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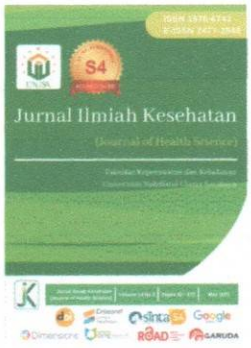

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FULL ISSUE

PDF

ARTICLES

The The Role Of Family Support And Self-Efficacy On Self-Care Behavior In The Elderly With Type 2 Diabetes

Ratna Yunita Sari, Umdatus Soleha , Erika Chandra Dewi 82-89

PDF

DOI : 10.33086/jhs.v14i02.1801

Abstract views: 21 , Downloads : 10

The The Correlation Between Nutritional Status And Urine Glucose With Estimated Fetal Weight In Trimester III Pregnant Women At Prima Husada Hospital

Nur Masruroh, Andreas Putro Ragil Santoso 90-96

PDF

DOI : 10.33086/jhs.v14i02.1782

Abstract views: 11 , Downloads : 8

The The Length Of Stay In Patients Undergoing Diagnostic MRI And CT-Scan With Intravenous Anesthesia At Outpatient Clinic Dr. Soetomo General Hospital: An Overview

Virda Maharani, **Arie** Utariani, Lucky Andriyanto, Bambang Harjono 97-102

PDF

DOI : 10.33086/jhs.v14i02.1748

Abstract views: 9 , Downloads : 10

Bacterial Identification And Antibiotics Sensitivity Of Ventilator-Associated Pneumonia (VAP) Patients At RSD Dr. Soebandi Jember

Muhammad Ali Shodikin, Mira Haninda Ramadhanty, I Nyoman Semita 103-111

PDF

DOI : 10.33086/jhs.v14i02.1891

Abstract views: 15 , Downloads : 11

The The Effect Of Listening To Quran Recitation On Social-Emotional Development In Pre-School Children During Covid-19 Pandemic

firdaus firdaus, Rahmadaniar Aditya Putri, Andini Hardiningrum 112-116

PDF

DOI : 10.33086/jhs.v14i02.1826

Abstract views: 10 , Downloads : 8

Adherence Level Of Medical Personnel In Implementing 2019 Postoperative Pain Management Guidelines

Nasrulloh Nasrulloh, Hamzah Hamzah, Arie Utariani, Dedi Susila 117-127

PDF

DOI : 10.33086/jhs.v14i02.1744

Abstract views: 10 , Downloads : 8

Evaluation Of Programs For Stunting Prevention Management At Tajinan Public Health Center

rifzul maulina 128-136

PDF

DOI : 10.33086/jhs.v14i02.1754

Abstract views: 10 , Downloads : 15

The The Correlation Between Total Cholesterol Levels In Pregnancy Women And Baby Birth Weight

uliyatul laili, Rizki Amalia 137-140

PDF

DOI : 10.33086/jhs.v14i02.1845

Abstract views: 10 , Downloads : 6

The The Correlation Between Participation In Pregnancy Workouts And Perineum Ruptures Incidence In Woman With Normal Labor At The Sumengko Village Maternity Cottage, Lamongan District

khusnul nikmah, Eka Sarofah Ningsih, Vita Yushofa 141-146

PDF

DOI : 10.33086/jhs.v14i02.2014

Abstract views: 10 , Downloads : 6

The The Correlation Between Patient Satisfaction Regarding Nutrition Service And Hospital Length Of Stay With Food Waste In Covid-19 Patients

Budhi Setianto, Agus Aan Adriansyah, Umi Hanik, Difran Nobel Bistara 147-152

PDF

DOI : 10.33086/jhs.v14i02.2045

Abstract views: 15 , Downloads : 13

Genetic Polymorphism In Individuals With Type II Diabetes Mellitus Using PCR-RAPD In Sidoarjo District

Miftahul Mushlih, Fitri Kumala Sari , Djauharoh A. Hadie, Syahrul Ardiansyah 153-159

PDF

DOI : 10.33086/jhs.v14i02.1866

Abstract views: 37 , Downloads : 8

Profile Of Leukocyte Count In Children With Typhoid Fever At The Dr. Tadjuddin Chalid Hospital, Makassar

