

Juridical Analysis of Management Hospital Liquid Waste in Perspective Environmental Health Law

By

Yani Kamasturyani

Department of Health science, Sekolah Tinggi Ilmu Kesehatan Mahardika, Indonesia

Indra Surya Permana

Department of Economic Science, Universitas Nahdlatul Ulama Cirebon, Indonesia

Taufik Hidayat

Department of Computer Engineering, Universitas Wiralodra, Indonesia

Corresponding author: Taufik Hidayat

Abstract

The hospital as a health service and health care provider really closely related with various matters illness and disease. It has responsibility to provide safe health services and protection to the community both patients and their families. The aim of this study is to conduct a juridical analysis of hospital liquid waste management in the perspective of environmental health law. This qualitative research uses library research techniques and field research using empirical normative juridical methods, normative juridical methods with secondary legal materials. The object of this research is the liquid waste management at Ciremai hospital as government Hospital run by Indonesian military force that located in Cirebon, West Java, Indonesia. Data collected by interview and secondary data of liquid waste management documents between October 2021 to November 2021. The result of the study was that the liquid waste management at Ciremai Hospital used a Wastewater Treatment Plant (WWTP) that operates for 24 hours / day, with quality standards referring to the Minister of Environment Regulation No. 5 of 2014 on Wastewater Quality Standards for Businesses and / or Activities of Health Service Facilities Appendix XLIV A (for health care facilities that conduct domestic liquid waste treatment) and B (for health care facilities which performs the sewage treatment of toxic hazardous materials).

Keywords: Juridical Analysis, Hospital Liquid Waste Management, Environmental Health Law

Introduction

As a public facility referred to Government Regulation Number 47/2021 concerning the Implementation of the Hospital Field, the hospital served as a place for sick people (patients) and healthy people (patient families) that allowed physical contact between humans with the environment (du Toit & Kotzé, 2022), (Salimifard et al., 2022). As for that, it must guarantee a clean and healthy environment as much as possible as well as to minimize the occurrence of diseases obtained from the hospital. This brought up waste management that resulted from various activities in the hospital (Wadoo et al., 2021).

Based on Government Regulation No. 18/1999 Jo.PP 85/1999, waste is residual from a human activities. In other words, waste is remnants of an activity that is no longer useful or economically valuable. Waste can have a negative impact on society if not managed properly (Zendeli, 2011). In carrying out its functions, the hospital used wide range of materials, facilities and equipment contained hazardous and toxic materials that can cause health

problems both physical and environmental (Colston et al., 2022). Waste generated from the activities of this hospital included solid waste, hazardous and toxic material waste (B3), liquid waste and gas waste that could also pollute the environment (Kotzé & Kim, 2019), (du Toit & Kotzé, 2022).

Environmental health according to the World Health Organization (WHO) is an ecological balance that must exist between humans and the environment in order to ensure the healthy state of humans (Cardona et al., 2021). Meanwhile, according to Government Regulation No. 66 of 2014, environmental health is an effort to prevent diseases and / or health disorders from environmental risk factors to realize healthy environmental quality from both physical, chemical, biological, and social aspects (Cardona et al., 2021).

Healthier environments could prevent almost one quarter of the global burden of disease. It included clean air, stable climate, adequate water, sanitation and hygiene, safe use of chemicals, protection from radiation, healthy and safe workplaces, sound agricultural practices, health-supportive cities and built environments, and a preserved nature are all prerequisites for good health which are carried out on residential environments, workplaces, recreation areas, and public places and facilities (Wadoo et al., 2021), (Thaler, Attems, & Fuchs, 2022). Health efforts carried out by hospitals focus on preventive maintenance, improvement of health (promotive) treatment (curative) and health recovery (rehabilitative) which is held thoroughly, integrated and continuously (Dimiyati et al., 2021), (Simões, Fronteira, & Augusto, 2021).

The hospital's environmental health arrangement aims to realize a healthy environmental quality for the hospital, both from physical, chemical, biological, and social aspects, protecting the human resources of hospitals, patients, visitors, and the community around the hospital from environmental risk factors and realizing environmentally friendly hospitals (Regulation of the Minister of Health of the Republic of Indonesia Number 7/2019 on Hospital Environmental Health) (Osman et al., 2019). The purpose of this study is to conduct an analysis of the hospital's liquid waste management in the perspective of environmental health law (Salimifard et al., 2022), (Dimiyati et al., 2021).

