



**FACTORS INFLUENCING BREAKDOWN OF MEDICAL EQUIPMENT IN PUBLIC
HOSPITALS**

EBRAHIM ALSAKKAF

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ABSTRACT

The objective of this study is to examine the factors influencing breakdown of medical equipment in public hospitals in Yemen. This study explores the issue of medical equipment breakdown in public hospitals in Yemen and its problems of long-time repairing and entering into service in terms of the three factors. The study examines these factors to find a way for medical equipment to work efficiently and serve patients with medical services. The data were collected from medical supplier companies and public hospitals in Yemen because they have the knowledge about the medical equipment issue in public hospitals, and they helped the researcher to get the results. The survey is an online questionnaire about the effect of financial aids, organizational neglect, and technological awareness on the breakdown of medical equipment in public hospitals. The population was taken from the medical supplier companies and public hospitals laboratories in Yemen. The sample includes biomedical engineers, operators, technicians, and management from medical supplier companies and the laboratory department of public hospitals. The number of questions distributed is 220. Only 151 participants responded to the questionnaire without any missing data. This is a deductive study that applies the quantitative approaches. The study provides recommendations to all people who are responsible in public hospitals for the sake of helping them to overcome the causes of the breakdown of medical equipment and serve a wide sector of people that need medical services and cannot afford the high cost of private hospitals. The study gives suggestions for future research; it suggests that other researchers expand the scope of the study by selecting some other public hospitals and examining other factors influencing breakdown of medical equipment in public hospitals.

Keywords: Factors, Breakdown of Medical Equipment, Public Hospitals, Financial Aids, Organizational Neglect, Technical Awareness, Biomedical Engineer, Maintenance, Yemen.

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LIST OF ABBREVIATIONS

BMETs	Biomedical Equipment Technicians
CT	Computed tomography
DV	Dependent Variable
FAn	Financial Aids, n: number of Questions in the questionnaire
IV	Independent Variable
LIU	Lebanese International University
MRI	Magnetic Resonance Imaging
NYS	New York State
ONn	Organizational Neglect, n: number of questions in the questionnaire
PCB	Printed Circuit Board
PPM	Planned Preventive Maintenance
RCM	Reliability Centered Maintenance
SPSS	Statistical Package for Social Sciences
TAn	Technical Awareness, n: number of questions in the questionnaire
UPS	Uninterruptible Power Supply
US	United States

CHAPTER 1

INTRODUCTION

1.1 Background

As Yemeni public hospitals consider the lifeline for all people in Yemen, it is necessary for them to be number one in health care to serve many people and maintain healthy lives for them. Nursing and medical staff in hospitals cannot serve patients without using medical equipment (Quinn, 1998). Today, we note that nearly all public hospitals in Yemen suffer from the periodical breakdown of medical equipment, out-of-work equipment and long-time repair. Sometimes, the medical device never works even if it is a new installation. Therefore, all these problems increase the budget of public hospitals, and they cannot serve patients properly.

A public hospital is a hospital that belongs to the government and gets financial support from the government ("Public hospital", n.d.). Public hospitals in Yemen give medical care to people for free or at least for a small amount of money in comparison to the expensive private hospital (All Answers Ltd, 2018). Public hospitals must be the references for all private hospitals in Yemen. They should be of interest to the Ministry of Health and people.

Not all public hospitals are equal. It depends on the buildings, divisions, furniture, type of medical equipment they have, the field of specialization, and the budget allowed by the Ministry of Health. All public hospitals have departments that should have medical equipment. For example, a laboratory department needs chemistry analysis, immunology analysis, a blood analyzer, a centrifuge, blood gas analysis, a polymerase chain reaction analysis, and refrigerators. Other departments have specific medical equipment according to their need.

Medical equipment in public hospitals ranges from highly expensive to cheap, depending on the quality of the equipment, the country of the manufacturing, the reputation of the manufacturing, and the durability of the equipment. Medical equipment cannot be bought directly by the manager or sales officers of public hospitals. Medical equipment is bought from the suppliers of medical equipment companies in Yemen through three ways. First, if public hospitals have the money for renewing or opening new departments, they prepare a list of files for the type and specifications of medical equipment. Then they process tenders and announce them in newspapers. After that, they buy the specific medical equipment from the winning medical company that provides the suitable

descriptions with a suitable price. The second way of buying medical equipment is done through organizations. Most organizations in Yemen provide support for public hospitals by visiting them, and seeing whether there are any shortages in some departments according to hospitals' needs. Then the organizations contact medical companies and buy the required medical equipment, or they can use tenders. The third way of buying medical equipment involves only medical equipment that requires reagents to operate or cannot work without these reagents. This happens when buying equipment for laboratory departments or kidney departments. Supplier companies offer medical equipment free of charge in exchange for consuming the target of reagents in a year, depending on the cost of medical equipment. Some targets range between twenty and forty thousand dollars yearly. Then hospitals have the rights to own medical equipment after four or five years if they commit to the target of the contract.

It is not easy to get all or some of medical equipment for public hospitals due to the bad circumstances the country is going through. Therefore, medical equipment must be preserved to work with normal condition and serve as many people as possible, but this does not happen in most public hospitals. Medical device needs maintenance and attention by an operator first and second by a biomedical engineer service of the supplier company. The task of an operator is to perform daily maintenance according to the guideline of a company, but this does not happen actually due to one or all of the three factors influencing breakdown of medical equipment. The task of biomedical engineering service is also to perform the PPM, but this task is performed only in the first year of buying a medical device due to a one-year warranty. It cannot be performed after the second year due to mostly the factor of financial aids.

Medical equipment requires two types of parts. One is the consumable parts, which must be replaced after some time or after several hours. Medical equipment in this case is consumed during operations, and the examples of such equipment are like lamps, oxygen sensors, reaction cells, and measuring cell. The other type is spare parts. These devices must be replaced with defective parts while repairing medical equipment like PCB boards, liquid pump, x-ray tubes and others. Public hospitals must have the inventory for these two types of parts (Bektemur, Muzoglu, Arici & Karaaslan, 2018).

In this study, the researcher focuses on three factors that influence the breakdown of medical equipment in public hospitals. The first factor is the financial aids, which are considered the most important factor because medical device will not work without them. In addition, if the lifetime of medical equipment passes, it must be replaced with new and updated equipment (Kim & McCue, 2008). The second factor is the organizational neglect as a result of the situation in the workplace. Neglect can be caused by the operator, the head of a department, the maintenance department, and the management of hospitals (Manyisa & van Aswegen, 2017). The last factor is the operator's technical awareness of skills such as development programs, trainings, and quality controls (Gregory & Crispin, 2014).

