NURSE NEED MANAGEMENT DURING COVID 19 PANDEMIC

Ilhamsyah[1], Patimah[2], Sri Eka Wardani[3]

[1,2,3] Nursing Study Program, Faculty Of Medicine And Health Sciences, UIN Alauddin Makassar, Indonesia

ARTICLE INFORMATION

CORRESPONDENCE

Phone: -
Email: -

KEYWORDS

ABSTRACT

Background: *Currently, coronavirus disease (COVID-19) is a major problem throughout the world. World Health Organization (WHO) has declared COVID-19 a global health emergency.*

Objective: *The purpose of writing this scientific paper is to identify the needs of nurses during the COVID-19 pandemic.*

Method: *This study uses a qualitative descriptive with a literature review approach.*

Results: *The results of a literature study of 423 articles obtained only 10 articles that met the inclusion criteria. The results of the study show that nurses are a large proportion of staff in hospitals, it is estimated that around 75% of personnel are nurses. As the number of COVID-19 continues to increase, hospitals are faced with a shortage of health workers, especially nurses, to treat COVID-19 patients.*

Conclusion: *Results showed that 74% of nurses favored the third schedule for the following reasons: wearing and removing PPE twice a day increased the consumption of medical resources, frequent switching between contaminated and clean areas increased the risk of infection, frequent complicated procedures wearing and removing PPE increased the risk of infection. their mental burden, working for 6 hours continuously pushes their physiological limits, because they cannot go to the bathroom when wearing PPE in isolation area.*

INTRODUCTION

Currently, *coronavirus disease* (COVID-19) is a major problem throughout the world. COVID-19 first appeared in the Chinese city of Wuhan and has now spread to more than 200 countries in the world.disease *Corona virus* is an infectious disease caused by the *Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV2) virus*. This disease is transmitted from person to person where most of the infected people will experience mild to moderate respiratory illness and recover without requiring special treatment

(Ministry of Health of the Republic of Indonesia, 2020).

World Health Organization (WHO) has declared COVID-19 a global health emergency. In recent months, cases of COVID-19 have increased dramatically in the world, including in Indonesia. Globally, as of June 14, 2020 there were 7,633,886 million positive cases of COVID-19 with 426,317 deaths, while in Indonesia alone there were 38,277 positive cases of COVID-19 with 2134 deaths (COVID19.GO.ID, 2020).

With the increase in COVID-19 cases both in the world and in Indonesia, many health service centers will be overwhelmed in terms of facilities, infrastructure and human resources (Dhamanti, 2020). Hospitals are public service institutions that are important and needed in an effort to fulfill health demands. Human resources are one of the important components in hospital services (Julia, Rambe, & Wahyuni, 2015).

As the number of COVID-19 continues to increase, hospitals are faced with limited facilities, such as a shortage of space, personal protective equipment, and a shortage of health workers, especially nurses to handle COVID-19 patients (Ministry of Home Affairs Work Team, 2020) . The *ratio* of patients to nurses is out of *balance*, causing extreme fatigue, causing the death of several health workers, due to being infected with the COVID-19 by patients being treated (Ministry of Home Affairs Work Team, 2020).

Data from the *International Council of Nurses* (ICN) states that at least 90,000 health workers worldwide are believed to have been infected with the COVID-19 virus and more than 260 nurses died due to

the COVID-19 pandemic (Kenny, 2020). The Task Force for the Acceleration of Handling COVID-19 in Indonesia also stated that as many as 55 medical personnel died during the COVID-19 pandemic (Ihsanuddin, 2020). The medical personnel's fatalities consisted of 38 doctors and 17 nurses. Then the Indonesian National Nurses Association (PPNI) updated the number of nurses who died while on duty serving COVID-19 patients to 20 people as of May 19, 2020 (Mantalean, 2020).

During the COVID-19 pandemic, nurses are one of the medical personnel who are at the forefront of handling COVID-19 because nurses are the first point of contact in treating COVID-19 sufferers. According to Liu et al. (2020) the most prominent issues are the arrangement of medical staff to diagnose and treat patients with COVID-19 and the allocation of medical protective equipment. Quoted from news satu.com, Bogor regent Ade Yasin stated that several obstacles in dealing with the *corona virus (* COVID-19) pandemic in Bogor Regency, one of which was due to the lack of medical personnel (Berita Satu, 2020). Other news related to the shortage of medical personnel also occurred in the city of Malang where the Jatim.com Tribune explained that the Malang City Hospital lacked health personnel in handling patients during the COVID-19 pandemic (Edgar, 2020).