Research Method

Methodology Qualitative

This qualitative research uses library research techniques and field research (Wagner et al., 2020), (McDowell, Engel, & Daftary, 2019). Field research is conducted in empirical juridical terms, i.e. research methods for obtaining primary data from data in the field on environmental health law regulations are associated with liquid waste management behavior data in hospitals (Gorea et al., 2010). In addition to empirical juridical methods, normative juridical methods are also used with secondary legal materials. The object of this research is the liquid waste management at Ciremai hospital. The study was conducted from October 2021 to November 2021. Data collection techniques using interview methods. Interviews were conducted on the unit that handles liquid waste management. Data analysis techniques using descriptive analytics with analysis units consist of: types of liquid waste produced by Ciremai hospital, liquid waste management activities at Ciremai hospital, and legal aspects in liquid waste management.

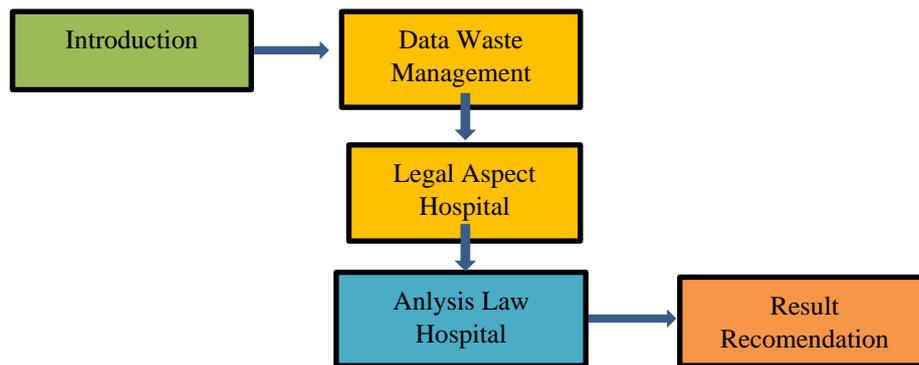


Figure 1. Philosophy of Qualitative Research (Whiffin et al., 2022)

Result and Discussion

The implementation of liquid waste management at Ciremai Hospital Cirebon is carried out by the Environmental Sanitation Unit and already has WWTP. Ciremai Hospital Cirebon conducts the process of processing both domestic liquid waste and liquid waste containing hazardous and toxic materials (B3). The results of liquid waste treatment at Ciremai Hospital Cirebon refer to the Regulation of the Minister of Environment of the Republic of Indonesia No. 5 of 2014 concerning Wastewater Quality Standards for Businesses and/ or Activities of Health Service Facilities Appendix XLIV A (for health care facilities that conduct domestic liquid waste treatment) and B (for health care facilities that conduct sewage treatment of toxic hazardous materials).

In carrying out the hospital's liquid waste management, the environmental sanitation unit makes a work program of activities to be carried out. Clarity of all figures is of the utmost importance. If the final version is not prepared in a format or does not include all the details, the publication process will be delayed.

Table 1. Environmental Sanitation Unit Work Program Ciremai Hospital Cirebon Year 2021

Activity Details Purpose	Goal	Implementation
Liquid Waste Quality Check	Quality check of contaminated wastewater.	Sampling and testing of wastewater quality by Tirtawening Bandung laboratory every month.

The Environmental Sanitation Union made a quarterly report related to Liquid Waste Management at Ciremai Hospital Cirebon. It is intended that the work program can be evaluated every three months.

1. In the aspect of planning, study the licensing of liquid waste management.
2. In the aspect of organizing, look at the organizational structure and learning related to the duties of each officer who conducts liquid waste management.
3. In the implementation aspect, look at the process of sampling wastewater at the Wastewater Treatment Plant (WWTP) in the inlet pool and outlet by the Tirtawening Laboratory of Bandung City which has been accredited by KAN accompanied by the Cirebon City Environment Office.
4. In the aspect of supervision, participate in monitoring the discharge of wastewater produced every day.
5. In the aspect of evaluation, study and provide input on the evaluation report of the liquid waste management work program of Ciremai Hospital Cirebon semester I 2021.

Hospital liquid waste before being discharged into a body of water, needs to be accommodated and treated first. It aims to preserve the surrounding environment.

