

Factors Affecting Oxygen Availability

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Abstract

Introduction: Oxygen is a chemical substance needed by patients for treatment and or the healing process. To maintain the availability of oxygen so that it is always in an effective and efficient amount, always try in a safe condition. However, in practice, there are sometimes problems related to availability in the warehouse, such as vacancies. **Methods:** This research is descriptive qualitative research. The informants in this study were 9 people who were obtained using a purposive sampling technique. **Result and Discussion:** The results of this study describe that Human Resources still need to be added, there is a delay in goods from the supplier. Control is hampered and requires more time due to the increase in COVID-19 patients, and the output component, namely the availability of oxygen in the warehouse, is experiencing a shortage. **Conclusion:** The availability of oxygen, especially during the COVID-19 pandemic, is certainly unavoidable where the need increases, but several things can hinder the availability of oxygen, including delays in goods from suppliers. Control is hampered and requires more time due to the increase in COVID-19 patients.

Keywords: Control; Scarcity; Oxygen Cylinder Availability;

Introduction

Hospital is a health service institution that provides plenary individual health services that provide inpatient, outpatient, and emergency services (Melyanti et al., 2020) & (Law of the Republic of Indonesia, 2009). As a labor-intensive and capital-intensive organization, hospitals need good management in order to manage all components contained in them so that synergy occurs with each other. One of the management contained in the Hospital that plays an important role in the continuity of the service process, both internal services and external services of the Hospital is logistics management including availability *stock* Medical Gases (Nasution, 2018)

The total oxygen cylinders of Harapan Sendawar Hospital measuring 500 L are 522 tubes. Where as many as 138 tubes are self-procurement hospitals and 384 tubes are assistance from several company partners. While oxygen cylinders measuring 1 m³ containing 2 L are only found in *ambulance transport* with a total of 5 tubes. Due to the surge in the second wave of COVID-19, Harapan Sendawar Hospital received back 20 tubes of oxygen concentrator assistance from the center through the provincial health office with a capacity of 5 L.

In July and August 2021, Harapan Sendawar Hospital was still experiencing a shortage of oxygen supply during the COVID-19 surge, so the demand for oxygen supply was still experiencing a one-time shortage, the demand for oxygen supply within 24 hours was 200 tubes.

This is a problem in itself, due to limited oxygen supply, thus the Harapan Insan Sendawar Regional General Hospital carried out a budget *refocusing* process for the purchase of Oxygen machines (BIONET) in order to produce oxygen itself in an effort to fulfill oxygen needs in hospitals both for COVID-19 patients and for other general patients who need oxygen. Harapan Insan Sendawar Regional General Hospital has purchased PCR medical devices for COVID-19 testing and other medical devices that support health service needs related to COVID-19.

Limited oxygen supply and delivery systems are often an obstacle, especially in places with limited resources. Every option for supply must be carefully assessed, especially in terms of access and distribution (World Health Organization, 2020)

Keeping goods always in effective and efficient quantities is in the form of good availability, inventory for all groups of goods is always sought in safe conditions. However, in its implementation, sometimes problems related to availability in the warehouse such as empty goods (out stock) or *accumulation of goods* (over stock) often occur. This problem even becomes a trend every year as happened at Harapan Insan Sendawar Hospital where oxygen stock vacancies occurred in July and August 2021 due to a surge in COVID-19 cases.

Method

This research is a qualitative research that is descriptive. In this study, researchers tried to analyze the implementation of logistics management by means of in-depth interviews, observations, and secondary documents/data reviews.

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The informants or resource persons in this study were 9 resource persons, namely 1 Head of the Medical Support Section, 1 Planning Committee, 1 Procurement Committee, 1 Reception and Storage Committee, 2 Medical and Distribution Technicians, and 3 users, namely room heads and COVID-19 Isolation employees, which were obtained using *purposive sampling* techniques. That is, informants or interviewees are selected based on criteria that have been made before.