1.2 Problem Statement

Some public hospitals have deviated from their main assigned function of medicine (Bajpai, 2014). These public hospitals should persist to offer healthcare to all social classes of people for a prolonged period (All Answers Ltd, 2018). However, sometimes, people who do not afford to pay money cannot get healthcare from public hospitals because of the breakdown of medical equipment. On the other hand, people who afford to pay never go to public hospitals because they know that their medical equipment is out of work or has permanent malfunctions without maintenance.

In some countries, private hospitals try to buy all the medical equipment to compete with public hospitals and give patients a full service. Patients in those countries prefer to go to public hospitals to take the full services because public hospitals have the bigger, modern and updated medical equipment compared to private hospitals (All Answers Ltd, 2018).

When we make a comparison between our public hospitals in Yemen and public hospitals in other countries, we can find some factors which cause the breakdown of medical equipment, and such factors are related to the bad reputation of hospitals. One of the important factors is financial aid. If public hospitals have a problem with financial aid, they will face difficulty in keeping or maintaining a good service and healthcare for patients (Akinleye, McNutt, Lazariu & McLaughlin, 2019). Medical equipment needs attention and maintenance by operators and the maintenance departments of public hospitals which cannot continue working if there are

financial problems. The cost of PPM must be determined by service biomedical engineers of the supplier companies, and that needs \$3500 yearly if we are talking about the immunology analyzer for a specific model used in a laboratory department. For example, if maintenance is not performed on time, the immunology analyzer will break down or stop working. Furthermore, medical equipment needs suitable UPSs to avoid any technical breakdown in case of the electrical power supply cuts during an operation. Otherwise, the cost of repairing will be high, which cannot be afforded by public hospitals due to the lack of financial aid and this leads to breakdown of medical equipment. To conclude, if there are problems with the financial aids in public hospitals, there will be carelessness towards patients due to the breakdown of medical equipment (Akinleye et al., 2019).

All public hospitals in Yemen suffer from organizational neglect. The reason may be that employees are working under difficult circumstances, which leads to neglect of the maintenance by operators of medical equipment (Manyisa & van Aswegen, 2017). Working together as a team will help to avoid the breakdown of medical equipment, but it must be noted that every operator of medical equipment depends on other workers to perform his daily maintenance. Everyone wants to complete his tasks to leave the hospital, and they do not care about medical equipment due to the shortage in technical awareness. They need trainings in personal skills and get development programs (Gregory & Crispin, 2014).

The researcher wants to discuss this topic because this topic has not been discussed by anyone in Yemen. The researcher explored diverse research that dealt with the breakdown of medical equipment in hospitals to support the argument of the study. He explored how to reduce hospitals' equipment downtime, the conceptual framework to determine medical equipment maintenance in hospitals using RCM method, medical equipment maintenance manual, and guideline to medical equipment management.

Some internally reports in the public hospitals mentioned that due to the shortage in the financial resources, the number of the breakdown of medical equipment is increasing, because there is no attention to the PPM and periodically check on the medical equipment, also the organizational neglect and technical awareness to the employees are another factors to increases the number of the breakdown of medical equipment.

1.3 Research Questions

In this study, the researcher seeks to examine the factors influencing the breakdown of medical equipment in public hospitals. Therefore, the research questions are as follows:

- Q1. What is the impact of financial aids on the breakdown of medical equipment in public hospitals?
- Q2. What is the impact of organizational neglect on the breakdown of medical equipment in public hospitals?
- Q3. What is the impact of technical awareness on the breakdown of medical equipment in public hospitals?

1.4 Research Objectives

It can be noted that nearly all public hospitals in Yemen suffer from a fast breakdown of medical equipment, so patients cannot get the full services by public hospitals. The purpose of this study is to achieve the following objectives related to the factors:

- Examining the impact of financial aids on the breakdown of medical equipment in public hospitals
- Examining the impact of organizational neglects on the breakdown of medical equipment in public hospitals
- Examining the impact of technical awareness on the breakdown of medical equipment in public hospitals

1.5 Significant of the Study

This study is important because it explores whether there are problems in most public hospitals that give full-service healthcare to patients. One of these problems is the breakdown of medical equipment, which negatively affects the health sector and the reputation of public hospitals, and leads to shifting to private hospitals by most patients. The study aims to examine the impact of the factors of financial aids and organization neglect and technical awareness on the breakdown of medical equipment.

On the other hand, this study adds the correct plan to the practical aspects of the management of hospitals by preventing wasted time, the cost of repairing, training the staff of hospitals on cultural awareness and the importance of healthcare for citizens. Public hospitals are considered the common property of people and must be preserved to serve for a longer period.

1.6 Scope of the Study

This study focuses on the important factors that influence the breakdown of medical equipment in most public hospitals all over Yemen. The factors include financial aids, organizational neglect, and technical awareness.

The targets of this study are the people working in the field of health, like biomedical engineers, operators, technicians, heads of departments, and managers in laboratories of public hospitals.

The survey is an online questionnaire distributed via WhatsApp to the targets to see their responses to the factors (financial aids, organizational neglects, and technical awareness) influencing the breakdown of medical equipment, which will help us to reduce the breakdown of medical equipment in public hospitals in Yemen and serve a wide variety of patients.

1.7 Definitions of Terms

The essential concepts used in this study are six: public hospitals, breakdown of medical equipment, maintenance, financial aids, organizational neglects and technical awareness.

1.7.1 Public Hospitals

Public Hospitals are government hospitals consisting of buildings with different departments, and each department has medical equipment. Public hospitals employ different people with different specializations. Every employee has a function according to his degree of specialization. The main function of public hospitals is to diagnose, treat, and perform operations for all people. Public hospitals are under the control, observation, and finance of the Ministry of Health (Fralick, Piercey & Scarborough, 2020).

1.7.2 Breakdown of Medical Equipment

Breakdown of medical equipment refers to out of service or out of work medical devices in hospitals due to several reasons such as not using the medical equipment according to the user manual, users' neglect, problems in the electrical power supply, problems in many parts of the medical device, environment condition, incorrect maintenance, and low durability of the machine or the system (Intermed, 2020).

1.7.3 Maintenance

Maintenance is the process in which medical equipment can be repaired to ensure it returns to the operation mode of the industrial standard. Maintenance can be performed by the BMETs or by the biomedical engineering service of the supplier company (Salim & Mazlan, 2019).

1.7.4 Financial Aids

Financial aids are the amount of money given to public hospitals, so that they can offer healthcare service to patients for free or for a small amount of money. The amount of money given by the government depends on the yearly budget of healthcare. Financial aids can be given as a donation by any organization or benefactor. The financial aids also help public hospitals to buy medical equipment, give the salaries and perform maintenance for medical equipment to prevent its breakdown (Snider, 2019).

