Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Maria Caecilia Nanny Setiawati, Siti Munisih, Mishanah, Ang...
Assignment title:	PENELITIAN
Submission title:	Potential Drugs Incompatibilities in Intensive Care Unit of ty...
File name:	C1303011721_IOSPHR.pdf
File size:	352.17K
Page count:	5
Word count:	2,258
Character count:	12,142
Submission date:	08-Apr-2023 08:30PM (UTC+0700)
Submission ID:	2059001033



IOSR Journal Of Pharmacy
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 13, Issue 3 Series. I (March 2023), PP.17-21
www.iosrphr.org

Potential Drugs Incompatibilities in Intensive Care Unit of type C Hospitals in Semarang Period January – June 2022

Maria Caecilia Nanny Setiawati*[1], Siti Munisih[2], Mishanah[3], Anggardha Paramita[4]
[1,2,4] *Department of Pharmacology and Clinical Pharmacy Stifar Yayasan Pharmasi Semarang*
[3] *dr. Gunawan Mangunkusumo Regional Public Hospital Semarang*
Received 17 March 2023; Accepted 31 March 2023

Abstract. Injectable medication errors primarily occur during preparation and administration. Currently, Indonesia's Ministry of Health has a regulator for the pharmacist's role in iv admixture. But Indonesia still lacks pharmacists, so they have not routinely monitored intravenous drug incompatibility. The objective of the study is to know the potential incompatibility of intravenous admixtures. Data from the patients in the intensive care unit of two type C hospitals in Semarang who stayed from January to June 2022 were retrospectively collected. We analysed the iv drugs that had been given simultaneously. The results of the study show that patients aged >65 years are the most (32 %) and cardiovascular disease (29,82%) is the most diagnosed. From 114 patients who meet our criteria, we find 1719 iv drug simultaneously given, 7,5% are incompatible. Midazolam, dobutamine, furosemide, heparin, were the most commonly involved in potential incompatibility in our study.
Key words: Incompatibilities, Intravenous, Intensive Care Unit.

I. INTRODUCTIONS

Intensive Care Unit (ICU) is part of a hospital for intensive inpatient services who come in critical condition. The intensive care unit is equipped with a series of technologies that support treatment in patients who are at risk of experiencing organ system failure, especially lungs, cardiovascular systems, and kidneys (1). These room handles patients with diseases, trauma, or life-threatening complications. Most drugs given to ICU patients are generally through parenteral routes(. This parenteral drug administration is often done because it can provide a rapid pharmacological effect and facilitates therapy in patients who cannot use drugs orally(2). Another reason for parenteral drug administration is that it is often not well absorbed through oral routes(3). Parenteral preparations have two types, the single form or the form of being reconstituted with other parenteral preparations in a container before being given by injection or infusion. Among these, drug incompatibility is appraised to be a fatal condition(4)

Pharmacists should be able to identify potential incompatibilities by gathering information on the physical and chemical compatibility of various i.v.drugs. Numerous studies have confirmed that this is an important and growing problem(5). About half of all ward-based intravenous drug preparations and administrations are defective. These incompatibilities cause approximately 20% of all medication errors and nearly 89% of all medication errors(2) .

Drug incompatibilities can define as an unwanted interactions that occur during intravenous drug reconstitution and administration process, also when two or more drug solutions are mixed together (3)

The incompatibilities of intravenous drugs have been evaluated in a number of research. Mainly in intensive care unit, during which parenteral drug administration is often complicated by the fact that the number of concurrently administered drugs transcend the number of available infusion lines, intravenous drug incompatibilities speak for a significant problem(4).

An investigation related to intravenous drug incompatibility for patients on ICU rooms is still limited in Indonesia. This study aimed to know the potential incompatibility problems of intravenous drugs

II. METHODS

This research has received licence from the Health Research Ethics Committee of STIFAR Yayasan Pharmasi Semarang, No *Ethical Clearance* 389/YP-NA/KEPK/STIFAR/EC/VII/2022

Data from the patients in the intensive care unit of two type C hospitals in Semarang were retrospectively collected. We analysed the iv drugs that had been given simultaneously (seen from the same time of

Copyright 2023 Turnitin. All rights reserved.