METHODS

Design *qualitative descriptive* with a *literature review approach.* The literature search used four *data* such as PubMed, *Scient Direct*, DOAJ *(Directory of* Open *Access Journals), MedRxiv* and *Google Scholar*.

Table 1 Search Keywords and Number of Articles

Search Keywords	Databased	Number of Articles
Nurses AND Shift AND COVID-19	PUBMED/NCBI	16 Articles
Nursing staffing AND shift AND COVID-19	Google Scholar	243 Articles
Nurses AND Shift AND COVID-19	*Scient Direct*	122 Articles
Nursing Stafing AND Shift AND COVID-19	*MedRxiv*	39 Articles
Nursing AND Shift AND COVID-19	DOAJ *(Directory of Open Access Journals)*	3 Articles

Table 2
Strategies used to search for articles using the PICOS *framework*.

PICOS *framework*	Inclusion	Criteria
Population	study that focuses on nurses caring for COVID-19 patients A	study that does not address the issue of nurse needs during the COVID-19 pandemic
Intervention	Studies that examine nursing management during the COVID-19 pandemic	Studies that do not discuss the nursing management during the COVID-19 pandemic
Comparators	*Not Comparators*	
Outcomes	Knowing the description of the needs of nurses during the pandemic and setting nurse schedules during the COVID-19 pandemic	Not discussing the needs of nurses during the COVID-19 pandemic
Study design and publication type	*Cross sectional study, systematic review , qualitative research*	*Quasi-experimental studies*
Publication years	*Post-2019*	*Pre-2019*
Language	English	Languages other than English and Indonesian

RESULT

The results of the database search strategy were 423 articles were obtained, but 413 articles were issued, on the grounds that they were not in line with the objectives study and find Pat double publication article. There are 10 articles that meet the inclusion criteria of all the articles that have been identified.

Table 3
List of journals included in the review

No.	Author and year	Title	Purpose	Method (Design, Population, Sample, Instrument)	Results
1.	Liu et al., (2020)	*Emergency management of nursing human resources and supplies to respond to coronavirus disease 2019 epidemic*	To introduce emergency management of nursing human resources and large general hospital supplies when facing the coronavirus disease 2019 (COVID-19) outbreak.	**Method :** *Research article*	Emergency management of nursing human resources and material resources for Covid-19 hospitals was successful. But some shortcomings were identified as well, which indicated that the hospital needed to establish an efficient emergency management system, and pay attention to the practice of emergency nursing plans to increase the capacity to cope in public health emergencies.
2.	Wang et al., (2020)	*Contingency management strategies of the Nursing Department in centralized rescue of patients with coronavirus disease 2019*	This article aims to summarize a series of Department of Nursing contingency management strategies in the centralized treatment of patients with coronavirus disease 2019 (COVID-19) .	**Methods :** *Research article*	Summarizing a series of contingency management strategies from the Department of Nursing in the centralized treatment of patients with coronavirus disease 2019 (COVID-19).
3.	Buheji & Buhaid, (2020)	*Nursing Human Factor During COVID-19 Pandemic*	This article aims to determine the effect of the COVID-19 pandemic on the capacity of nurses to provide services to infected patients with minimal risk.	**Methods:** Literature review	This study made two main contributions. From a theoretical perspective, this study highlights how the specific dimensions of the human factor can help increase the capacity of nurses and their availability, therefore their reliability during a dynamic and complex pandemic such as COVID-19. From practical implications, this research can help prepare nurses for the upcoming pandemic with better overall productivity effectiveness that will reduce the suffering of nurses, while minimizing risks and most of all deaths.
4.	Huang, Lin, Tang, Yu, & Zhou, (2020)	*Special attention to nurses' protection during the COVID-19*	Because nurses have a high vulnerability to COVID-19, it is necessary to develop hospital-specific protocols to reduce the	**Method :** Editorial Article	COVID-19 is a highly contagious disease, hospital-associated virus transmission remains an enormous threat to healthcare workers, and nurses are at the forefront of care