1.7.5 Organizational Neglect

Organizational neglect is defined as the absence of interest at work and commitments to business tasks entrusted to supervisors or line managers due to lack of interest in the staff by the management. Things that can make workers interested in work are bonuses, trainings, certifications, and upgraded pay. The result of organizational neglect in public hospitals is costly and exorbitant as people cannot get suitable healthcare (Kampen, 2015).

1.7.6 Technical Awareness

Technical awareness refers to the human ability to understand the technological environment and use them in daily life in a suitable manner to serve people. Technical awareness depends on personal skills, team development, and communication skills. Technical awareness requires trainings, reading, and keeping up to date with the new daily development of new inventions of new machines and software programs (Gregory & Crispin, 2014).

1.8 Research Organizing

This study contains five chapters. Chapter 1 includes the background, the problem statement, the research questions, the research objectives, the significance of the study, the scope of the study, and the definitions of terms. Chapter 2 is a review of the previous studies about the factors influencing the breakdown of medical equipment, which focuses on financial aids, organizational neglects, and technical awareness (the independent variables), and the breakdown of medical equipment (the dependent variable). Chapter 3 describes the

methodology of the study, which includes the research design, the population, the sample of the study, the instrumentation, data collection tools, and the scale of validity and reliability. Chapter 4 presents the result and findings of the study, and analyzes the data using a Google form analyzer. Chapter 5 discusses the findings, evaluation, recommendations, limitations, future research, and conclusion.

1.9 Summary

This chapter is an introduction to the study which includes the study background, the problem statement, the research questions, the research objectives, the significance of the study, the scope of the study, the definition of terms, and the research organizing.

CHAPTER 2

LITERATURE REVIEW

1.1 Introduction

Chapter 2 focuses on the three factors influencing the breakdown of medical equipment in public hospitals. The three factors are financial aids, organizational neglect and technical awareness. This chapter reviews the previous studies about the three factors. Previous studies varied in terms of talking about one factor or more. Some of them talked about two and three factors together, and some talked about these factors in the context of public and private hospitals in the healthcare sector. Other studies talked about these factors in a different sector other than healthcare. All previous studies helped the researcher to improve factors that negatively affect the success of projects. The types of such studies include books, journals, and research studies. This study describes the factors mentioned using a deductive approach.

1.2 Public Hospitals

A public hospital is a government healthcare facility offering medical services such as treatment, diagnosis, operations, and dispensing medicines according to the type of diagnosis of patients. A public hospital contains different departments equipped with furniture and specific medical equipment. Public hospitals' employees have different functions, and specialists are distributed into two types: specialists responsible for technical work like treatment, diagnosis, operations surgical and medicines, and specialists responsible for administrative work (Non-Professional Services) like admitting, purchasing, accounts, human resources, financial, marketing, information technology, housekeeping, laundry, and warehouses (Fralick et al., 2020).

A public hospital contains different departments that have specific functions in a hospital like a laboratory department, radiology department, intensive care unit department, pediatric intensive care unit department, emergency department, outpatient department, ward department, operation surgery department, recovery department, dialysis department, psychiatric department, nursing department, dietary department, rehabilitation department, central sterilization department, obstetrics, and gynecology department. These departments have medical equipment according to the needs of the department. Furthermore, a hospital contains a pharmacy

department, mechanical department, maintenance department, central supply department, and insurance department (Henderson, 2019).

Yemeni Public hospitals are considered the main hospitals which have a bigger number of beds. The larger the number of beds, the larger the hospital will be to accommodate the largest possible number of patients (Akinleye et al., 2019). Most people who do not have healthcare insurance tend to go to public hospitals because they are less expensive than private hospitals ("Wooster Community Hospital," 2019).

1.3 Breakdown of Medical Equipment

Breakdown of medical equipment is the stage in which medical equipment is out of service and stops to serve patients with the diagnosis, monitoring, therapy, and treatment. Breakdown of medical equipment is an issue that occurs to the medical device due to problems with electrical supply, misuse by operators, the end of lifetime of the medical device and lack of maintenance according to the guideline or supply company recommendation. Other marks of breakdown occur when the quality of the device made by the factory is not solid to override the working load. Another cause is the environmental circumstances that increase the probability of the breakdown of any part of medical equipment (Intermed, 2020).

Tadia and Kharate (2020) noted that most causes of the breakdown of medical equipment are human mistakes. They also noted that 40% of the breakdown of medical equipment in public hospitals is attributed to mistakes by operators or the engineers, the electrical power supply or UPSs, and mechanical problems. They analyzed the steps for solving the problems of breakdown of medical equipment by the maintenance department in case there is a complaint in public hospitals as shown in Figure 2.1.

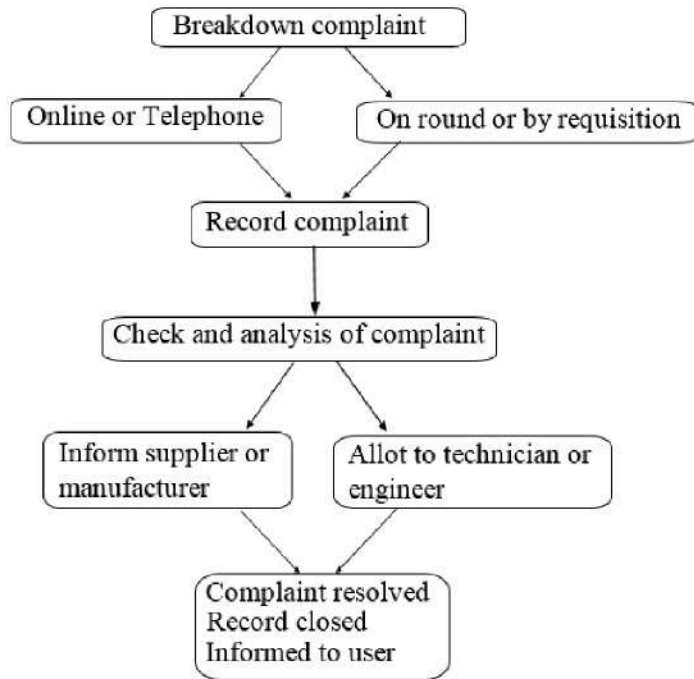


Figure 2.1 The steps for solving problems of breakdown of medical equipment in a public hospital by the maintenance department.