Table 2. Liquid Waste Management Activity Program Ciremai Hospital Cirebon

Activity Name	Purpose	Goal	Implementation	Evaluation	Recording and Reporting
Main Activities: Liquid Waste Management in Hospitals Activity Details: 1. Take a sample of the physical, chemical and microbiological quality of water from liquid waste. 2. Conduct the delivery of samples of physical, chemical and microbiological quality examination of water from liquid waste. 3. Perform a sample examination of the physical, chemical and microbiological quality of water from liquid waste. 4. Perform an analysis of the results of examination of the physical, chemical and microbiological quality of water from liquid waste.	General Purpose: The liquid waste management in accordance with applicable legislation. Specific objectives: <ul style="list-style-type: none"> • Create a safe and secure work environment. • Prevent nosocomial disease • Increase knowledge to employees and related parties in handling waste management. 	Liquid waste treatment has been detected and monitored	The Environmental Health Unit inspects liquid waste to the Bandung City Tirtawening PDAM Laboratory which has been accredited by KAN every 1 (one) month with characteristics in accordance with the Decree of the Minister of Environment and Forestry of the Republic of Indonesia Number 5 of 2014 concerning Wastewater Quality Standards.	Evaluation of liquid waste management program at Ciremai Hospital Cirebon is carried out quarterly and semester to see the achievement of targets and planning of next year's activities.	1. The Environmental Health Unit makes reports, analyzes, evaluates and follow-ups and makes recommendations to the Head of Ciremai Hospital Cirebon. 2. Reporting the results of evaluation activities for the implementation of liquid waste management work program activities is carried out regularly every quarter and semester by the Environmental Sanitation Unit of Ciremai Hospital Cirebon to the Head of Hospital

Liquid waste management at Ciremai Hospital Cirebon using WWTP. There are 4 waterways from each room of Ciremai Hospital Cirebon, namely:

- a. Line 1: IGD, Outpatient (Poly Clinic), Wira Room, Hemodialysis Room, New Wira Room, Puspa Room, Widya Room, Primary room and Pratiwi
- b. Line 2: Yuda Room, Kartika Room, Super VIP, and Mortuary
- c. Line 3: Laboratory, Radiology, ICU, OK, and Dating Room
- d. Line 4: *Laundry* and Nutrition Installation

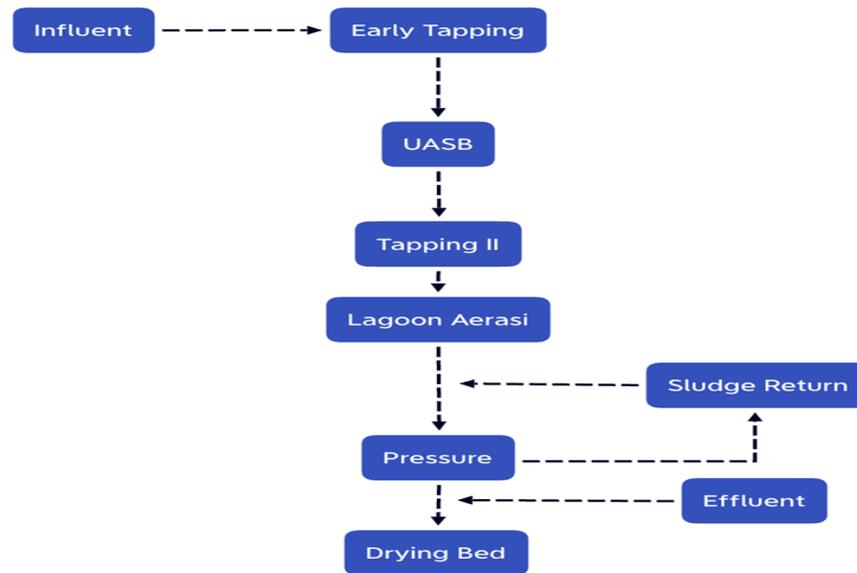


Figure 2. Flow Sheet of Liquid Waste Treatment

Table 3. Report of Wastewater Quality Testing Results at Ciremai Hospital Cirebon November 2021

