR, had a temperature of 35.6 ^{0}C. Therefore, patients who undergo longer surgery and anesthesia will lose heat continuously and are at greater risk of experiencing hypothermia.

Based on the description, the researcher assumes that the length of surgery is directly proportional to *postoperative hypothermia* in patients with spinal anesthesia in RR, meaning that the longer the patient's surgery, the more hypothermia the patient experiences. This is caused by vasodilation that occurs due to drugs from spinal anesthesia and exposure to cold environments for a long time which causes a decrease in core body temperature.

Spearman rank statistical test, *the p-value* = 0.000 <0.050 was obtained , so the conclusion H1 was accepted, there was a relationship between the length of surgery and *postoperative hypothermia* (when 30 minutes in RR) in patients with spinal anesthesia in RR RS Lavalette Malang with a correlation value of 0.621,

meaning that it had a strong relationship with a negative correlation direction where the longer the patient's surgery, the higher the *postoperative hypothermia* (when 30 minutes in RR) in patients with spinal anesthesia in RR.
This study is in line with the study conducted by Xu et al., (2023), the study showed that there was a relationship between the duration of surgery and post-spinal anesthesia hypothermia with a *p Value* = 0.000 (p <0.05).
In this study, it was found that the patient with the longest duration, which was 140 minutes when arriving at the RR, experienced hypothermia with a temperature of 34.5 ^{0}C and the patient with the fastest duration of surgery, which was 5 minutes when arriving at the RR, had a temperature of 35.9 ^{0}C. This shows that the duration of surgery can cause *postoperative hypothermia* in patients with spinal anesthesia, this is because the longer the surgery, the patient will be exposed to cold temperatures for a long time and the duration of anesthesia received by the patient.
Based on the description, the researcher assumes that the length of surgery is directly proportional to *postoperative hypothermia* in patients with spinal anesthesia when 30 minutes in RR means the longer the patient's surgery, the more hypothermia the patient experiences. This is caused by exposure to cold environments for a long time and the more anesthetic drugs the patient receives, this causes a decrease in the patient's core body temperature.
Spearman rank statistical test, *the p-value = 0.074 < 0.050* was obtained , so the conclusion H1 is that there is no relationship between the length of surgery and *post-operative hypothermia* (when transferred to inpatient care) in patients with spinal anesthesia at the RR Lavalette Hospital, Malang.
This study is in line with the study conducted by Xu et al., (2023) which showed that there was no relationship between the length of surgery and post-spinal anesthesia hypothermia with a *p-value* of 0.4950 (p <0.05). This shows that the length of surgery cannot cause *post-operative hypothermia* (when the patient is transferred to inpatient care) in patients with spinal anesthesia because when the patient experiences hypothermia in the RR, the patient will receive intervention to reduce hypothermia in patients by providing external warmers such as blankets and warming blankets.
Based on the description, the researcher assumes that the length of surgery does not affect *postoperative hypothermia* (when the patient is transferred to inpatient care) in patients with spinal anesthesia in the RR. This is due to the provision of interventions during the patient's stay in the RR to reduce hypothermia in patients. Providing blankets is one of the interventions given to reduce *postoperative hypothermia* in patients.

Relationship Between Bleeding Amount and *Post-Operative Hypothermia* in Patients with Spinal Anesthesia at RR RS Lavalette Malang

Spearman rank statistical test, *the p-value = 0.000 <0.050* was obtained , so the conclusion H1 was accepted, there was a relationship between the amount of

bleeding and *post-operative* hypothermia (when arriving at the RR) in patients with spinal anesthesia at the RR of Lavalette Hospital Malang with a correlation value of 0.705, meaning that it had a strong relationship with a negative correlation direction where the greater the amount of patient bleeding, the greater the *post-operative hypothermia* (when arriving at the RR) in patients with spinal anesthesia at the RR.

This study is in line with the study conducted by Liu & Qi, (2021) (Liu and Qi, 2021) that the analysis of risk factors for hypothermia that has been carried out on patients in the PACU (*post anesthesia care unit*), one of which is *intraoperative blood loss* . The results showed that respondents with bleeding > 300 ml were 52.63% with an incidence of hypothermia of 48.31% while respondents who experienced bleeding ≤ 300 were 47.37%. Bleeding is one of the factors that can cause intraoperative hypothermia because losing a lot of blood can remove some of the body's heat and can cause hypothermia. Hypothermia can occur with blood loss during intraoperatively of more than 300 ml (Liu and Qi, 2021) .