Another cause of the breakdown of medical equipment in public hospitals is the failure that happens to medical equipment at any time. There is no time or schedule for this type of failure to medical equipment. Sometimes, the availability of qualified biomedical engineers is not possible. Even if the qualified biomedical engineer is found to repair the failure, there will be a lack of spare parts to fix this problem, which leads to taking a long time till the medical equipment in a hospital returns to the operation mode (Thapa, Saldanha & Prakash, 2018).

1.4 Maintenance

Maintenance is a step of the procedure to repair medical equipment, or it is a way to preserve medical equipment in the working mode to serve people with healthcare services like monitoring, diagnosis, therapy and treatment (Tadia & Kharate, 2020). There are two types of maintenance: preventive maintenance and corrective maintenance. Preventive maintenance is a type of maintenance that requires planning by qualified service engineers of a supplier company. Therefore, it is named planned preventive maintenance (PPM), which performs the maintenance before any failure or breakdown for any medical equipment. This helps to decrease the number of

failures or breakdowns of medical equipment in public hospitals. Qualified service engineers of a supplier company follow the procedure and the checklist of the PPM for specific medical equipment and replace the required parts during the PPM visit like kit maintenance for half a year, kit maintenance for one year, kit maintenance for two years, and kit maintenance for four years. The impact of the PPM is to increase the lifetime of medical equipment in public hospitals and predict if any part needs to be replaced before breakdown. The increasing number of medical equipment breakdowns indicates poor PPM performed by the service engineers and leads to a decrease in the lifetime of medical equipment (Hupjé, 2018).

Corrective maintenance is the process of repairing the breakdown or failure of medical equipment in public hospitals. This type of maintenance is performed after the breakdown or emergency of medical equipment compared to the PPM, which is performed before the breakdown of medical equipment. Corrective maintenance requires the availability of qualified service engineers and the availability of spare parts in stock (Al-Bashir, Al-Tawarah & Jawwad, 2017). If corrective maintenance is not performed on time due to a lack of qualified service engineers or spare parts, it will cost public hospitals and patients dearly.

There are different levels of maintenance needed for the breakdown of medical equipment in public hospitals. Each level depends on the type of breakdown and the type of medical device. When talking about the type of breakdown, some breakdowns like cleaning the filters and the probe, and checking the cables are easy and can be repaired by an operator. However, some breakdowns, like checking the fuse and the power supply socket, can be repaired only with the help of biomedical engineering in departments of maintenance in public hospitals. Some breakdowns like a failure in power supply, in any mechanical parts and in the PCB parts can be repaired with the help of biomedical engineering in departments of maintenance in public hospitals. Finally, some breakdowns can be repaired only by qualified service engineers of a supplier company. Regarding the type of machine in maintenance, some machines, like CT scan and MRI or complex machine or any medical equipment under warranty or contract with the supplier company, need to be repaired or perform the PPM by qualified service engineers. Some medical equipment can be repaired by biomedical engineers of maintenance departments of public hospitals ("Ministry of Health and Family Welfare," 2010).

1.5 Financial Aids

“Financial aids” is defined giving assistance or help from one side that has a financial ability to another side that needs financial aids. There are many forms of financial aids like aiding students in scholarships to study, aiding a family to be afford expensive life requirements or for paying salaries to teachers, aiding hospitals to give healthcare to patients, aiding people to create their projects or own business, and aiding universities to open or furnish new departments (Martin, 2020).

Another definition of financial aids is the amount of money given to a specific type of people to complete a part-time of a specific job to encourage them to depend on themselves to get money. This type of aid is offered by the government, colleges, universities, employers, social unions, education lenders, foundations, private scholarships, and fraternal organizations to help people in education, healthcare, projects and other types of benefits (Kantrowitz, 2020).

In this study, financial aids are referred to as the aids given to public hospitals in Yemen. Accordingly, financial aids are defined as a group of aids which are introduced by a local government, donors, companies, organizations, international and neighboring countries to help public hospitals in Yemen to service patients get healthcare.

The factor of financial aid is very important in Yemeni public hospitals. It is considered the core of healthcare because without financial aid, public hospitals cannot provide healthcare services to patients who cannot afford the price of healthcare services like monitoring, diagnosis, treatment and therapy. These services cannot be provided without biomedical equipment which needs financial aid. The factor of financial aid has the ability to continue the processing of healthcare by making medical equipment work without breakdown and stops (Snider, 2019).

Biomedical equipment needs PPM and repairing to continue working, which is very costly. The cost varies from one machine to another. The PPM for a specific medical device like Cobas e411 is used in laboratory departments of public hospitals to assist doctors in diagnosis and give the correct medicines is cost for \$3000 (M. S. Aldalali, personal communication, November 14, 2021).

According to A. S. Alqadasi (personal communication, November 14, 2021), the PPM needs \$300 for kit maintenance for half a year, and nearly \$3800 for yearly maintenance. The cost of randomly spare parts ranges

between \$200 and \$12000, depending on the type of spare parts required to repair machines to return to a working mode. Some public hospitals prefer to contract with a supplier company to avoid the high cost of spare parts and repair. The contract may be for one year, two years or five years. The cost of the contract for the type of Cobas e411 is between \$5000 and \$7000 yearly. This cost will increase every year because the lifetime of medical equipment will decrease and the number of breakdowns will increase. Therefore, supplier companies need to increase the cost of the contract. If public hospitals do not have a financial budget in this case, there will be no PPM and repairing, which will lead to wrong diagnosis and decrease in patients' care and safety (World Health Organization, 2012).

Previous studies on financial aids. Akinleye et al. (2019) conducted a study to measure the effect of the finance of government hospitals in New York State (NYS) on the quality of medical service and patients' safety. They found strong and stable financial matters in public hospitals. Improving the quality of providing medical services to patients with low cost is achieved by maintaining good quality of medical equipment. The study indicated that when a hospital has strong financial aids, it will give medical services of good quality.

Akinleye et al. (2019) found that the accuracy of diagnosis and medicine affects patients' healthcare service when a public hospital faces a financial crisis due to external factors like the local economy problems of the country. They concluded that if a hospital has a stable and strong financial status, it will provide good healthcare with a systematic plan for servicing patients with good quality. This type of systematic plan helps to choose the correct resources and correct management in hospitals, which will benefit the preservation of medical equipment and protect it from breakdown. The study indicated that strong and stable financial aids would help in getting the correct diagnosis by medical equipment.

Public hospitals have an over-reliance on erratic government funding and agreements with organizations and charitable supporters, which is considered a disadvantage and puts public hospitals at high risk of financial shortage. Public hospitals cannot provide a medical service with good quality when compared with private hospitals that have a good financial return. Financial aid in Yemeni public hospitals is affected by the economic crisis in the country, which has led to difficulty in obtaining financial aid from the government (Myser, 2016). This

study indicated that public hospitals completely depend on the financial aid that comes from the government, organizations, and charities, which has a negative effect on medical services.