		epidemic	risk of nurses' infection in interactions with COVID-19 patients		and are therefore more susceptible to infection. We believe that flexible and customizable policies and protocols play an important role in reducing nosocomial infections.
5.	Zhang et al., (2020)	*Nurses reports of actual work hours and preferred work hours per shift among frontline nurses during coronavirus disease 2019 (COVID-19) epidemic: A cross-sectional survey*	To analyze actual and preferred work hours per shift from nurse reports among frontline nurses fighting the COVID-19 epidemic and to explore factors influencing nurse reported hours of choice.	**Design :** Cross-sectional survey **Methods :** Quantitative and qualitative **Population :** All nurses who treat patients in 10 hospitals in China **Sample :** 109 nurses. **Instrument :** Questionnaire with open-ended questions.	The results showed that there was a gap between actual working hours and nurses reporting preferred working hours. A total of 109 nurses responded to the survey. The actual shift length (5 hours) exceeds the nurse's preferred working hours (4 hours). 66 nurses out of 109 nurses considered 4 hours to be the preferred number of hours worked per shift.
6.	Kluger et al., (2020)	*COVID-19 pandemic*	thelesser nosocomial in settings where personal protective equipment is imperfect or unavailable.	**Methods:** *Research article*	In all of our simulations, a lengthy rotation of doctors and nurses of 1-3 days led to a higher team failure rate. Shifting 12 vs. 8 hour nursing and avoiding surprising doctor rotations also reduced the likelihood of team failure.
7.	Mascha, Schober, Schefold, Stueber, & Luedi (2020)	*Staffing With Disease-Based Epidemiologic Indices May Reduce Shortage of Intensive Care Unit Staff During the COVID-19 Pandemic*	Studying the dynamics of staff drop out from time to time with different scheduling strategies	**Methods:** This study used publicly available epidemiological data on COVID-19. Pandemic-	adapted staff significantly reduced labor shortages, and the effect increased as the likelihood of infection increased. Maximum effect was observed at week 4 for each infection probability with staff reductions of 17%, 32%, and 38% for infection probabilities of 0.10, 0.25, and 0.40, respectively.
8.	Raurell-Torredà, (2020)	*Management of ICU nursing teams during the COVID-19 pandemic*		**Method :** Editorial Article	For a level III care center the ratio will be 1 patient to 1 nurse; for level II centers 1.6 patients per nurse and for level I centers 3 patients for one nurse.

| 9. | Seccia, (2020) | *The Nurse Rostering Problem in COVID-19 emergency scenario* | Provide health facilities with a flexible mathematical formulation to schedule nurse shifts in scenarios with insufficient number of nurses by introducing the possibility for nurses to work more than one shift per day . | **Method :** *Research article* | Numerical results on synthetic problems demonstrate the effectiveness of the framework and its ability to solve in a short time the scheduling problem under consideration. All proposed formulations are described and implemented. The resulting framework is available as an opensource tool on github to assist all healthcare facilities in managing nurse shifts during this emergency period. |
| 10. | Zucchi, Iori, & Subram anian, (2020) | *Personnel scheduling during the Covid-19 pandemic* | Determining a schedule that seeks to meet contractual employee working time | **Method :** *Research article* | formulation *Mixed integer linear programming* (MILP)proposed for the scheduling problem which is solved by using the *open-source*, namely CBC from COIN-OR. |

These articles discuss the emergency management of nursing human resources in the face of the COVID-19 outbreak, the effect of the COVID-19 pandemic on the capacity of nurses to provide services to infected patients with minimal risk, the model for the rotation of the nurse inpatient rotation, actual working hours and hours of work. preferred work per shift from nurse reports among frontline nurses fighting the COVID-19 epidemic, dynamics *drop out* over time and methods of scheduling health workers using mathematical formulations. All articles written in English, three out of ten articles reviewed are *research articles*. one *literature review*, one cross-sectional-correlation study, one editorial article and one study using epidemiological data.

The ten articles reviewed, two research articles explored the management of nursing human resources when dealing with the 2019 coronavirus disease (COVID-19) outbreak, as well as the nursing department's contingency management strategy in patient-centred treatment with coronavirus disease 2019 (COVID-19) (Liu et al. , 2020)(Wang et al., 2020). One literature review article describes the effect of the COVID-19 pandemic on the capacity of nurses to provide services to infected patients with minimal risk (Buheji & Buhaid, 2020). Two editorial articles explore hospital-specific protocols to reduce the risk of nurse infection in interactions with COVID-19 patients (Huang, Lin, Tang, Yu, & Zhou, 2020) and ICU care team management during the COVID-19 pandemic (Raurell-Torreda, 2020).