Rivaldy Prayudha, Najamuddin Andi Palancoi, Syatirah Jalaluddin 160-165

PDF

DOI : 10.33086/jhs.v14i02.1864
Abstract views: 15 , Downloads : 10

An An Educational Video For Earthquake Disaster Preparedness In Students At St. Aloysius Weetabula Christian Middle School, Southwest Sumba

Wahyu Dini Metrikayanto, V Gonsalves 166-172

PDF

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The Length Of Stay In Patients Undergoing Diagnostic MRI And CT-Scan With Intravenous Anesthesia At Outpatient Clinic Dr. Soetomo General Hospital: An Overview

Virda Maharani [1], Arie Utariani [2], Lucky Andriyanto [3], Bambang Harjono [4]

[1, 2, 3, 4] *Anesthesiology and Reanimation Department of Medical Faculty of Universitas Airlangga / Soetomo General Hospital, Surabaya, Indonesia*

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CORRESPONDENCE

E-mail: vmaharani.anes@gmail.com

No. Tlp : +628123301587

A B S T R A C T

Magnetic Resonance Imaging (MRI) and Computerized Tomography (CT) Scans might be challenging for children or individuals with anxiety or claustrophobia. General anesthesia aims to increase the success rate, but inadequate management can result in a longer length of stay. This study aims to analyze patients' length of stay on MRI and CT-scan with intravenous anesthesia. This was a descriptive observational study. The data were collected retrospectively from the medical records at General Diagnostic Center Dr. Soetomo General Hospital. A total of 721 patients underwent MRI or CT Scan procedures with intravenous anesthesia during 2017-2018. The data obtained were patients' age, gender, procedure, physical status, comorbid, type of anesthesia drug, diagnostic procedure duration, length of observation in the Post Anesthesia Care Unit (PACU), and overall length of stay. All MRI procedures used a midazolam-propofol combination. Meanwhile, only one CT scan procedure used those combinations, and other CT scan procedures utilized propofol. Patients undergoing MRI had a length of stay with a mean duration of 6,6,3±1,26 hours, compared to CT scans with 5,20 ±1,38 hours, due to the lengthier procedure and observation duration in the PACU. Patients undergoing MRI have a longer overall length of stay than the ones doing CT scans.

INTRODUCTION

Magnetic Resonance Imaging (MRI) and Computerized Tomography (CT) Scans have been widely used in Indonesia. These diagnostic procedures require patients to stay still for a certain amount of time during the process, which might be hard to achieve for patients with certain conditions, such as children and patients with anxiety or claustrophobia. General anesthesia to increase these diagnostic procedures' success rates has been commonly used (Bailey et al., 2016; Choi et al., 2018; Rubin, 2014).

According to Mujiburrahman, there were 1.399 and 1.048 procedures in 2015 and 2016 in the General Diagnostic Center of Dr. Soetomo General Hospital that used general anesthesia (Mujiburrahman, 2017). Ambulatory anesthesia can lower-risk nosocomial infection, better cost-effectiveness, and shorter length of stay. It can be done in patients with physical status (PS–ASA) I and II; and all ages except premature infants (Lee, 2017).

Recovery post-anesthesia procedures are crucial. After anesthesia, patients are observed in the Post-Anesthesia Care Unit (PACU) then assessed with Modified Aldrete Score before getting discharged. This criteria evaluates activities, respiration, circulation, consciousness, oxygen saturation, scaled 0,1, and 2. The patient can be removed from PACU after reaching a score >9 (Lee, 2017; Shetty & Raveendra, 2015). A study comparing propofol and thiopental found that the recovery time needed in patients who

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used propofol is less than thiopental. The mean of Modified Aldrete Score in PACU was also higher in patients who used propofol (Makwana et al., 2016).

Sometimes, there is a complication in patients undergoing anesthesia. Largo-Pineda et al. showed that adverse effects in children aged less than 15 years old happened to 12 children in a study of 4.786 subjects. The most common negative impact was nausea and vomiting that primarily resulted from inadequate post-anesthesia treatment (Largo-pineda et al., 2017). Poor complication management can result in a longer length of stay. No study ever mentioned how long a patient should ideally stay in the hospital. Therefore, this study aims to analyze patients' overall length of stay undergoing diagnostic procedures such as MRI and CT-scan with intravenous anesthesia.