This research was carried out at Harapan Sendawar Hospital, West Kutai Regency, which was carried out from February 12, 2022 to March 12, 2022. The instrument used in this study is a *structured or interview* conducted based on interview guidelines that have been prepared previously to determine the picture of factors that affect oxygen availability in the Harapan Insan Sendawar Regional General Hospital in 2021. In this study the author collected data by means of Document Studies, interviews, discussions (FGDs) and field observations

Result and Discussion

Informant Characteristics

The number of informants in this study was 9 informants, consisting of 1 Head of Medical Support Section, 1 Planning Committee, 1 Procurement Committee, 1 Reception and Storage Committee, 2 Medical and Distribution Technicians, and 3 users, namely room heads and COVID-19 Isolation employees. The table of informant characteristics is as follows:

Table 1
 Informant Characteristics

No	Name	Gender	Age	Education	Position
1	Informer I	Man	43 years old	Dentistry Bachelor	Head of Medical Support
2	Informer II	Man	38 years old	Physiotherapist Bachelor	Planning Committee
3	Informer III	Man	52 years old	Environmental Health Associate degree	Procurement Committee
4	Informer IV	Man	38 years old	High School	Reception/Storage/Distribution Committee
5	Informer V	Man	46 years old	SHS	Technician
6	Informant VI	Man	20 years	SHS	Technician
7	Informant VII	Man	35 years old	Nursing Associate degree	user
8	Informant VIII	Man	25 years	Nursing Associate degree	user
9	Informer IX	Woman	31 years old	Obstetrics Associate degree	user

Source: Primary Data Analysis, 2022

Data Analysis

The purpose of data analysis is to simplify data into a form that is easier to read and interpret data analysis using the Tricoagulation method, as a method that ensures the credibility of the data (Sarosa, 2021)

Source tricoagulation is a step to recheck data obtained from informants by asking the truth of data or information to one informant with another informant. The researcher

uses several additional informants in addition to the main informant to check the veracity of the main informant (*Sugiyono, 2011*) in (Tenda et al., 2022)

Table 2
 Tricoagulation Resources about HR

Researcher Questions	Informant	
	Informant I	Informant IV
Problem factors in Oxygen management HR	In terms of oxygen supply services, the number of human resources is sufficient and has been able to complete the service. The educational background also varies from high school education to D3, and for competence because it is taken from various disciplines so education and training on oxygen management governance is given, legal training has never been, but training and introduction to oxygen machines have been given from vendor technicians. although in terms of human resources there are shortcomings	HR needs have not been in accordance with ANJAB (Job Analysis) and ABK (Workload Analysis), but Additional Recruitment has been carried out HR needs are not in accordance with ANJAB (Job Analysis) and ABK (Workload Analysis), PAN Regulation No. 33 of 2011 but Additional Employee Recruitment has been carried out at the end of 2020 for oxygen handling. Where the condition at that time was the beginning of the increase in COVID-19. The opinion of informant I is in line with the opinion of informant IV there are still shortcomings in human resources in terms of quality.

Source: Primary Data Analysis, 2022

Table 3
 Tricoagulation Source on Oxygen *Stock* Availability

Researcher Questions	Informant	
	Informant II	Informant III
Factors affecting the availability of oxygen stock at HIS Hospital	The reason for the scarcity of oxygen stock availability at HIS Hospital is due to the high demand for oxygen related to the increase in COVID-19 patients	The scarcity of oxygen cylinder stocks was caused by the increase in COVID-19 patients in July and August 2021

Source: Primary Data Analysis, 2022

Table 4
 Tricoagulation Resources on Controlling Oxygen Availability

Researcher questions	Informant	
	Informer I	Informer II
How to control the availability of oxygen stocks that are experiencing scarcity	Coordinating with the natural resources sector in the local PEMDA to coordinate with several mining companies in the district / city environment asking for oxygen cylinder assistance	Coordinating with several mining companies to assist in the need for oxygen cylinders
How to overcome the scarcity of oxygen stocks	Coordinating with BPBD to assist the process of handling oxygen cylinders that have been ordered and the pick-up process on the way from large trucks to BPBD operational cars so that the cylinders immediately arrive at the hospital	Coordinate with BPBD for the process of picking up oxygen cylinders in the middle of the trip by estapet so that some of the cylinders can immediately reach the hospital