One cross-sectional study explored actual and preferred hours worked per shift from nurse reports among frontline nurses fighting the COVID-19 epidemic as well as exploring factors influencing nurse reported preferred hours of work (Zhang et al., 2020). The cross-sectional study conducted by Zhang et al., (2020) consisted of 109 nurses as a sample. The questionnaire used by Zhang et al. is a questionnaire with open-ended questions in Chinese. The contents of the questionnaire include the basic characteristics of nurses (gender, age, professional position, educational background, position, days of care for patients with COVID19), actual working hours per shift, nurses reporting preferred

working hours per shift and reasons or factors affecting preferred working hours .

One research article explored models of multiple inpatient rotation schedules of physicians and nurses so as to determine patterns associated with optimal labor preservation and lower nosocomial infections in settings where personal protective equipment is imperfect or unavailable (Kluger et al. , 2020). Two other research articles discuss the method of scheduling health workers using a flexible mathematical formulation to schedule shifts (Seccia, 2020) (Zucchi, Iori, & Subramanian, 2020). One epidemiological study describes the dynamics of staff drop out over time with different scheduling strategies (Mascha, Schober, Schefold, Stueber, & Luedi, 2020)

DISCUSSION

1. **Determining the number of nurses and the ratio of nurses to patients**

Success in providing a complete service involves human resources. Among the human resources directly involved in providing services to patients are nurses. The number of nurses is the most dominant among other human resources. This is also supported by the statement that nurses are a large proportion of staff in hospitals, it is estimated that around 75% of personnel are nurses. Seeing such a large percentage in nursing services, nursing staff can be said to be assets for hospitals in improving the quality of health services. In addition, nursing services provide 24 hours full service to patients, which can affect the quality felt by patients.

According to Liu et al., (2020) there are several effective management steps to respond to an epidemic, namely:

a. The epidemic control leadership team formulates appropriate systems and emergency plans in advance and ensures that nursing work is carried out in an orderly manner.

b. The third level echelon of nurses was established beforehand to ensure adequate preparation of the workforce. The efficiency of the nursing staff is improved by empowering the head nurses in various departments. This approach prevents blind selection by the Department of Nursing during integrated deployment.

c. Magnetic hospital management ideas are followed to improve cohesiveness. Nurse leaders work on the front lines to act as role models and mentors, evoke a sense of purpose and responsibility in nurses, and activate the nurse's proactive spirit.

d. Equipment and materials for the first line should be in sufficient stock without wastage.

e. Periodic rotation of first-line nursing staff maintains a model of combining novice and advanced staff. This model ensures that first-line nursing staff can get adequate rest ensuring the quality and safety of new nurses in the outpatient clinic or isolation ward.

According to Wang et al., (2020) adequate human resources are the basis for epidemic prevention and control. In response to the mobilization of the nursing department, all nurses volunteered to work on the front lines. Nursing staff are allocated according to clinical classification and number of patients. The nurse-patient ratio is 1:5 to 8 per shift on the ward for suspected cases, or confirmed mild and moderate patients, 1:3 to 5 on the ward for

severe patients, 1:1 to 3 in the ICU. A nurse-patient ratio of 1:1 per shift should be guaranteed for patients who are ventilated in the prone position, with invasive mechanical ventilation and hemodynamic instability. The group work system is implemented, and each shift is assigned by the group leader according to the patient's condition, and the division of nurse actions. According to direct care actions and indirect care positions, direct care refers to the work of nurses who directly contact patients in the isolation ward and are involved in clinical nursing. Indirect care refers to the work of nurses who are involved in additional work such as handling medical orders and material management in isolation wards. Nursing nurses work directly on 4-hour shifts, while nurses do not directly work on 8-hour shifts. At the same time, a backup nurse is reserved in case of an emergency.

WHO (2020) estimates the required number of each type of health worker based on the target number of mild, moderate, severe and critical patients per day. Patients with category require 1 nurse for 3 patients, moderate category 1: 0.9 and severe and critical category 1: 0.6.