Potential Drugs Incompatibilities in Intensive Care Unit of type C Hospitals in Semarang Period January – June 2022

by Maria Caecilia Nanny Setiawati, Siti Munisih, Mishanah, Anggardha Paramita

Submission date: 08-Apr-2023 08:30PM (UTC+0700)
Submission ID: 2059001033
File name: C1303011721_IOSPHR.pdf (352.17K)
Word count: 2258
Character count: 12142

IOSR Journal Of Pharmacy
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 13, Issue 3 Series. I (March 2023), PP.17-21
www.iosrphr.org

Potential Drugs Incompatibilities in Intensive Care Unit of type C Hospitals in Semarang Period January – June 2022

Maria Caecilia Nanny Setiawati*[1], Siti Munisih[2], Mishanah[3], Anggardha Paramita[4]

[1,2,4] *Department of Pharmacology and Clinical Pharmacy Stifar Yayasan Pharmasi Semarang*
[3] *dr. Gunawan Mangunkusumo Regional Public Hospital Semarang*
Received 17 March 2023; Accepted 31 March 2023

Abstract. Injectable medication errors primarily occur during preparation and administration. Currently, Indonesia's Ministry of Health has a regulator for the pharmacist's role in iv admixture. But Indonesia still lacks pharmacists, so they have not routinely monitored intravenous drug incompatibility. The objective of the study is to know the potential incompatibility of intravenous admixtures. Data from the patients in the intensive care unit of two type C hospitals in Semarang who stayed from January to June 2022 were retrospectively collected. We analysed the iv drugs that had been given simultaneously. The results of the study show that patients aged >65 years are the most (32 %) and cardiovascular disease (29,82%) is the most diagnosed. From 114 patients who meet our criteria, we find 1719 iv drug simultaneously given, 7,5% are incompatible. Midazolam, dobutamine, furosemide, heparin, were the most common involved in potential incompatibility in our study.
Key words: Incompatibilities, Intravenous, Intensive Care Unit.

I. INTRODUCTIONS

Intensive Care Unit (ICU) is part of a hospital for intensive inpatient services who come in critical condition. The intensive care unit is equipped with a series of technologies that support treatment in patients who are at risk of experiencing organ system failure, especially lungs, cardiovascular systems, and kidneys (1). These room handles patients with diseases, trauma, or life-threatening complications. Most drugs given to ICU patients are generally through parenteral routes(. This parenteral drug administration is often done because it can provide a rapid pharmacological effect and facilitates therapy in patients who cannot use drugs orally(2). Another reason for parenteral drug administration is that it is often not well absorbed through oral routes(3). Parenteral preparations have two types, the single form or the form of being reconstituted with other parenteral preparations in a container before being given by injection or infusion. Among these, drug incompatibility is appraised to be a fatal condition(4)

Pharmacists should be able to identify potential incompatibilities by gathering information on the physical and chemical compatibility of various i.v.drugs. Numerous studies have confirmed that this is an important and growing problem(5). About half of all ward-based intravenous drug preparations and administrations are defective. These incompatibilities cause approximately 20% of all medication errors and nearly 89% of all medication errors(2) .

Drug incompatibilities can define as an unwanted interactions that occur during intravenous drug reconstitution and administration process, also when two or more drug solutions are mixed together (3)

The incompatibilities of intravenous drugs have been evaluated in a number of research. Mainly in intensive care unit, during which parenteral drug administration is often complicated by the fact that the number of concurrently administered drugs transcend the number of available infusion lines, intravenous drug incompatibilities speak for a significant problem(4).