Parameters	Unit	Quality Standards	Test Results	
			I	II
Physics				
Temperature	°C	38	30,7	30,9
Total Dissolved Solids (TDS)	mg/L	2.000	1.672,00	1.196,00
Total suspended Solids (TSS)	mg/L	30	134,00	38,00
Chemistry				
Ph	-	6,0 - 9,0	6,81	7,55
Dissolved Iron (Fe)	mg/L	5	<0.1680	<0.1680
Dissolved Manganese (Mn)	mg/L	2	0,0209	0,0593
Barium (Ba)*	mg/L	2	<0.2602	<0.2602
Copper (Cu)*	mg/L	2	<0.0092	<0.0092
Seng (Zn)*	mg/L	5	<0.0162	0,0189
Chrome Hexavacent (Cr-V)	mg/L	0,1	0,0472	0,0179
Total Chrome (Cr-T)	mg/L	0,5	0,0400	0,0598
Cadmium (Cd)*	mg/L	0,05	<0.0192	<0.0192
Mercury (Hg)*	mg/L	0,002	<0.0004	<0.0004
Lead (Pb)*	mg/L	0,1	<0.0538	<0.0538
Arsen (AS)*	mg/L	0,1	<0.0021	<0.0021
Selenium (Se)*	mg/L	0,05	<0.0013	<0.0013
Nickel (Ni)*	mg/L	0,2	<0.1858	<0.1858
Cobalt (Co)*	mg/L	0,4	0,0259	0,0049
Cyanide (CN-)*	mg/L	0,05	<0.0050	<0.0050
Sulfide (S ²⁻)	mg/L	0,05	5,9817	0,4220
Flourida (F)	mg/L	2	0,2381	0,1559
Free Chlorine (Cl ₂)	mg/L	1	0,89	0,30
Free Ammonia (NH ₃ -N)	mg/L	1	2,6404	2,0526
Nitrate (NO ₃ -N)	mg/L	20	37,7392	18,2068
Nitrite (NO ₂ -N)	mg/L	1	0,3383	0,1501
Detergent (MBAS)	mg/L	5	0,9372	0,3660
Phenol	mg/L	0,5	0,0166	0,0055
BOD	mg/L	50	131,54	61,92
COD	mg/L	80	424,3378	95,2632
Oil and Fat	mg/L	10	14,00	3,00
Microbiology				
Colifrom	Jml/100 mL	5.000	4.900	1.600

Based on the results of activities at TK III Hospital 03.06.01, in the hospital's liquid waste management activities, the management aspects carried out are as follows:

Table 3. Aspects of Liquid Waste Management at Ciremai Hospital Cirebon

Planning	Organizing	Implementation	Monitoring	Evaluation
a. Preparation of work programs related to Liquid Waste Management	a. Head of Environmental Sanitation Unit	a. Recording WWTP water discharge	a. Conduct surveillance of WWTP channels and control tubs	Make reports, analyze, evaluate and make recommendations and follow-up related to liquid waste management programs and planning activities next year.
b. Preparation of Standard Operating Procedures (SPO) on liquid waste management procedures	b. Staff of Environmental Sanitation Unit	b. Make changes and improvements to WWTP facilities and infrastructure	b. Monitoring WWTP water discharge	
c. Create a schedule for channel surveillance and WWTP control tubs	c. Staff K3RS	c. Draining the WWTP tub every 1 to 3 months	d. Sampling the physical, chemical and microbiological quality of water from liquid waste every month	
d. Make requests for liquid waste management tools and materials				

Ciremai Hospital Cirebon in carrying out its operational activities produces liquid waste both domestic waste and clinical waste from health care activities. Liquid waste generated from hospital activities can contain hazardous, infectious and radioactive materials that can cause problems for the environment as well as public health. So before being discharged into a body of water, wastewater needs to be accommodated and treated first. It aims to preserve the surrounding environment. Based on the research has been carried out and from the data obtained, Ciremai Hospital Cirebon has conducted liquid waste management in accordance with the Regulation of the Minister of Health of the Republic of Indonesia Number 7 of 2019 on Hospital Environmental Health, namely by using a Wastewater Treatment Plant (WWTP). Liquid waste management activities using WWTP at Ciremai Hospital Cirebon are carried out by the Environmental Sanitation Unit with a resource of 10 people. WWTP at Ciremai Hospital Cirebon has been equipped with supporting facilities in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 7 of 2019 on Environmental Health of Hospitals, namely with water sampling tubs, has water discharge measuring instruments, has

an WWTP area safety fence with lighting lights and prohibition boards, the existence of coordinate points both inlets, outlets and outfalls using GPS, as well as safety facilities (first aid) located at WWTP locations. The frequency of sampling of liquid waste at Ciremai Hospital Cirebon has been in accordance with the regulations, namely once every month, and wastewater sampling is carried out at two points, namely in inlet pools and outlets. The liquid waste management using WWTP aims that the liquid waste produced by the hospital in accordance with the quality standards that have been set so as not to pollute the environment when discharged into the water body, in this case the liquid waste of Ciremai Hospital Cirebon which has gone through the process of further treatment will be streamed into the Suba River.