According to Raurell-Torreda (2020) for a level III care center the ratio would be 1 patient to 1 nurse; for level II 1.6 patients per nurse and for level I 3 patients for one nurse. According to the EfCCNa *(European federation of Critical Care Nursing associations)* (2020) as a consequence of the pandemic, one of the recommendations made by Italian nurses, is to redefine the nurse:patient ratio of 1:1 and when faced with high-risk procedures that require high concentration , the ratio even has to be 2: 1.

2. **Arrangement of nurse shift schedules during the COVID-19 pandemic**

Along with the development of the increasing number of COVID-19 , hospitals are faced with a shortage of health workers, especially nurses to handle COVID-19 patients. The *ratio* of patients to nurses is out of *balance*, causing extreme fatigue, and causing the death of several health workers, due to being infected with the COVID-19 by patients being treated (Ministry of Home Affairs Work Team, 2020). Experience in China and Italy shows that health workers are especially vulnerable to COVID-19 infection in Italy, 20% of health workers are infected with COVID-19 at the peak of the disease spread (The Lancet, 2020).

The results of the review described by Kluger et al., (2020) stated that to prevent COVID-19 infection among health workers, especially nurses, it is very important to maintain the safety of nurses who are health care providers. One way to reduce infection rates is to optimize staff scheduling to minimize interactions between health workers and limit the group of patients exposed to health workers.

In order to prevent nurses from being infected with the COVID-19 by patients, it is necessary to staff. Arrangements for staffing can be in the form of setting the qualifications of the nurses needed, the nursing care system, and nurse self-isolation system. Scheduling is closely related to the method of care used. Innovation about effective scheduling is important for nursing managers (Krisnawati, 2017). Patient care in the isolation room uses complete PPE, this can trigger fatigue, causing nurses to be unable to meet their physiological needs, such as drinking, eating, toileting and nurses also feel short of breath due to using PPE for too long (Rahmi, 2020).

The results of research conducted by Zhang et al., (2020) stated that 66 nurses out of 109 nurses considered four hours as the preferred number of working hours per shift. nurses consider four hours to be the preferred length of work per shift as

recommended by the PRC National Health Commission. Four hours is preferred because it can reduce the risk of infection and maintain physical strength. Patterson et al., (2018) showed that shorter shift durations were more beneficial for reducing fatigue and fatigue-related risks than longer shift durations.

There are several factors that cause nurses to choose a four hour shift. Five themes emerged covering circumstances, personal protective equipment, nurses' physical and psychological needs, safety and nurses' work intensity. Circumstances indicate that different units and rooms have different requirements. Some nurses stated that it is ideal to adjust working hours according to different circumstances (unit and post). The main problem with personal protective equipment is that nurses have to spend a lot of time wearing them, and the mist droplets that appear on the goggles can obstruct the nurse's vision. 4 hour shifting arrangement can be a solution as an effective time for the use of PPE (Zhang et al., 2020).

A survey of frontline doctors and nurses in West Africa by Den Boon et al. found that use of personal protective equipment resulted in sweating and dehydration among healthcare staff, and prolonged use of goggles caused fog to obscure their vision, thus affecting their clinical practice (Den Boon, Vallenas, Ferri, & Norris, 2018).

This is different from the review conducted by Huang et al., (2020) who conducted a survey of 78 nurses and tried 3 shift schedules, the first 4 hours of work in the morning and 4 hours of work in the afternoon with 8 hour intervals, the second 6 hours of work. hours of continuous work and a third 6 hours of continuous work, with subsequent nursing shifts overlapping 1 hour at the end of the shift.

The results showed that 74% of nurses favored the third schedule for the following reasons: wearing and removing PPE twice a day increased the consumption of medical resources, frequent switching between contaminated and clean areas increased the risk of infection, frequent complicated procedures putting on and removing PPE increased the burden their mental health, working for 6 hours continuously pushes their physiological limits, as they cannot go to the bathroom when wearing PPE in isolation area, and they often feel dizzy or tired at the end of work and having 1 hour overlap between shifts provides flexibility and facilitate handovers, which reduces nurses' mental stress and possible side effects. In addition, the 1-hour overlap allows two nurses to work together on tasks that are difficult for one person to complete, such as administering injections and drawing blood, changing bed linen, and disinfecting terminal rooms.

Huang et al., (2020) stated that there are several special precautions that can be taken to protect nurses during the COVID-19 pandemic, firstly providing intensive education and training for nurses, providing counseling, avoiding unnecessary contact with patients and setting shift schedules. scientific sense to nurses.