In this study, it was found that patients with the largest amount of bleeding, namely 400 cc, when they arrived at the RR experienced hypothermia with a temperature of 33.9 ^{0}C and 34 ^{0}C and patients with the minimum amount of bleeding, namely 5 cc, when they arrived at the RR had a temperature of 35.6 ^{0}C. Based on the description, the researcher assumes that the amount of bleeding is directly proportional to postoperative hypothermia in patients with spinal anesthesia in RR, meaning that the greater the amount of bleeding in the patient, the greater the hypothermia experienced by the patient. This is because bleeding causes the body to lose body heat so that the patient experiences *postoperative hypothermia* .

Spearman rank statistical test, *the p-value = 0.000 <0.050* was obtained , so the conclusion H1 was accepted, there was a relationship between the amount of bleeding and *postoperative hypothermia* (When 30 minutes in RR) in patients with spinal anesthesia in RR RS Lavalette Malang with a correlation value of 0.651, meaning it had a strong relationship with a negative correlation direction where the greater the amount of patient bleeding, the greater the *postoperative hypothermia* (When 30 minutes in RR) in patients with spinal anesthesia in RR.

This study is in line with the study conducted by Xu et al., (2023), showing that there is a relationship between the amount of bleeding and hypothermia after spinal anesthesia with a p-value of 0.004 (p <0.05). This study explains that low bleeding is a factor in reducing *postoperative hypothermia* in patients. Bleeding is one of the factors that can cause *intraoperative hypothermia* because losing a lot of blood can remove some of the body's heat and can cause hypothermia. Hypothermia can occur with blood loss during intraoperatively of more than 300 ml (Liu and Qi, 2021) .

In this study, it was found that patients with the highest amount of bleeding, namely 400 cc, experienced hypothermia with a temperature of 34.5 ^{0}C for 30

minutes in RR and patients with the minimum amount of bleeding, namely 5 cc, experienced hypothermia with a temperature of 35.9 ^{0}C for 30 minutes in RR.
Based on the description, the researcher assumes that the amount of bleeding is directly proportional to *postoperative hypothermia* in patients with spinal anesthesia in RR, meaning that the greater the amount of bleeding in the patient, the greater the hypothermia experienced by the patient. This is because bleeding causes the body to lose body heat so that the patient experiences *postoperative hypothermia* .
Spearman rank statistical test, *the p-value = 0.021 < 0.050* was obtained , so the conclusion H1 was not accepted, there was no relationship between the amount of bleeding and *post-operative hypothermia* (when transferred to inpatient care) in patients with spinal anesthesia at RR RS Lavalette Malang.
This study is in line with the study conducted by Xu et al., (2023) which showed that there was no relationship between the amount of bleeding factor and post-spinal anesthesia hypothermia with a *p-value* of 0.0809 (p <0.05). This shows that the amount of bleeding cannot cause *post-operative hypothermia* (when the patient is transferred to inpatient care) in patients with spinal anesthesia because when the patient experiences hypothermia in the RR the patient will receive intervention to reduce hypothermia in the patient.
Based on the description, the researcher assumes that the amount of bleeding does not affect *postoperative hypothermia* (when the patient is transferred to inpatient care) in patients with spinal anesthesia in RR. This is due to the provision of interventions to reduce hypothermia in patients. Providing blankets is one of the interventions given to reduce *postoperative hypothermia* in patients.

CONCLUSION

Based on the results of the study, there is a significant relationship between the length of surgery and *postoperative hypothermia* in patients with spinal anesthesia. The results of the study showed that the longer the patient's surgery, the greater the risk of the patient experiencing *postoperative hypothermia* when transferred to the RR and 30 minutes in the RR. There was no significant relationship between the length of surgery and *postoperative hypothermia* in patients with spinal anesthesia when transferred to the inpatient room.
There is a significant relationship between the amount of bleeding and *postoperative hypothermia* in patients with spinal anesthesia. The results of the study showed that the greater the amount of bleeding in patients during surgery, the greater the risk of patients experiencing *postoperative hypothermia* when transferred to the RR and 30 minutes in the RR. There was no significant relationship between the amount of bleeding and *postoperative hypothermia* in patients with spinal anesthesia when transferred to the inpatient room.