The quality standard that is the reference of Ciremai Hospital Cirebon is the Regulation of the Minister of Environment of the Republic of Indonesia No. 5 of 2014 on Wastewater Quality Standards with physical examination parameters (temperature, TDS, TSS), chemistry (ph., dissolved iron, dissolved manganese, barium, copper, zinc, hexavalent chrome, total chrome, cadmium, mercury, lead, arsenic, selenium, nickel, cobalt, cyanide, sulfide, fluoride, free chlorine, free ammonia, nitrate, nitrite, detergent, phenol, BOD, COD, as well as oil and fat), and microbiological parameters (coliform). Before getting the test results and to find out if the resulting wastewater is appropriate, then in the WWTP outlet pool is given biological indicators in the form of fish. From the results of observations during research activities, fish in live WWTP outlets, then the results of liquid waste management conducted by Ciremai Hospital Cirebon are still within safe limits. Level III Hospital 03.06.01 Ciremai has open channels for rainwater and closed channels for wastewater. There are 4 lines of wastewater from each room located in Ciremai Hospital Cirebon, namely:

- Line 1: IGD, Outpatient (Poly Clinic), Wira Room, Hemodialysis Room, New Wira Room, Puspa Room, Widya Room, Primary room and Pratiwi
- Line 2: Yuda Room, Kartika Room, Super VIP, and Mortuary
- Line 3: Laboratory, Radiology, ICU, OK, and Dating Room
- Line 4: Laundry and Nutrition Installation

Liquid waste from certain sources in hospitals that have special characteristics must be completed with initial processing (pre-treatment) before being channeled to the WWTP. Ciremai Hospital Cirebon has also conducted initial processing (pre-treatment) on liquid waste that has special characteristics such as the presence of oil / fat catcher tubs for nutrition installations and canteens, as well as the presence of detergent processing tubs and chemicals for laundry liquid waste. In addition, the results of developer waste from hospital activities can enter the WWTP channel, while the results of pixer waste from X-rays cannot enter the WWTP and must be treated as B3 waste. WWTP at Ciremai Hospital Cirebon operates for 24 hours per day. Structuring reporting at Ciremai Hospital Cirebon is carried out every three months to the Cirebon City Environment Office. The reporting contains the frequency of waste, the number of parameters tested by the laboratory as well as the quality of liquid waste laboratory test results. The testing of samples of physical, chemical and microbiological quality was conducted by the laboratory of PDAM Tirtawening Kota Bandung, which has been accredited by KAN (National Accreditation Committee).

Ciremai Hospital Cirebon have good liquid waste management that can be summarize as follows :

Planning	1. Preparation of work programs related to Liquid Waste Management.
	2. Preparation of Standard Operating Procedures (SPO) on Liquid Waste Management Procedures.
	3. Create a schedule for monitoring of WWTP channels and control tubs.
	4. Make a demand for liquid waste management tools and materials.
Organizing	1. Head of the Environmental Sanitation Unit.
	2. Staff of the Environmental Sanitation Unit.
	3. K3RS staff.
Actuating (Implementation)	1. Recording WWTP water discharge.
	2. Make changes and improvements to WWTP facilities and infrastructure.
	3. Draining the WWTP tub every 1 to 3 months.
	4. Sampling the physical, chemical and microbiological quality of water from liquid waste every month.
Control (Surveillance)	1. Conduct surveillance of WWTP channels and control tubs.
	2. Monitoring WWTP water discharge.
	3. Control WWTP operating tools.
Evaluation	Make reports, analyze, evaluate and make recommendations and follow-up related to liquid waste management programs and planning activities next year.

Conclusion

Based on research that has been conducted at Ciremai Hospital Cirebon we can concluded that liquid waste management at Ciremai Hospital Cirebon uses Wastewater Treatment Plant (WWTP) which operates for 24 hours a day. It means that they already met the requirement of the regulation standards, i.e The Minister of Environment Regulation No. 5 of 2014 on Wastewater Quality Standards for Businesses and/or Health Service Facility Activities Appendix XLIV A (for health care facilities that conduct domestic liquid waste treatment) and B (for health care facilities that perform sewage treatment) toxic hazardous materials). Other than that, Ciremai Hospital Cirebon already have good Liquid Waste Management including planning, organizing, implementation, surveillance, and evaluation.