CONCLUSION

The results of a literature study of 423 articles obtained only 10 articles that met the inclusion criteria. The results of the study show that nurses are a large proportion of personnel in hospitals, it is estimated that around 75% of personnel are nurses. As the number patients COVID-19 continues to increase, hospitals are faced with a shortage of health workers, especially nurses, to treat COVID-19 patients. The results showed that 74% of nurses favored the third schedule for

the following reasons: wearing and removing PPE twice a day increased the consumption of medical resources, frequently moving between contaminated and clean areas increased the risk of infection, often going through complicated procedures putting on and removing PPE increased the burden. their mental, working for 6 hours constantly pushes their physiological limits, because they cannot go to the bathroom when wearing PPE in isolation   area.

REFERENCES

News One. (2020). Bogor Regency Lack of Medical Personnel. Retrieved from https://www.beritasatu.com/megapolitan/623281-kabupaten-bogor-kekurangan-

Tenaga-medis Buheji, M., & Buhaid, N. (2020). Nursing Human Factor During COVID-19 Pandemic. *International Journal of Nursing Science, 2020*(1), 12–24. https://doi.org/10.5923/j.nursing.20201001.02

COVID19.GO.ID. (2020). Task Force for the Acceleration of Handling COVID-19. Retrieved from https://covid19.go.id/

Den Boon, S., Vallenas, C., Ferri, M., & Norris, SL (2018). Incorporating health workers' perspectives into a WHO guideline on personal protective equipment developed during an Ebola virus disease outbreak. *F1000Research, 7*(0), 1–17. https://doi.org/10.12688/f1000research.12922.1

Dhamanti, I. (2020). Why are Hospitals Overwhelmed with Corona and What Are the Impacts? Kompas.com. Retrieved from https://www.kompas.com/sains/read/2020/05/08/130400523/why-rumah-sakit-kewalahan-hadapi-corona-dan-apa-impaknya-

Edgar, R. (2020). Malang City Hospital Lacks Medical Personnel to Handle Patients During the Corona Pandemic, There are Only 228 People. Retrieved from https://jatim.tribunnews.com/2020/05/05/rsud-kota-malang-kekurangan-energi-medis-tangani-patient-di-masa-pandemi-corona-only-ada-228-orang

Huang , L., Lin, G., Tang, L., Yu, L., & Zhou, Z. (2020). Special attention to nurses' protection during the COVID-19 epidemic. *Medicine & Science in Sports & Exercise, 49*(5S), 354. https://doi.org/10.1249/01.mss.0000517849.21762.33

Julia, P., Rambe, AJM, & Wahyuni, D. (2015). Analysis of Nurse Needs Based on Workload Using Workload Indicator Staff Need (Wisn) and Work Sampling Methods. *E-Journal of Industrial Engineering FT USU, 5*(2), 22–25. Retrieved from https://media.neliti.com/media/publications/219688-analysis-needs-energi-perawat-berdas.pdf

Ministry of Health of the Republic of Indonesia. (2020). Guidelines for the Prevention and Control of COVID-19. *COVID-19 Preparedness Guidelines*, 0–115. Retrieved from https://www.kemkes.go.id/resources/download/info-terkini/COVID-19 official document/REV-04_Pedoman_P2_COVID-19_ 27 March2020_Tanpa TTD.pdf.pdf

Ministry of Health Republic of Indonesia. (2020). Technical Instructions for Personal Protective Equipment (PPE) in Facing the COVID-19 Outbreak, (April), 1–35.

Kluger, DM, Aizenbud, Y., Jaffe, A., Aizenbud, L., Parisi, F., Minsky-Fenick, E., … Kluger, Y. (2020). Impact of healthcare worker shift scheduling on workforce preservation during the COVID-19 pandemic. *MedRxiv*, 2020.04.15.20061168. https://doi.org/10.1101/2020.04.15.20061168

Krisnawati, KMS (2017). The Four Pillars of Professional Nursing Methods, 1–14. Retrieved   from

https://simdos.unud.ac.id/uploads/file_pe
nelitian_1_dir/5426925f4d6aaa4250af87
c2a50761bd.pdf