According to Kim and McCue (2008), old medical equipment needs to be replaced because its lifetime has passed, and cannot serve patients properly. Therefore, public hospitals need capital investment like financial aids or donations to be able to purchase or refurbish all the necessary medical equipment to serve patients properly. The results of their study showed that public hospitals must preserve medical service provided to patients and meet public healthcare desires by extending and promoting medical equipment owned by public hospitals and adding new departments and services. This cannot be achieved without financial investment or financial aids which need strong management to predict the plan growth for public hospitals. The results of the study showed that public hospitals need to have financial aids for repairing, refurbishment, and renewing medical equipment in hospitals.

The financial stability of public hospitals, which forms the foundation of the healthcare system, determines its viability. To do this, public hospitals must have competent and stable financial management (Curtis & Roupas, 2009).

Medical equipment in public hospitals requires much money for repairing and performing PPM, especially those devices used in radiology and laboratories. Furthermore, the financial aid will help public hospitals not only in the PPM and repairing, but also in choosing the suitable durability and strong medical equipment as a first stage and in regulating cost as a second stage. As shown in Table 2.1, financial aids will assist to build maintenance departments in public hospitals by providing the necessary resources like biomedical engineers, engineering tools, stock of the spare parts, and contract with the supplier companies to perform the repairing and PPM needed (World Health Organization, 2012). This study indicates that financial aids help to select medical equipment with durability and perform the PPM and repairing required for medical equipment.

Table 2.1

Financial Resources Required for Maintenance Program

	Initial cost	Operation cost
Physical Resources	Space, tools, test equipment, computer resources, vehicles.	Operation, utilities, maintenance, calibration.

Human Resources	Recruiting, initial training.	Salaries, benefits, turnover, continuing education.
Direct Maintenance	(Not applicable)	Service contracts, parts and materials, travel, shipping.

According to Dong (2015), when a country faces an economic crisis, the healthcare field will be negatively affected, and the consequences will appear. Public hospitals will not be able to get financial aids from the government and cannot get the profit from patients because public hospitals are giving medical services to patients with low cost depending on the financial aids coming from the government. The conclusion of Dong's research (2015) is that a hospital might close and no longer service will be given to patients due facing a financial crisis. However, some public hospitals do not close and continue working with low quality. When public hospitals work with low quality, patients will tend to go to private hospitals to get good service. Sometimes public hospitals advise patients to go to a private healthcare center or private hospitals to get good medical service. The study by Dong (2015) indicated that public hospitals cannot provide medical services if there are no financial aids from the government due to financial crisis.

According to Bajpai (2014), some public hospitals keep providing medical healthcare to the community even if there are some difficulties with the resources like the lack of financial aid. Therefore, intelligent workers will move from public hospitals to private hospitals because they are looking for the best chance and best salaries. The study showed that intelligent workers would leave public hospitals for private hospitals to get the best salaries, which means the impact of financial aids on medical services in public hospitals.

According to Heever (2009), the country's government in South Africa allocates a yearly budget to every local health division for providing resource requirements like human resources, financial resources, and medical equipment to give health care services to patients.

Public hospitals need regular and consistent financial aids to provide medical services to patients continuously (Stuart, 2020). Because of a crisis in a country, most public hospitals cannot deal with a financial crisis and need professional management to decrease the negative impact on medical services such as working condition of medical equipment (Stuart, 2020).

When there are poor financial aids in public hospitals in the US, hospitals cannot respond to patients and remain in a health care system to face public health terrorizations. Therefore, public hospitals in the US need rules and sustainable finance to help make a strong base of public health (Alfonso, Leider, Resnick, McCullough & Bishai, 2021). On the other hand, Alfonso et al. (2021) concluded that strong healthcare in public hospitals in a country means priorities are supported with financial aids by the government. In contrast, when there is poor health care in public hospitals in a country, there will be no financial aid by the government. To sum up, the previous four studies indicated that public hospitals must have stable financial aids to continue providing medical services to patients.

According to Bektemur et al. (2018), biomedical engineers in maintenance departments of public hospital are responsible for future financial planning in maintenance departments because without financial resources in public hospitals, biomedical engineers will not be able to perform any repairing and PPM for medical equipment. Financial resources have a strong influence on the health care service. Financial programs can cover the cost of spare parts and labor cost to repair medical equipment. Therefore, there are a lot of medical supplier companies with different brands and a strong financial program in hospitals can choose the strongest brand. This study indicates that financial aids in public hospitals will assist biomedical engineers to perform the maintenance required to keep medical equipment in a working mode.

When public hospitals do not receive financial aids from the government due to a financial crisis in the country, hospitals will not be able to serve patients with good medical service. Therefore, the best way is to transfer the business from public hospitals to private hospitals control (privatization) to improve the financial performance and introduce the health care service to people (Ramamonjiarivelo, Weech-Maldonado, Hearld, Pradhan & Davlyatov, 2020).

Heever (2009) pointed out that when a public hospital faces a financial crisis, it is not necessary to get financial aids from the government or any organizational donation. However, there are some points the hospital should take into consideration for controlling and enhancing the financial performance. First, the hospital needs a professional in financial issues. For instance, a financial officer needs to control the expenditure, coordinate with the maintenance department to perform the schedule PPM and prevent any emergency breakdown in medical equipment. A professional also needs to charge a nominal fee for the services provided to patients, disburse the

financial reward for the employees who work extra to motivate them, perform the necessary training for the employees, and pay other expenses.

Serra, de Almeida and Ferreira (2013) pointed out that the lack of financial resources like turnaround failures, inadequate management, and turnaround strategy to the demise of an organization affects organizations. Romero, Ventas, Barrio and Torres (2013) argued that public financial aids are effective because they improve recipients' performance in the beginning and increase the existence of variations in the average values of efficiency indicators according to the type of help received. The previous two studies showed that the lack of financial aids affects hospitals' managements and consequently affects the healthcare service provided to patients.

1.6 Organizational Neglect

Neglect is usually progressive and begins with a habit if there is no plan by employees or monitoring from leadership management (Kampen & Henken, 2017). Neglect is a type of abuse by humans caused by a lack of attention, often via carelessness or contempt for others' needs. There are many types of neglect such as physical neglect, emotional neglect, financial neglect, self-neglects, and organizational neglect (Massey-Stokes, 2018).

Organizational neglect is a form of dissatisfaction about a current job followed by less productivity during work, disobedience for the line manager order, less effort given at work, not arriving on time and talking for a long time at break time. Job neglect can be infectious to some employees because some employees can show unwanted behavior alike (Karimi, Gilbreath, Kim & Grawitch, 2014).