METHOD

This study was a descriptive observational study. The data were collected retrospectively from the medical records in the General Diagnostic Center of Dr. Soetomo General Hospital, which consisted of 721 patients who underwent diagnostic procedures such as MRI and CT scan with intravenous anesthesia from 2017 until 2018. The inclusion criteria were patients with no history of difficult anesthesia and no acute or chronic respiratory system infection. Exclusion criteria were not enough fasting period, difficult intravenous access, life-threatening organ dysfunction, and incomplete medical record. The sample was chosen using total sampling. The data obtained were patients' characteristics: age, gender, procedure, physical status classification, comorbid, type of anesthesia drug and its dose, diagnostic procedure duration, length of observation in the Post Anesthesia Care Unit (PACU), and patient's overall length of stay. The data presentation was descriptive.

The study was initiated with a research proposal and accepted by research supervisors. Its proposal was assessed for ethical clearance. After our hospital's ethical committee approved it, we proceeded with data collection through medical records and data proceedings.

Data obtained from patients' medical records were then presented as a table consisted of name, age, gender, physical status classification, diagnostic procedure type (MRI or CT Scan), procedure duration, duration of observation in the PACU, and patient's overall length of stay. Data were processed using SPSS 20.0.

RESULT

Subjects' characteristics

A total of 721 patients underwent diagnostic procedures with general anesthesia in our outpatient clinic that fulfilled inclusion and exclusion criteria. There were 319 procedures in 2017 and 402 in 2018. Over

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60% of these procedures are MRIs. There was no significant difference in patients' gender. The highest number was among children 1 to 5-years-old. More than half of the patients were categorized into PS-ASA 2 and had one comorbid (See table 1). 2,1

Table 1. Subjects' characteristics

Characteristics	Frequency (n)	Percentage (%)
Year		
2017	319	44,3
2018	402	55,7
Procedure		
CT Scan	280	38,8
MRI	441	61,2
Gender		
Female	339	47,0
Male	382	53,0

	MRI		CT Scan	
	N		%	
Age group			n	%
0-11 months	47	10,7	64	22,9
1-4.9 years	205	46,5	169	60,4
5-18 years	162	36,7	46	10,5
>18 years	27	6,1	1	0,2
PS – ASA				
1	76	17,2	61	21,8
2	325	73,7	188	67,1
>2	40	9,1	31	11,1
Comorbid				
None	61	13,8	50	17,9
1	249	56,5	145	51,8
2	116	26,3	79	28,2
3	15	3,4	6	2,1

Drugs used in the procedures

All of the MRI procedures used midazolam and propofol combination. Only one CT scan procedure utilized both; most CT scan procedures used propofol only. The propofol dose was 2mg/kg body weight (BW), while midazolam was 0.15/kg BW. The mean dose of midazolam and propofol used in the MRI procedures sequentially were 2,93±2,31 mg and 78±46,24 mg, while the mean dose of propofol used in most of the CT scan procedures was 23,42±15,23 mg.

Table 2. Intravenous anesthesia drugs and doses administered in milligrams

Drug	Frequency of procedures	Min.	Max	Mean	Std. Deviation
MRI					
Midazolam	441	0,48	15,00	2,93	2,31
Propofol	441	9,60	300,00	58,78	46,24
CT Scan					
Midazolam	1	1,31	1,31	1,31	-
Propofol	280	5,80	160,0	23,42	15,23

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Duration of procedures, observation in PACU, and overall length of stay

MRIs took longer than CT scans, with a mean duration of 55,96±15,85 minutes compared to CT scan with a mean duration of 10,31±6,71 minutes. Patients who underwent MRI also took a more extended observation period in the PACU, with a mean duration of 173,61±67,52 minutes compared to CT scans with 135,29 ±62,98 minutes mean duration. Therefore, MRI patients had a longer overall length of stay than CT scans with a mean duration sequentially of 6,6,3±1,26 hours and 5,20 ±1,38 hours.