An investigation related to intravenous drug incompatibility for patients on ICU rooms is still limited in Indonesia. This study aimed to know the potential incompatibility problems of intravenous drugs

II. METHODS

This research has received licence from the Health Research Ethics Committee of STIFAR Yayasan Pharmasi Semarang, No *Ethical Clearance* 389/YP-NA/KEPK/STIFAR/EC/VII/2022

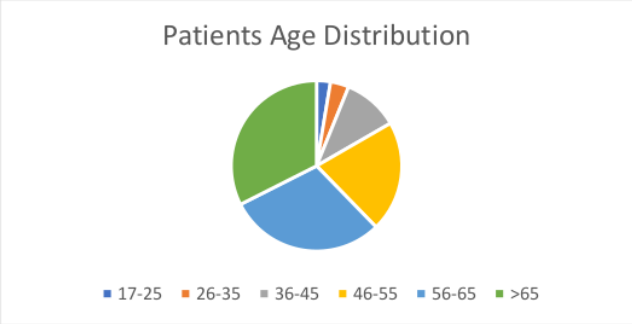
Data from the patients in the intensive care unit of two type C hospitals in Semarang were retrospectively collected. We analysed the iv drugs that had been given simultaneously (seen from the same time of

administration), concerning the potential compatibility of those intravenous drugs. We don't compare the two hospitals but combine the data because each hospital only has 3 beds so the number of patients is small.
The inclusion criteria were patients hospitalized in ICU for at least 24 hours, and received minimal two iv drugs which were given simultaneously. The Patient enters ICU until the patient leaves ICU, starts from the beginning of January to the end of June 2022.

III. RESULT AND DISCUSSION

There are 114 patients who meet our criteria. The number of male and female is almost the same, 58 (51%) and 56 (49%) consecutively. Most of the patients (106 persons, 93%) stay in ICU less than 1 week. The rest stay equal to and more than 7 days. The longest is 13 days length of stay in ICU. The characteristics of prolonged ICU stay also depend on the length of hospital stay before ICU admission (4). The Patients' age distribution can be seen in figure 1.

Figure 1. Patients Age distribution



We divided the patients' age according to the Indonesia' Ministry of Health. The most are elderly patients, more than 65 years old (32%). Age was reported as a prodigy factor in critical ill patients, the study assessed disease severity, hospitalization diagnosis, but comorbidities were a more important risk factor than age(5)
Accurate diagnose is very important for critically ill patients in ICU. The first diagnose can be seen on table 1

Table 1. Distribution of the patients' diagnoses

No	Diagnostic	Total patients	%
1	Cardiovascular disorder	34	29,82
2	Respiratory failure of various causes	22	19,31
3	Stroke	12	10,53
4	Septicemia and septic shock	8	7,02
5	Post major surgery	7	6,14
6	Kidney disorder	6	5,26
7	Respiratory disorder	6	5,26
8	Gastrointestinal disorder	5	4,38
9	Diabetes milletus	3	2,63
10	Loss of consciousness	2	1,75
11	Tuberculose millier	2	1,75
12	Combustio	2	1,75
13	Incomplete pregnancy	1	0,88
14	Hypertensive heart disease	1	0,88
15	Hypertensive encephalopathy	1	0,88
16	chronic obstructive pulmonary disease	1	0,88
17	Guillain barre syndrome	1	0,88

Total	**114**	**100**

The most commonly found disease is as many cardiovascular disorders, namely in 34 patients (29,82%). Cardiovascular disease is a term for various diseases that affect the heart and blood vessels, including coronary arteries heart disease (congestive heart disease), cerebrovascular disease, hypertension, and peripheral vascular disease(6). Cardiovascular disease major cause of mortality and morbidity in people. Since the 1980s, mortality due to cardiovascular disorders associated with age starts to decline, but in women fewer than men (7)
However, these incompatibilities with the IV admixtures happen not only with drugs, sometimes with a diluent and a drug. When two or more drugs are added into the diluents, it can result in crystallization, clouding, and precipitation. The diluent in our research was Ringer Lactate, Normal saline (NaCl 0,9%) and NaCl 3%. Ringer Lactate was diluent which has many incompatibilities with some drugs, especially with Ceftriaxone(8).