According to Harpwood (2001), neglect in the workplace is referred to as a lack of or inability to oversee and govern an organizational development for an extended period. Neglect is made by lack of making the performance demands and performing working standards results in patterns of negative interaction between management and employees (Kampen, 2015). In a tough lawful sense, neglect involves more than negligence or thoughtless attitudes whether in omission or commission. It also involves the complex of obligation, breach, and loss incurred by the person to whom the duty is owed (Addison, 1972).

Studying the factors of neglect in an organization, especially in public hospitals, is important to know the causes that lead to employees' neglect. Neglect in the workplace, especially in public hospitals with medical equipment, is very unimaginable. It affects patients and the resources of hospitals. According to Addison (1972),

negligence can be a criminal offense because it shows such a complete disregard for the lives and safety of others, which amounts to a crime against the state, and neglectful people ought to be punished. A supervisor can have a significant effect on employees' neglect in the workplace because he is directly supervising employees (Karimi et al., 2014). It is very important to address neglect in public hospitals because if it is not treated, it will become a habit for employees (Kampen & Henken, 2017). Neglect is very risky to public hospitals, especially when there is no alarm coming to business (Kampen, 2015). Therefore, it is very important to raise awareness of employees about the risk of neglect in public hospitals because they are working to serve people and save the resources of public hospitals. Neglect is very bad for the growth of the Yemeni economy, especially these days during the financial crisis in Yemen.

Previous studies on the organizational neglects. Most breakdowns of medical equipment are caused by the neglect of operators and technicians in public hospitals (Bektemur et al., 2018). According to Salim and Mazlan (2019), the misuse of medical equipment by operators or technicians is the cause of the breakdown of medical equipment in public hospitals, which is named the carelessness of the hospital staff. The two previous studies indicated that the breakdown of medical equipment is attributed to neglect and misuse of operators.

According to Karimi et al. (2014), in American public hospitals, employees take a long time to eat their lunch, and they perform their personal tasks in surfing the Internet and chatting with friends during the working hours. Employees also get out of work during the working hours and let colleagues do their tasks. Generally, Karimi's study indicated that there is job neglect by employees in public hospitals in the US.

Manyisa and van Aswegen (2017) pointed out that organizational neglects are affected by the working condition factors (employees working around or the working environment in public hospitals, employees' working load during their duty, long working hours, shortage of employees, lack of bonuses and rewards, lack of healthcare insurance and others).

According to Kampen (2015), neglect in an organization is caused by the doubt between the management and employees. Kampen (2015) pointed out that the management must be fast in responding to employees to overcome any organizational neglect. Otherwise, maintaining personal dignity is a priority for employees over providing service to patients and achieving the organization's goals. To sum up, the two previous studies showed

that when there is no interest in employees by the management of an organization, it will lead to organizational neglect by employees.

According to Dash and Jena (2020), neglect in the workplace appears in employees' act. Neglect can be seen through incomplete objectives, carelessness about the organization rules, permitting to break the laws, distrust, and bad attitudes towards the management and customers. Neglect will be a risk to the organization's objectives in the long term. Maybe the causes of neglect in the workplace are discrimination, harassment, and carelessness about employees by the line managers, supervisors, and colleagues in the organization. Dash and Jenan's study showed that employees' neglect in an organization is attributed to discrimination, harassment of the line managers and supervisors.

Prolong neglect in the workplace depends on several factors in an organization. The factors can be the organization's development history, the features of major processes, the board of directors' dedication, senior management and support staff's attitudes concerning potential neglect, and direct supervisors' posture (Kampen & Henken, 2017).

Neglect in the medical sector costs many millions of pounds in England, and the rising rate is 25% annually. Furthermore, neglect in the medical sector affects patients and decreases the financial resources of hospitals (Towse & Danzon 1999). The medical sector suffers from neglect financially. Therefore, it is important to start investing in employees' training to increase the technical awareness about serving patients. According to Quinn (1998), healthcare sectors lose a lot due to clinical negligence by operators. The two previous studies showed that there is negligence in the healthcare sector, and it is very costly to public hospitals.

According to Harpwood (2001), medical negligence in Britain causes the loss of nearly sixteen new hospitals due to allegations by patients who were subjected to mistreatment and misdiagnosis resulting from this neglect. Harpwood (2001) pointed out that not all mistakes in the treatment or mistakes in diagnosis are considered negligence. The medical staff works with great effort, but sometimes the situation of a patient is very hard to survive during the operations. This study indicated that neglect in healthcare causes a loss in the budget of a hospital because compensation is requested by patients.

1.7 Relationship between Financial Aids and Organizational Neglects

When a public hospital has a strong financial income like cash flow or support of financial aids, it will employ staff with good quality and experience, commitment and responsibility to their work. When a public hospital rewards the staff via bonuses and high salaries, it will get the loyalty (Akinleye et al., 2019).

Akinleye et al. (2019), pointed out that when public hospitals face a financial crisis, the staff starts to neglect their working duties or submit their resignation and search for a new job in other hospitals, which consequently affects the medical health services.

There is a lot of neglect by employees who cannot get enough salaries in public hospitals due to lack of financial aids. Those employees tend to move from public health sectors to private health sectors, which affects the healthcare community (Bajpai, 2014). According to Kampen (2015), the best way to eliminate employees' neglect in the workplace is by building a strong relationship between management and staff. Furthermore, it is much recommended to support the staff using financial rewards. When there is a poor quality of financial performance in public hospitals, there will be a bad medical service situation due to the neglect by employees who cannot receive the motivation in public hospitals and tend to search for other jobs in other positions (Heever, 2009).

According to Kampen and Henken (2017), most neglect in an organization is attributed to the management of the organization. The reason can be the general manager, the line manager, the head of a department and the supervisor. When employees are not satisfied financially, they start to neglect the workplace due to lack of response from the management to their demands for extra rewards or increase in the monthly salary.

Karimi et al. (2014) stated that, "Supervisor's behaviors are associated with job neglect." Therefore, the best way to decrease employees' neglect is to decrease the negative effect superintendents because when there is a negative effect of superintendents on employees, employees tend to neglect the workplace and they do not do their job perfectly. All in all, superintendents have the ability to support employees either negatively or positively.

According to Hickson (2014), the success of a project cannot be achieved without managing the financial and human resources. Therefore, when there is good financial support for a project, the project manager can plan, process and complete the project successfully. However, if there is a shortage or no financial support for a project, the project cannot bring the human resources, which leads to the project failure.