Table 3. Duration of Procedures in minutes

Diagnostic procedure	Min.	Max	Mean	Std. Deviation
CT Scan	4	70	10,31	6,71
MRI	5	135	55,96	15,85

Table 4. Duration of Observation in the PACU in minutes

Diagnostic procedure	Min.	Max	Mean	Std. Deviation
CT Scan	0	390	135,29	62,98
MRI	20	360	173,61	67,52

Table 5. Patients' overall Length of Stay in hours

Diagnostic procedure	Min.	Max	Mean	Std. Deviation
CT Scan	1,5	9,5	5,20	1,38
MRI	1,5	11	6,63	1,26

DISCUSSION

The anesthesia drugs used in our outpatient clinic's diagnostic procedures were propofol and a combination of propofol and midazolam. All MRI procedures used propofol and midazolam. Meanwhile, only one CT scan procedure used propofol and midazolam, and the other 279 CT scan procedures used propofol only. The mean dose of propofol used in MRI was higher, which was 58,78±46,24 mg compared to CT scan with a mean dose of 23,42±15,23 mg. It was possible because the mean age of patients undergoing MRI was older than CT scan, which also came with heavier bodyweight.

Ambulatory anesthesia commonly uses propofol because of its rapid onset and recovery. However, it has a narrow therapeutic range, so that respiratory distress is more likely to occur when there is carelessness in use. In this combination, midazolam plays a role as a sedation agent chosen because of its rapid onset and short half-life (Dasgupta et al., 2017). A study in the Netherlands showed that the mean dose of midazolam needed to sedate a child less than six years old was twice as required for an adult (Verhage, Mulder & Willekens, 2003). A similar thing did not happen in this study. Despite the differences of patients' age, all procedures used the same small dose of midazolam, which was 0.15mg Kg BW. Its combination with propofol is beneficial for both drug use since the dose of propofol was also small, 2mg/kg BW, which lowered respiratory distress. A study in Korea reported that midazolam as a combination of propofol could reduce the dose of propofol needed, so the odds of respiratory distress

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were lower. The research informed that used only propofol showed the risk of respiratory distress of 7%. In comparison, the ones that used midazolam and propofol combination indicated the risk of respiratory distress of only 2.8% (Kang et al., 2017). Both propofol and midazolam combinations were used in all MRI procedures because the procedure duration took longer than the CT scan.

Diagnostic procedures in patients who needed general anesthesia consist of these phases: risk assessment, history taking, and physical examination; diagnostic procedure; and post-anesthesia observation in the PACU. MRI took longer than a CT scan, with a mean duration of 55,96±15,85 minutes and 10,31±6,71 minutes. Observation in patients undergoing MRI was also longer than the CT scan, with a mean duration of 173,61±67,52 minutes and 135,29 ±62,98 minutes. It resulted in a longer overall length of stay in the hospital, with a mean duration of 6,6,3±1,26 hours in MRI patients and 5,20 ±1,38 hours in CT scan patients. To date, no studies directly analyzed the difference in length of stay between patients undergoing MRI and CT scans under intravenous anesthesia.

Furthermore, we investigate these findings in terms of anesthetic agents. The contrast of length of stay might be happening because the drugs used in MRI are a combination of midazolam and propofol, which have a longer recovery time than propofol alone. Kang et al. reported that patients that were sedated using those combinations had longer recovery time significantly compared to propofol only (mean difference 1.8 minutes; CI 95% 0.9-2.9; $p<0.001$). It resulted in a shorter stay in the hospital (mean difference 4 minutes; CI 95% 3.0-5.1; $p<0.001$) (Kang et al., 2017). A study also showed that the overall length of stay (the duration from the end of the anesthetic administering to the condition appropriate for discharge) was longer in patients who received intravenous propofol than intravenous midazolam ($p = 0.010$). The research was conducted on MRI, CT scans, or DTPA renal scintigraphy procedures (Sebe *et al.*, 2014). The synergistic characteristics in the combined regimen of midazolam and propofol promote more profound and longer moderate sedation, which may prolong the early recovery time (Molina-Infante et al., 2012).

As an impact of the COVID-19 pandemic, we found difficulties in sample collection due to limited access to medical records installation. Therefore, data collection was used manually using the registration book of patients in the Radiology Unit of General Diagnostic Center.

CONCLUSION

Of all the imaging diagnostic procedures using intravenous anesthesia, there is a longer overall length of stay in patients who undergo MRI than patients undergoing CT scans.

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