Source: Primary Data Analysis, 2022

Tricoagulation Method

Tricoagulation Method is a method that checks research results with different data collection techniques, namely interviews, observations and documentation so that the degree of confidence can be valid. Researchers use all data collection techniques obtained. (Octaviani & Sutriani, 2019)

Table 5
 Tricoagulation Method on HR

Researcher questions	Data collection methods	
	interview	Observation
Factors that affect the availability of oxygen stock at HIS Hospital are seen from HR factors	"Human resources who manage oxygen stocks at HIS Hospital in quantity are sufficient, but in fact, yes, the most important thing is that it can function, for standard power problems, we consider it at another time."	From the observations of researchers that human resources who manage oxygen at HIS Hospital still do not meet the professional standards of medical gas technicians with the sake of researchers assume that the recruitment of personnel still does not follow the regulation of PAN Regulation No. 33 of 2011 concerning ANJAB and ABK as the opinion of informant IV above

Source: Primary Data Analysis, 2022

Table 6
Tricoagulation Method on Oxygen Control

Researcher questions	Data collection methods	
	interview	Observation
How to control the availability of oxygen stocks	"From the management of HIS Hospital, refocusing the budget for the procurement of BIONET oxygen generator machines to meet the needs of COVID-19 patients"	From the observations of researchers, the management of HIS Hospital prepared a budget of around 83.95% for the purchase of oxygen generator machines so that they could produce their own
How to handle the availability/scarcity of oxygen stocks	"We remain optimistic that even though our human resources have not met the standards for managing oxygen, but the vendor still provides optimal training for 3 days to be able to master the operation of the BIONET oxygen machine we purchased"	From the observations of HIS Hospital researchers holding an oxygen generator machine through e-catalogue, the procurement process began on September 16 to December 3, 2021 and the procurement process has been effective and efficient for current conditions, starting from January 1, 2022, it can produce itself within 24 hours, it can produce around 40 oxygen cylinders,

Source: Primary Data Analysis, 2022

Tricoagulation Theory

Theory Tricoagulation is where the final result of qualitative research is in the form of a formulation of further information compared with relevant theoretical perspectives to avoid individual bias of researchers on the findings or conclusions produced. In addition, Theory Tricoagulation can increase the depth of understanding as long as researchers are able to explore in-depth theoretical knowledge of the results of data analysis obtained. This stage is the most difficult stage because researchers are required to have expert judgment when comparing their findings with certain perspectives, especially if the comparison shows far different results

Table 7
Tricoagulation Theory on Oxygen Scarcity

Researcher Questions	Research results	Theory
What factors affect the availability and scarcity of oxygen	The oxygen cylinder crisis in the midst of the COVID-19 surge has resulted in various uses for patient needs increasing sharply, one of which is the use of alternative oxygen cylinders to help respiratory disorders, namely the Oxygen Concerator of approximately 20 assistance units from the Kal-Tim provincial Health Office.	According to Prof. Ir Panut Mulyono (2021), the scarcity of oxygen supply recently occurred along with the increasing number of COVID-19 patients. One of the steps that can be taken to answer the scarcity of oxygen supply, especially hospitals, is to optimize existing production units in the country which currently only operate 74% of the installed capacity, 72% of existing products are used for industrial purposes, only 28% for medical needs. Suitable small-scale oxygen production is PSA (<i>Pressure Swing Adsorption</i>)
How to handle the scarcity of oxygen availability at HIS Hospital	HIS Hospital has coordinated with various parties to obtain oxygen supply from providers and other places. Order oxygen cylinders from Samarinda and the delivery process is transported via truck.	According to the minister of industry, Agus Gumiwang Kartasasmita (2021), the increase in the need for oxygen cylinders occurred because hospitals added treatment room facilities in handling COVID-19 in the form of emergency wards and tents, we tried to meet the need for oxygen cylinders for COVID-19 treatment.
Factors affecting oxygen availability at Harapan Sendawar Hospital	The oxygen availability system at the Harapan Insan Sendawar Regional General Hospital that is of concern to researchers is Human Resources (HR), Funds, Facilities, and <i>Suppliers</i> , which is in accordance with the results of the study. Based on the results of research conducted by researchers at Harapan Insan Sendawar Hospital, it is known that the human resources owned are not in accordance with the professionalism of medical gas techniques in accordance with the results of the study	Ramadan, (2020) entitled "Logistics Management of Medical Devices at Puskesmas Boja II Kendal Regency" which states that input in the problem is focused on infrastructure, human resources, management methods, and funds. In addition, this research is also in line with research conducted by Sri Puji Lestari et al., (2021) with the title "Analysis of Logistics Management of the Procurement of Medical Devices at Bogor Islamic Hospital in 2019" which said that the input that supports the implementation of a process is HR. Tonis et al. (2021) entitled "Analysis of Drug Logistics Management System at the Hospital Pharmacy Installation Prof. Dr. Tabrani Pekanbaru" which states that the human resources that play a role in the pharmaceutical warehouse are still insufficient.