1.8 Technical Awareness

Technical awareness refers to the person or people who are attentive to the recent technology, which has become popular and accepted in our lives, and they can be used to serve people in the market and industry. It also includes the ability of a person or people to understand the usefulness of technology in the success of business ("Technology trend awareness," 2016). Hosman and Comisso (2020) defined the concept of awareness as a perception of a phenomenon. They argued that the operationalization of awareness is extremely challenging because it is a relative notion with many different interpretations. Therefore, awareness is defined as the capacity to notice patterns in a given environment and manage new problems without having to know all of the system's contemporaneous aspects. Hosman and Comisso also defined the combination of socio-technical awareness as the capacity to perceive patterns and settings within socio-technical systems. Socio-technical awareness includes the capacity to comprehend and develop new interactions with technology within the complex socio-technical systems in which humans and technologies interact.

Technical awareness is the activities of the brain about how someone can get access to the objects and how someone is aware of this type of object (Clifford, Arabzadeh & Harris, 2008). Technical awareness is a sense of responsibility by the operator, technician, and biomedical engineer of the medical devices they use to reduce the number of breakdowns in public hospitals (World Health Organization, 2012). The awareness of using tools by biomedical engineers is needed to help them perform the PPM and corrective maintenance and use the Internet to access training, seminars, online development, and computer skills to communicate with others and supplier companies.

Situation awareness means the ability to move around, operate equipment, or manage a system with the most up-to-date cognizance or awareness. Situation awareness has arisen as a psychological concept in the applied behavioral science field, akin to intelligence, alertness, attention, tiredness, stress, compatibility, and workload (National Research Council, 1998).

Technical awareness in the healthcare sector is important to improve and keep technology up to date. When an operator, technician, or biomedical engineer has technical awareness about medical equipment in public hospitals. They can maintain medical equipment in a working mode without breakdown because they have knowledge about different medical equipment. Technical awareness helps to reduce the time consumption to

perform the treatment or diagnosis for patients. It also helps to send the result directly to patients' mobile phones without wasting time ("Technology trend awareness," 2016). It is very important that employees have training and skills during work because the investment in employees' training in the medical sector is very important to reduce technical errors with patients (Towse and Danzon 1999). It is important that surgeons, for example, have technical awareness to gain a deeper understanding of the technical features of medical devices (Campanile & Campanile, 2020). Employees' technical awareness is considered an extremely successful investment in the future (Palka, Brodny & Stecul, 2017).

Technical awareness needs training and experience which is very important to decrease the risk of using medical equipment (Quinn, 1998). Many patients will benefit from technical knowledge since they will be able to view the results of their tests on their computers or mobile phones. They can access the site of a hospital or laboratory to see the result on their mobile phone. ("Technology trend awareness," 2016).

Previous studies on technical awareness. Public hospitals need skilled, trained, and experienced employees like operators, technicians, and biomedical engineers to deal with biomedical equipment. They will be aware of dealing with medical equipment during their work. Operators or technicians, for example, will be aware of using biomedical equipment and performing daily maintenance, calibration, and quality control to test whether medical equipment is working in normal conditions without any errors. Technical awareness of biomedical engineers will help to perform the PPM (when, where, and how), and predict and prevent any breakdown for medical devices (World Health Organization, 2012). The study showed that staff that deals with medical equipment must have technical awareness to help decrease the breakdown of medical equipment.

According to a journal article by Bajpai (2014), good public hospitals with awareness of medical equipment provide patients with a good service because they know good medical equipment for treatment and diagnosis. All of this can be done with a good education program for the staff of public hospitals, especially those who have the intelligence to convert this science into practical life in big challenging circumstances in healthcare service. The study showed that technical awareness of staff would maintain a good condition for medical equipment.

Roughly 55% of technicians lacked the necessary educational qualifications to handle medical equipment, and about 15% were not provided training when the equipment was purchased. Likewise, some managers are not

aware of the importance of the maintenance procedures and management of maintenance to get smooth and effective operation of their organizations (Tadia & Kharate, 2020).

Operators, technicians, and biomedical engineers of public hospitals need training by a supplier company to have technical awareness to prevent any breakdown of a medical device resulting from misuse (Bektemur et al., 2018). To sum up, it is important for staff dealing with medical devices to have training to deal with medical equipment.

One of the most important things to keep medical equipment working is fast repairing after the breakdown, which requires an inventory of spare parts available in public hospitals. This can be done by experienced, trained, and skilled biomedical engineers in maintenance departments. Furthermore, trained and skilled clinical staff will help to keep medical equipment in operation (World Health Organization, 2011).

According to Karimi et al. (2014), when an organization selects a supervisor, it is very important to use the selection technique and conditions like experience, management training, objective setting, and feedback responsive to ensure the supervisor has technical awareness. According to Salim and Mazlan (2019), the breakdown of medical equipment occurs due to many factors. One of these factors is the misuse of operators and technicians due to low skills and training and lack of technical awareness. The previous three studies showed that the staff and management should have necessary skills and experience for technical awareness to help reduce the breakdown of medical equipment.

According to Thapa et al. (2018), reducing the breakdown of medical equipment is achieved by performing periodic training for biomedical engineers on how to handle medical equipment during the hopper cleaners and sterilization by any department of a hospital to prevent any damage to the PCB or any parts of medical device. Training is important to prevent the steam from entering a medical device and to check it after the cleaner and sterilization to enhance the lifetime of medical equipment, and this positively affects the financial stability of a hospital. Finally, the study mentioned that a biomedical engineer must have training of technical awareness to deal with medical equipment.

Iyer and Bandyopadhyay (2000) pointed out that training employees in any organization should be both technical training and awareness training. Awareness training will help employees to learn the methods of limiting risks and loss of data, equipment, and supplies for many sorts of probable interruptions. On the other hand,

technical training involves the knowledge of technical failures due to unreliable equipment and applications, power outages, and the system's failure to satisfy users' expectations. The study indicated the necessity of technical awareness training.

According to Al-Bashir et al. (2017), medical equipment in developing countries is misused by operators, and there is no suitable maintenance due to the lack of technical awareness by maintenance departments in hospitals. Medical supplier companies reported that customer training is not enough as the main factor because technical awareness is necessary for employees to prevent the breakdown of medical equipment. Furthermore, the quality of medical devices, using inappropriate devices, low level of information, lack of documentation and plan of services are causes of the breakdown of medical equipment in any health sector (Quinn, 1998). The two previous studies pointed out that operators and biomedical engineers need required training and information to get technical awareness.

The team members in any organization need to have technical awareness of the diversity field with good knowledge and collaborate with each one. Therefore, it is very important to know the needs of an organization and the importance of technical awareness in this field, and recommend hiring experienced staff (Gregory & Crispin, 2014).