References

- Cardona, C., Anand, N. S., Alfonso, Y. N., Leider, J. P., McCullough, J. M., Resnick, B., & Bishai, D. (2021). County health outcomes linkage to county spending on social services, building infrastructure, and law and order. *SSM - Population Health*, 16, 100930. <https://doi.org/10.1016/j.ssmph.2021.100930>
- Colston, D. C., Xie, Y., Patrick, M. E., Thrasher, J. F., Titus, A. R., Elliott, M. R., Levy, D. T., & Fleischer, N. L. (2022). Tobacco 21 laws may reduce smoking and tobacco-related health disparities among youth in the U.S. *Preventive Medicine Reports*, 27, 101762. <https://doi.org/10.1016/j.pmedr.2022.101762>

- Dimiyati, K., Nashir, H., Elviandri, E., Absori, A., Wardiono, K., & Budiono, A. (2021). Indonesia as a legal welfare state: A prophetic-transcendental basis. *Heliyon*, 7(8), e07865. <https://doi.org/10.1016/j.heliyon.2021.e07865>
- du Toit, L., & Kotzé, L. J. (2022). Reimagining international environmental law for the Anthropocene: An earth system law perspective. *Earth System Governance*, 11, 100132. <https://doi.org/10.1016/j.esg.2022.100132>
- Gorea, B. C., Tomuletiu, E. A., Costin, D. M., & Slev, A. M. (2010). Educating law students as good citizens Is the Romanian legal education system ready to fulfill its social mission? *Procedia - Social and Behavioral Sciences*, 2(2), 2927-2931. <https://doi.org/10.1016/j.sbspro.2010.03.442>
- Kotzé, L. J., & Kim, R. E. (2019). Earth system law: The juridical dimensions of earth system governance. *Earth System Governance*, 1, 100003. <https://doi.org/10.1016/j.esg.2019.100003>
- McDowell, A., Engel, N., & Daftary, A. (2019). In the eye of the multiple beholders: Qualitative research perspectives on studying and encouraging quality of TB care in India. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, 16, 100111. <https://doi.org/10.1016/j.jctube.2019.100111>
- Osman, I. H., Anouze, A. L., Irani, Z., Lee, H., Medeni, T. D., & Weerakkody, V. (2019). A cognitive analytics management framework for the transformation of electronic government services from users' perspective to create sustainable shared values. *European Journal of Operational Research*, 278(2), 514-532. <https://doi.org/10.1016/j.ejor.2019.02.018>
- Salimifard, P., Buonocore, J. J., Konschnik, K., Azimi, P., VanRy, M., Cedeno Laurent, J. G., Hernández, D., & Allen, J. G. (2022). Climate policy impacts on building energy use, emissions, and health: New York City local law 97. *Energy*, 238, 121879. <https://doi.org/10.1016/j.energy.2021.121879>
- Simões, J., Fronteira, I., & Augusto, G. F. (2021). The 2019 Health Basic Law in Portugal: Political arguments from the left and right. *Health Policy*, 125(1), 1-6. <https://doi.org/10.1016/j.healthpol.2020.11.005>
- Thaler, T., Attems, M.-S., & Fuchs, S. (2022). Bottom-up innovations in natural hazard risk management in Austria. *International Journal of Disaster Risk Reduction*, 67, 102689. <https://doi.org/10.1016/j.ijdr.2021.102689>
- Wadoo, O., Karim, M. A., ElTorki, Y., Riaz, S., Latoo, J., & Alabdulla, M. (2021). Clozapine prescribing and safety during COVID-19. *Asian J Psychiatr*, 60, 102658. <https://doi.org/10.1016/j.ajp.2021.102658>
- Wagner, M., Rosumeck, S., Küffmeier, C., Döring, K., & Euler, U. (2020). A validation study revealed differences in design and performance of MEDLINE search filters for qualitative research. *Journal of Clinical Epidemiology*, 120, 17-24. <https://doi.org/10.1016/j.jclinepi.2019.12.008>
- Whiffin, C. J., Smith, B. G., Selveindran, S. M., Bashford, T., Esene, I. N., Mee, H., Barki, M. T., Baticulon, R. E., Khu, K. J., Hutchinson, P. J., & Kolias, A. G. (2022). The Value and Potential of Qualitative Research Methods in Neurosurgery. *World Neurosurgery*, 161, 441-449. <https://doi.org/10.1016/j.wneu.2021.12.040>
- Zendeli, F. (2011). Educational reforms and administration of the education in Macedonia. *Procedia - Social and Behavioral Sciences*, 15, 4071-4075. <https://doi.org/10.1016/j.sbspro.2011.04.417>