Some incompatibilities were found between drugs and iv fluid that were given simultaneously. It can be seen in table 2.

Table 2. Incompatibilities drugs and iv fluid (n=45 from n=129 total incompatibilities)

Incompatible iv fluid + drug	Frequency	%
Ringer Lactate + Ceftriaxone	29	22,48
Ringer Lactate + meropenem	6	4,65
Ringer lactate + Nicardipine	2	1,55
Ringer lactate + Phenytoin	1	0,77
Ringer lactate + Nicardipine	1	0,77
NaCl 0,9% + Phenytoin	4	3,1
NaCl 0,9% + Meropenem	2	1,55
Total		35,64

The most was Ceftriaxone and calcium in Ringer lactate, happens 29 times (22,48%). In a study analysis reveals a relative paucity of evidence to keep up a serum precipitation events between Ceftriaxone and calcium salt in adults. Causal relationship appears to be relevant in infants receiving Ceftriaxone, but no findings were observed in the adult population(8) (9)

Patients in the ICU need a lot of drugs, because of their conditions. On table 2, we can see the number of drugs prescribed for the ICU' patients.

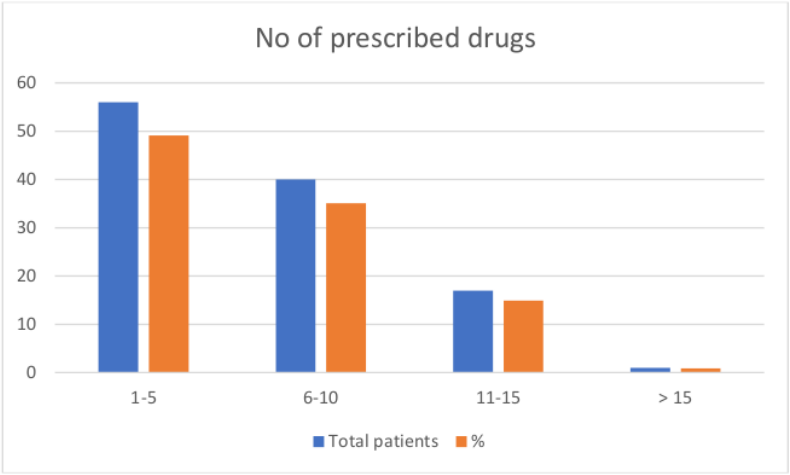


Figure 2. Number of prescribed drug

The study of Machotka in Czech Republic (10) shows the average prescription of drugs per patient in ICU is far less, namely 6 drugs. WHO has got a standard that the total drugs in a recipe is 1,6-1,8 drugs. But different with our study, cause the patients were in a critical condition. There are 68 kinds of iv drugs prescribed for the patients. We found 1719 iv admixture that was simultaneously given to the patient and we found 129 (7,5%) incompatibility between it. Patients in ICU had a high failure rate. Medicine incompatibilities can be identified and ruled out by the pharmacist on a base multidisciplinary team, reduce patients' adverse effects (11) Particular attention should be given to midazolam, dobutamine, furosemide, heparin, as these drugs were the most commonly involved in potential incompatibility on our study. We can see in table 3

Table 3. Incompatible Drugs pair

		No incompatibility
Drug A	Drug B	
Midazolam	omeprazole	5
	furosemide	5
	meropenem	4
	dobutamine	3
	hydrocortisone	2
	ampicilline	1
Dobutamine	heparin	7
	furosemide	4
	meropenem	3
	sodium bicarbonat	1
Furosemide	omeprazole	6
	levofloxacine	3
	nicardipine	2
	pantoprazole	2
	amiodarone	1
	ondansetron	1
Heparin	amiodarone	5
	isosorbide dinitrat	4
	levofloxacine	3

Minimizing the risk of coadministration of injectable drugs remains important as polymedicine is common practice in various patient populations such as cancer patients, post-transplant patients and intensive care patients (neonates, children, adults) (12)

We were not assessing the clinical appropriateness of the medicine in all prescription. However, so many medicines for therapy in ICU, because of it is nearly impossible to administer only one drug, especially medicines that are taken regularly dripping as an infuse.(13)

Limitation

Our research has a few limitations, such as the data was collected retrospectively and only got a few patients. Also, we can't observe to identify the real incompatibilities, especially physically incompatibilities.