Liu, Y., Wang, H., Chen, J., Zhang, X., Yue, X., Ke, J. , … Peng, C. (2020). Emergency management of nursing human resources and supplies to respond to coronavirus disease 2019 epidemic. *International Journal of Nursing Sciences*, *7*(2), 135–138. https://doi.org/10.1016/j.ijnss.2020.03.01 1

Mantalean, V. (2020). PPNI: 20 Nurses in Indonesia Died in Duty to Serve Covid-19 Patients Kompas.com. Retrieved from https://megapolitan.kompas.com/read/20 20/05/19/05582081/ppni-20-perawat-di-indonesia-meninggal-dunia-dalam-tugas-melayani-pasien?page=2

Mascha, EJ, Schober, P., Schefold, JC, Stueber, F., & Luedi, MM (2020). Staffing with disease-based epidemiologic indices may reduce shortage of intensive care unit staff during the COVID-19 pandemic. *Anesthesia and Analgesia*, *XXX*(Xxx), 1–7. https://doi.org/10.1213/ANE.000000000 0004849

Patterson, PD, Runyon, MS, Higgins, JS, Weaver, MD, Teasley, EM, Kroemer, AJ, … Martin-Gill, C. (2018). Shorter Versus Longer Shift Durations to Mitigate Fatigue and Fatigue-Related Risks in Emergency Medical Services Personnel and Related Shift Workers: A Systematic Review. *Prehospital Emergency Care*, *22*(S1), 28–36. https://doi.org/10.1080/10903127.2017.1 376135

Rahmi, A. (2020). Keselamatan Perawat di Masa Pandemi Covid-19 Halaman all - Kompasiana. Retrieved July 3, 2020, from https://www.kompasiana.com/annisarah mi1705/5ecd07a5097f3650d14ec4a3/kes elamatan-perawat-di-masa-pandemi-covid-19?page=all#section1

Raurell-Torredà, M. (2020). Management of ICU nursing teams during the COVID-19, *31*(2), 49–51. Retrieved from https://www.elsevier.es/en-revista-enfermeria-intensiva-english-edition--430-avance-resumen-management-icu-nursing-teams-during-S2529984020300197

Seccia, R. (2020). The Nurse Rostering Problem in COVID-19 emergency scenario, 1–17. Retrieved from http://www.optimization-online.org/DB_FILE/2020/03/7712.pdf

The Lancet. (2020). COVID-19: protecting health-care workers. *The Lancet*, *395*(10228), 922. https://doi.org/10.1016/S0140-6736(20)30644-9

Tim Kerja Kementerian Dalam Negeri. (2020). Pedoman Umum Menghadapi Pandemi Covid-19 Bagi Pemerintah Daerah : Pencegahan, Pengendalian, Diagnosis dan Manajemen, *53*(9), 1689–1699. Retrieved from https://www.kemendagri.go.id/document s/covid-19/BUKU_PEDOMAN_COVID-19_KEMENDAGRI.pdf

Wang, H., Feng, J., Shao, L., Wei, J., Wang, X., Xu, X., … Liang, T. (2020). Contingency management strategies of the Nursing Department in centralized rescue of patients with coronavirus disease 2019. *International Journal of Nursing Sciences*, (January). https://doi.org/10.1016/j.ijnss.2020.04.00 1

WHO. (2020). Covid-19 Heath Workforce Estimator User Guide. Retrieved from https://www.euro.who.int/de/health-topics/Health-systems/pages/strengthening-the-health-system-response-to-covid-19/surge-planning-tools/health-workforce-estimator-hwfe

World Health Organization. (2020). Clinical Care Severe Acute Respiratory Infection: Toolkit, 196. Retrieved from https://apps.who.int/iris/bitstream/handle /10665/331736/WHO-2019-nCoV-SARI_toolkit-2020.1-eng.pdf?sequence=1&isAllowed=y

Zhang, X., Jiang, Z., Yuan, X., Wang, Y., Huang, D., Hu, R., … Chena, F. (2020).

Nurses reports of actual work hours and preferred work hours per shift among frontline nurses during coronavirus disease 2019 (COVID-19) epidemic: A cross-sectional survey, (January). https://doi.org/https://dx.doi.org/10.1016%2Fj.ijnurstu.2020.103635

Zucchi, G., Iori, M., & Subramanian, A. (2020). Personnel scheduling during Covid-19 pandemic, 1–16. Retrieved from http://www.optimization-online.org/DB_FILE/2020/05/7794.pdf