BIBLIOGRAPHY

Alfarisi, W. (2021) 'The Relationship Between Family Support and Anxiety Levels

of Pre-Elective Major Surgery Patients in the Nyi Ageng Serang Ward, Sekarwangi Regional Hospital', *Journal Health Society* , 10(1), pp. 57–67.

Allene, MD (2020) 'Postoperative hypothermia and associated factors at Debre Berhan comprehensive specialized hospital 2019: A cross sectional study', *International Journal of Surgery Open* , 24, pp. 112–116. doi: 10.1016/j.ijso.2020.05.008.

Ardiyanto, A., Arman and Supriyadi, E. (2021) 'Arduino-Based Temperature Measuring Device Using Infrared Sensor and Alarm to Detect Above Normal Body Temperature', *Sinusoida* , 23(1), pp. 11–21.

Curless, M.S. *et al.* (2021) 'Management and Mitigation of Temperature and Humidity Events in the Perioperative Setting', *AORN Journal* , 114(6), pp. 563–571. doi: 10.1002/aorn.13563.

Fitrianingsih, F., Sukmaningtyas, W. and ... (2020) 'Description of Hypothermia Incidents in Post-Caesarean Section Patients with Spinal Anesthesia at the Ummu Hani Mother and Child Hospital (RSIA) Purbalingga', *INDONESIAN PUBLIC HEALTH RESEARCH AND DEVELOPMENT JOURNAL* , pp. 14–21. Available at: https://prosiding.uhb.ac.id/index.php/SNPPKM/article/view/1016%0Ahttps://prosiding.uhb.ac.id/index.php/SNPPKM/article/download/1016/360.

Ministry of Health of the Republic of Indonesia (2018) 'Laporan_Nasional_RKD2018_FINAL.pdf', *Health Research and Development Agency* , p. 674. Available at: http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf.

Liu, M. and Qi, L. (2021) 'The related factors and countermeasures of hypothermia in patients during the anesthesia recovery period.', *American journal of translational research* , 13(4), pp. 3459–3465.

Muntaha, Y. *et al.* (2020) 'The Relationship between Body Mass Index and Length of Surgery with the Incidence of Hypothermia in Postoperative Patients with Spinal Anesthesia at RSU Metro Medical Center Lhokseumawe', *INDONESIAN PUBLIC HEALTH RESEARCH AND DEVELOPMENT JOURNAL* , 2809(2767), pp. 537–544.

Siswoyo, C., Imam S, S. and Siyoto, S. (2020) 'Analysis of Factors Influencing the Increase in Post-Operative Care Costs', *INDONESIAN PUBLIC HEALTH RESEARCH AND DEVELOPMENT JOURNAL* , 1(37), pp. 18–25.

Tubalawony, SL and Siahaya, A. (2023) 'THE EFFECT OF SPINAL ANESTHESIA ON THE INCIDENCE OF HYPOTHERMIA IN POST-OPERATIVE PATIENTS', *Jurnal Keperawatan* , 15(1), pp. 331–338. Available at: http://journal.stikeskendal.ac.id/index.php/Keperawatan.

Widiyono, Suryani and Setiyajati, A. (2020) 'The Relationship between Age and Length of Surgery with Hypothermia in Post-Spinal Anesthesia Patients at the Central Surgical Installation Widiyono 1 , Suryani 2 , Ari Setiyajati 3', *INDONESIAN PUBLIC HEALTH RESEARCH AND DEVELOPMENT*

JOURNAL , 3(1), pp. 55–65.
Xu, R. *et al.* (2023) 'Incidence of postoperative hypothermia and shivering and risk factors in patients undergoing malignant tumor surgery: a retrospective study', *BMC Anesthesiology* , 23(1), pp. 1–11. doi: 10.1186/s12871-023-01991-8.