Source: Primary Data Analysis, 2022

Discussion

Hospital Oxygen Availability System Input

Inputs from the oxygen availability system at the Harapan Insan Sendawar Regional General Hospital that are of concern to researchers are Human Resources (HR), Funds, Facilities, and *Suppliers*,

Where this is in accordance with the results of research conducted by Ramadan, (2020) entitled "Logistics Management of Medical Devices at Puskesmas Boja II Kendal Regency" which states that input in problems is focused on infrastructure, human resources, management methods, and funds. In addition, this research is also in line with research conducted by Sri Puji Lestari et al., (2021) with the title "Analysis of Logistics Management of Medical Device Procurement at Bogor Islamic Hospital in 2019" which said that the inputs that support the implementation of a process are human resources, infrastructure, funds and procedures.

The role of HR in Oxygen management

Based on the results of research conducted by researchers at Harapan Insan Sendawar Hospital, it is known that the number of human resources for the section that handles oxygen is actually sufficient with the formation set by the medical support department, but the human resources owned are not in accordance with the professionalism of medical gas techniques, due to non-natural disasters, namely the COVID-19 pandemic, additional human resource needs are needed so that services can still be maximized.

This research is in line with research Tonis et al. (2021) entitled "Analysis of Drug Logistics Management System at the Hospital Pharmacy Installation Prof. Dr. Tabrani Pekanbaru" which states that the human resources that play a role in the pharmaceutical warehouse are still insufficient. This insufficient human resources causes reporting activities related to drug stock at the Pharmaceutical Installation to be not optimal because of the concurrent work and also no one to help their work.

Availability of Funds for Hospital Oxygen fulfillment.

Based on the results of research conducted by researchers, information was obtained that the source of funds for Harapan Sendawar Hospital came from the Regional Government Budget (APBD) and also came from the hospital's own operational funds, namely BLUD funds (Daerah Public Service Agency), this was in accordance with the decision of the Regent of West Kutai Number 067.445 / K.1027 / 2009 concerning the Determination of the Application of Financial Management Patterns of Regional Public Service Agencies (PPK-BLUD) with full status at General Hospitals Insan Sendawar Hope Area.

Based on the results of research that has been conducted by Ramadan (2020) entitled "Logistics Management of Medical Devices at Puskesmas Boja II Kendal Regency" shows that the source of funds for logistics management of puskesmas medical

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devices comes from funds from the State Budget (APBN), Regional Revenue and Expenditure Budget (APBD) and JKN. Funds derived from the APBN and APBD are used to buy medical devices, while funds from JKN are used to buy Consumables (BHP).

Facility Availability

Work facilities are a form of company service to employees to support performance in meeting employee needs, so as to increase employee work productivity. Based on the observations of researchers who have been conducted at Harapan Sendawar Hospital, it was found that the facilities in the central warehouse were fulfilled and were quite complete. This is proven by observations that show that every employee in the central warehouse can take advantage of existing facilities at work without having to take turns or queue waiting to use existing facilities.

Coordination with suppliers

Suppliers at Harapan Sendawar Hospital consist of *suppliers* of general goods, pharmaceuticals, and, engineering, service *suppliers*, and contractors. *The selected supplier* is the winner of the tender held by Harapan Sendawar Hospital online. *The winning supplier* is the one who offers the cheapest price and with quality that meets the standards and who has a good *track record* but constraints from the *supplier*, sometimes the goods ordered are late or arrive later than the agreed time.