IV. CONCLUSION

In this retrospective study, we highlight that potential incompatibilities that are very common in ICU (7,5 %) to simultaneously administration of incompatible drugs. Ceftriaxone and Ringer Lactate is the most incompatibility, iv liquid with drugs. Furosemide is the most common drugs' pair.

We suggested, to lower the IV incompatibilities in ICU, the pharmacist should be placed an IV incompatibility chart for the frequently used drugs.

ACKNOWLEDGEMENTS

This project was settled on by grant of the Stifar YAYASAN PHARMASI SEMARANG. Special Thanks to The Bhayangkara Hospital and Dr Gunawan Mangunkusumo Hospital in Semarang which allows us to retrieve those data.

REFERENCES

[1]. Vijayakumar A, Sharon EV, Teena J, Nobil S, Nazeer I. A clinical study on drug-related problems associated with intravenous drug administration. J Basic Clin Pharm. 2014 Mar;5(2):49–53.
[2]. Hiremath D, John NN, Patil SS, Anil A. Compatibility Assessment of Intravenous Admixtures in a Tertiary Care Teaching Hospital. 2020;6(2):4.
[3]. Abdelkader A, Fathi HA, Hamad MA, Elsabahy M. Nanomedicine: a new paradigm to overcome drug incompatibilities. J Pharm Pharmacol. 2020;72(10):1289–305.
[4]. Toptas M, Sengul Samanci N, Akkoc İ, Yucetas E, Cebeci E, Sen O, et al. Factors Affecting the Length of Stay in the Intensive Care Unit: Our Clinical Experience. BioMed Res Int. 2018 Mar 20;2018:e9438046.
[5]. Miniksar ÖH, Özdemir M. Clinical Features and Outcomes of Very Elderly Patients Admitted to the Intensive Care Unit: A Retrospective and Observational Study. Indian J Crit Care Med Peer-Rev Off Publ Indian Soc Crit Care Med. 2021 Jun;25(6):629–34.
[6]. Carapetis JR, Beaton A, Cunningham MW, Guilherme L, Karthikeyan G, Mayosi BM, et al. Acute rheumatic fever and rheumatic heart disease. Nat Rev Dis Primer. 2016 Jan 14;2(1):1–24.
[7]. Olvera Lopez E, Ballard BD, Jan A. Cardiovascular Disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 [cited 2023 Feb 27]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK535419/
[8]. Steadman E, Raisch D, Bennett C, Esterly J, Becker T, Postelnick M, et al. Evaluation of a Potential Clinical Interaction between Ceftriaxone and Calcium. Antimicrob Agents Chemother. 2010 Apr 1;54:1534–40.
[9]. Christensen ML, Zareie P, Kadiyala B, Bursac Z, Reed MD, Mattison DR, et al. Concomitant Ceftriaxone and Intravenous Calcium Therapy in Infants. J Pediatr Pharmacol Ther JPPT. 2021;26(7):702–7.
[10]. Machotka O, Manak J, Aleš Antonín K, Vlcek J. Incidence of intravenous drug incompatibilities in intensive care units. Biomed Pap Med Fac Univ Palacky Olomouc Czechoslov. 2014 Nov 6;
[11]. Castells Lao G, Rodríguez Reyes M, Roura Turet J, Prat Dot M, Soy Muner D, López Cabezas C. Compatibility of drugs administered as Y-site infusion in intensive care units: A systematic review. Med Intensiva. 2020 Mar;44(2):80–7.
[12]. Hecq JD, Krämer I, Vigneron J. European Databases on Stability and Compatibility of Injectable Medicinal Products in Europe. Pharm Technol Hosp Pharm. 2019 Sep 1;4(3–4):113–7.
[13]. Leopoldino RW, Costa HT, Costa TX, Martins RR, Oliveira AG. Potential drug incompatibilities in the neonatal intensive care unit: a network analysis approach. BMC Pharmacol Toxicol. 2018 Dec 6;19(1):83.

Maria Caecilia Nanny Setiawati, et. al. "Potential Drugs Incompatibilities in Intensive Care Unit of type C Hospitals in Semarang Period January – June 2022." *IOSR Journal of Pharmacy (IOSRPHR)*, 13(03), 2023, pp. 17-21.

Potential Drugs Incompatibilities in Intensive Care Unit of type C Hospitals in Semarang Period January – June 2022

ORIGINALITY REPORT

23%	16%	17%	13%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	impressions.manipal.edu Internet Source	2%
2	Edit Székely, Lilla Lőrinczi, Doina Bilca, Eleonóra Fodor, J. Sóki, Monica Sabau. "Incidence, antibiotic resistance and clonal relations of MRSA strains isolated from a Romanian university hospital", Acta Microbiologica et Immunologica Hungarica, 2008 Publication	2%
3	Submitted to University of Wollongong Student Paper	2%
4	peerj.com Internet Source	1%
5	Submitted to Indonesia International Institute for Life Sciences Student Paper	1%
6	Submitted to Monash University Student Paper	1%

7	Submitted to University of Queensland Student Paper	1 %
8	jag.journalagent.com Internet Source	1 %
9	www.labome.org Internet Source	1 %
10	www.jscimedcentral.com Internet Source	1 %
11	dspace.cuni.cz Internet Source	1 %
12	Irene Krämer, Judith Thiesen, Alain Astier. "Formulation and Administration of Biological Medicinal Products”", Pharmaceutical Research, 2020 Publication	1 %
13	Radwa Radwan, Ayat Abdelkader, Heba A. Fathi, Mahmoud Elsabahy, Gihan Fetih, Mahmoud El-Badry. "Development and Evaluation of Letrozole-Loaded Hyaluronic Acid/Chitosan-Coated Poly(d,l-lactide-co-glycolide) Nanoparticles", Journal of Pharmaceutical Innovation, 2021 Publication	1 %
14	Submitted to Badan PPSDM Kesehatan Kementerian Kesehatan Student Paper	1 %

15	Ramon Weyler Leopoldino, Haline Tereza Costa, Tatiana Xavier Costa, Rand Randall Martins, António Gouveia Oliveira. "Potential drug incompatibilities in the neonatal intensive care unit: a network analysis approach", BMC Pharmacology and Toxicology, 2018 Publication	1 %
16	Roland N. Dickerson, Angela L. Bingham, Todd W. Canada, Lingtak Neander Chan et al. "Significant Published Articles in 2021 for Pharmacy Nutrition Support Practice", Hospital Pharmacy, 2022 Publication	1 %
17	Heba A. Fathi, Carol Yousry, Mahmoud Elsabahy, Mahmoud El-Badry, Omaima N. El Gazayerly. "Effective Loading of Incompatible Drugs into Nanosized Vesicles: A Strategy to Allow Concurrent Administration of Furosemide and Midazolam in Simulated Clinical Settings", International Journal of Pharmaceutics, 2023 Publication	<1 %
18	theagingviking.substack.com Internet Source	<1 %
19	dugi-doc.udg.edu Internet Source	<1 %

20	zombiedoc.com Internet Source	<1%
21	Submitted to Darton State College Student Paper	<1%
22	Submitted to Southern New Hampshire University - Continuing Education Student Paper	<1%
23	koonja.com Internet Source	<1%
24	medintensiva.org Internet Source	<1%
25	www.aihw.gov.au Internet Source	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		