Planning implementation

Based on research that has been conducted at Harapan Sendawar Hospital, it is known that the process of planning oxygen machines is carried out based on needs through user submissions.

Planning for the procurement of oxygen machines was carried out at the beginning of the year and the process was about 3 months. The process of planning and determining needs is carried out based on the calculated level of needs, so that oxygen supply can be absorbed. but sometimes there are problems, this is caused because there have been non-natural disasters that began in March 2020 where all countries experienced this pandemic. However, Harapan Sendawar Hospital is trying and trying to deal with this problem by creating a separate isolation room for COVID-19 patients and procuring its own oxygen machine.

Budgeting Implementation

Based on the results of research that has been conducted, it is known that the Harapan Insan Sendawar Hospital has prepared funds of approximately 4 billion or around 83.95% to meet all the needs and needs of the oxygen management process. Regarding financial resources, hospital management shifts the budget to meet needs, but if the budget is still limited, budget changes will be made and focused on buying oxygen generator machines so that they can produce their own oxygen.

Procurement Implementation

From the results of in-depth observations and *interviews* conducted by researchers, it was found that the procurement process of medical devices and oxygen machine generators at Harapan Sendawar Hospital itself was in accordance with Presidential Decree No. 12 of 2021 concerning Procurement of Government goods/services. Where Harapan Insan Sendawar Hospital itself uses *the e-catalogue system* for the implementation of its logistics procurement. If it is above 200 million, it will be tendered, but if it is below 200 million, direct procurement will be made, but if the item is in *the LKPP e-catalogue*, then the hospital is obliged to buy it from there. But sometimes there are problems at the time of purchase, sometimes orders through the application must order directly to the principal in other words the principal can mean the factory where the goods are made or the *holder* of the brand of the goods where if they are not opening the order it will make delays in procurement logistics because the goods needed are not there and they can also agree and disagree to accept the order.

Storage Implementation

Based on the results of research that has been conducted at Harapan Insan Sendawar Hospital, it is known that the goods that have been ordered will be received directly by the Receiving Committee and will be stored in the warehouse before being distributed to every *user* in need, by paying attention to the quality of packaging, avoiding the accumulation of oxygen cylinders, installing good security devices and recording oxygen cylinder data in and out as accurately as possible and providing a code In each oxygen cylinder and oxygen generator to produce its own oxygen and stored in a special place.

Distribution Implementation

Distribution at Harapan Sendawar Hospital begins with the process of requests from *users*, where previously the goods that had come were stored in the warehouse. If there has been a request either by telephone or short message, the distribution of oxygen is carried out by appointed officers and distributed to users according to requests from their respective rooms.

Maintenance Implementation

For the maintenance of goods in the warehouse of Harapan Sendawar Hospital itself, it is not done specifically, it is enough to check so that no goods are damaged. In addition, calibration is also carried out for these tools. Calibration is carried out at least 4 x 1 year.

Removal Process

The process of removing oxygen cylinders and generators at Harapan Sendawar Hospital has never been done because the cylinders and machines are still very new.

Implementation of Control

The implementation of oxygen control at Harapan Sendawar Hospital itself has gone quite well even though it is not perfect. Like the control carried out for the budgeting process, if the income budget plan is not achieved then the solution is to refocus the budget by reducing the budget for funds in other fields, for example taken from building maintenance funds, it is done to meet logistics management budgeting, especially oxygen availability. And if the planning does not go as desired then changes will be made, in the changes will be re-planned.

Hospital Oxygen Availability System Output

The availability of oxygen at Harapan Sendawar Hospital is influenced by the funds and the procurement process. If the funds are there but the desired item is not there yet then it can be an obstacle. The availability of oxygen at Harapan Sendawar Hospital has experienced oxygen scarcity, this is due to a non-natural disaster that began in March 2020, namely the COVID-19 pandemic where all countries experienced this pandemic. however, Harapan Sendawar Hospital tried and tried to deal with the problem by creating a separate isolation room for COVID-19 patients and procuring its own oxygen machine

Conclusion

The number of human resources under normal conditions is sufficient but still constrained by human resources owned not according to the standards of ANJAB and ABK, not referring to the regulation of Minister of PAN No. 33 of 2011, in emergency conditions it is still necessary to add and special training on oxygen management. The oxygen management process, in terms of facilities, is sufficient, and Harapan Sendawar Hospital cooperates with suppliers to procure oxygen cylinders but experiences problems because the goods ordered are late or arrive later than the agreed time.

The budgeting process has been compiled, but because it requires additional funds, a refocusing of the budget is carried out to meet the needs of oxygen availability. The procurement of oxygen cylinders uses the direct procurement method, but because demand increases, the procurement of oxygen generators is carried out through *e-catalogue*. Oxygen cylinders that have been ordered will be received directly by the Receiving Committee and will be stored in the warehouse, while oxygen generators are stored in a special place.

The distribution of oxygen to the room based on requests from users either via telephone or short message, but in the conditions of the COVID-19 pandemic has increased, there has been a delay in distribution due to the scarcity of *oxygen stocks*. Maintenance is carried out by checking each item, if there is damage it will be repaired by replacing damaged tools. Removal has never been done because the oxygen machine is new and all oxygen cylinders are still fit for use. The implementation of oxygen control has been carried out through the planning and budgeting process, but the increasing demand means that the solution is refocusing the budget.

The *output* component, namely the availability of oxygen at Harapan Sendawar Hospital, is influenced by the funds and the procurement process. Because if funds exist but the desired items do not exist then it can be an obstacle, and oxygen scarcity has occurred due to the COVID-19 pandemic but the Hospital is trying and trying to deal with the problem by creating a separate isolation room for COVID-19 patients and procuring oxygen generators so that they can produce their own oxygen.

References

- Melyanti, R., Irfan, D., Febriani, A., Khairana, R., & Pekanbaru, S. H. T. (2020). Rancang Bangun Sistem Antrian Online Kunjungan Pasien Rawat Jalan Pada Rumah Sakit Syafira Berbasis Web Design of Online Queue System for Web-Based Visit of Patients in Syafira Hospital. *Journal of Information Technology and Computer Science (INTECOMS)*, 3(2), 192–198.
- Nasution, J. (2018). Strategi peningkatan mutu pelayanan di rumah sakit umum Padangsidempuan. *At-Tijarah: Jurnal Ilmu Manajemen Dan Bisnis Islam*, 4(1), 68–81.
- Octaviani, R., & Sutriani, E. (2019). *Analisis data dan pengecekan keabsahan data*.
- Ramadhan, F. (2020). Manajemen Logistik Alat Kesehatan di Puskesmas. *Higeia Journal of Public Health Research and Development*, 1(3), 84–94.
- Sarosa, S. (2021). *Analisis data penelitian kualitatif*. Pt Kanisius.
- Sri Puji Lestari, E., Chotimah, I., & Khodijah Parinduri, S. (2021). Analisis Manajemen Logistik Bagian Pengadaan Alat Kesehatan Di Rumah Sakit Islam Bogor Tahun 2019. *Promotor*, 4(2), 106. <https://doi.org/10.32832/pro.v4i2.5577>
- Tenda, Y. J., Kalangi, J. A. F., & Mukuan, D. D. S. (2022). Analisis Bauran Pemasaran Dalam Meningkatkan Penjualan Produk Kacang Shangrai di UD Virgin Kawangkoan. *Productivity*, 3(3), 279–285.
- Tonis, M., Wati, A. R., & Suryandartiwi, W. (2021). *ANALYSIS OF DRUG LOGISTIC MANAGEMENT SYSTEMS IN HOSPITAL PHARMACEUTICAL INSTALLATIONS PROF. DR. TABRANI PEKANBARU*. 2(1), 22–28.
- Undang-Undang RI. (2009). Undang-Undang Republik Indonesia Nomor 44 Tahun 2009 Tentang Rumah Sakit. *Undang-Undang*, 2(5), 255.
- World Health Organization. (2020). *Sumber Penyediaan dan Pendistribusian Oksigen Untuk Fasilitas Perawatan Covid-19*. World Health Organization.

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