Everyone can keep himself updated to improve technology awareness skills by reading particular topics and attending seminars about the newest technology in the relevant sites. Technological news can be followed on Twitter, Facebook, and other social media ("Technology trend awareness," 2016). The two studies pointed out that technical awareness needs to be up to date with the new technology and inventions in the healthcare field. With the increasing awareness of healthcare and wellness issues, patients will soon begin to take a larger role in the whole care process. Many new-age apps dealing with preventive and continuous monitoring of health are already driven by healthcare consumerism ("Technology's role in addressing India's healthcare challenges." n.d.).

According to Hosman and Comisso (2020), when a person uses information and communication technologies for technical awareness, he can access digital gadgets or the Internet to benefit from devices, connectivity, or training, which may be provided by governmental organizations, non-governmental organizations or development agency programs. Hosman and Comisso's study opposes communications rules that may hinder or encourage firms and governments to invest in infrastructure and maintenance in order to offer inexpensive

connectivity in a given place. To conclude, the two previous studies indicated that using technology in healthcare is one of the reasons for increasing technical awareness.

Palka et al. (2017) pointed out that the major problem of technical awareness of the new technological machine is the lack of appropriate training for the staff about a new technological machine. Furthermore, they found the lack of handling skills and technical knowledge and the fear of the unknown by employees are reasons for low technical awareness. The study showed that the lack of technical awareness is attributed to the lack of training for the staff.

1.9 Relationship between Financial Aids and Technical Awareness

Akinleye et al. (2019) argued that as public hospitals have a financial strength, there would be a plan for their staff to be developed by a training program. A management department in public hospitals must consider the awareness of technology during choosing the proper medical devices required. As financial aids are important in public hospitals for upgrading and purchasing medical devices, it is very important to have a staff that has experience and technical awareness for decision making and choosing the proper medical equipment in public hospitals to last a long lifetime in the future. Furthermore, the financial aid will help employees to have the training required and will increase the technical awareness because public hospitals with strong financial support can prepare and manage the training schedule for their employees by arranging with a supplier company or the manufacturer (World Health Organization, 2012). The financial stability in public hospitals helps to perform a training program for biomedical engineers in the maintenance departments of hospitals. Training may include a workshop, preparing a stock of spare parts required for fast responding to any breakdown of medical equipment, the tools needed for repair, calibration and adjustment, and reducing the time of medical equipment breakdown (Thapa et al., 2018). A training program does not necessarily require financial load by hospitals; it can be done by the supplier of medical companies after installation of new medical devices (Palka et al., 2017).

1.10 Theoretical Framework

The chart in Figure 2.1 shows the relationship between the breakdown of medical equipment in public hospitals and the three factors: financial aids, organizational neglects and the technical awareness. Figure 2.1 shows the independent variables: financial aids, organizational neglects and technical awareness and the dependent variable: the breakdown of medical equipment in the public hospital.

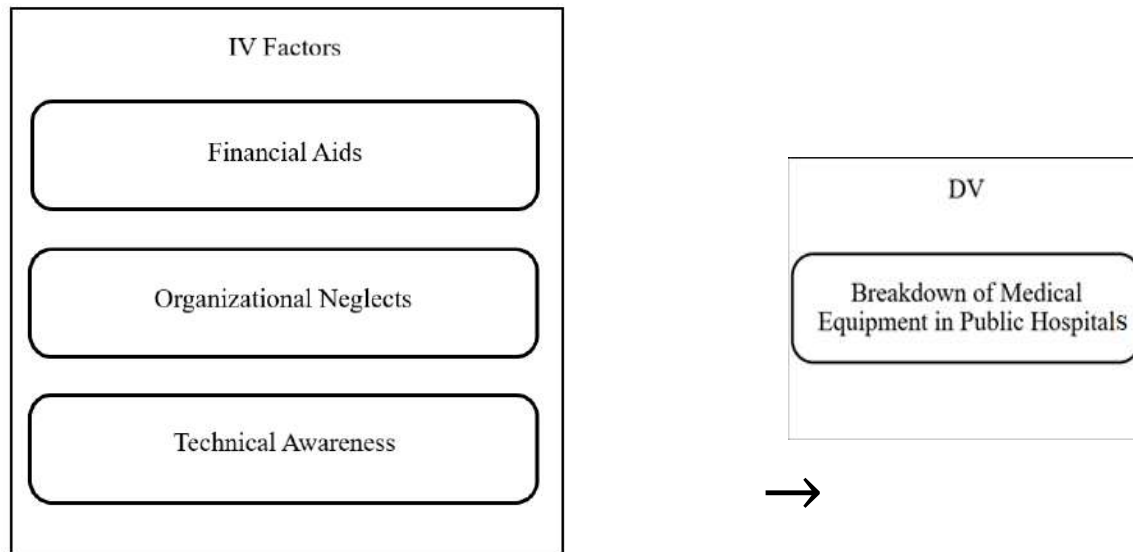


Figure 2.2 Theoretical framework.

1.11 Hypothesis Development

Based on the review of previous studies, there is a relationship between the breakdown of medical equipment in public hospitals and the three factors: financial aids, organizational neglect, and technical awareness. Therefore, the hypotheses were developed to answer the three research questions are the following:

H1: There is an impact of financial aid on the breakdown of medical equipment in public hospitals.

H2: There is an impact of organizational neglect on the breakdown of medical equipment in public hospitals.

H3: There is an impact of technical awareness on the breakdown of medical equipment in public hospitals.

1.12 Summary

Chapter 2 reviews the previous studies on the impact of the independent variables: financial aids, organizational neglect, and technical awareness on the dependent variable: breakdown of medical equipment in public hospitals. Some studies examined these factors in the healthcare sector, and other studies examined these factors in other fields other than the healthcare sector. Finally, this chapter discusses the development of the theoretical framework and hypothesis development.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains how the study is conducted in order to collect data, test hypotheses and answer research questions. It also presents the instrument used in this study, and the data analysis technique followed to test the relationship between the independent variables: financial aids, organizational neglect, and technical awareness and the dependent variable: breakdown of medical equipment in public hospitals.

3.2 Research Design

Quantitative research is a method of investigating objective hypotheses by looking at the relationship between the variables. This approach is one of the deductive approaches, as it builds upon existing theories to test and validate these theories (Sukamolson, 2007).

Qualitative research is a comprehensive inductive approach to learning, which entails exploration. Qualitative research may also be defined as a detect model that takes place in a natural context and allows a researcher to build a degree of depth via active participation in the actual events in which a researcher can build a theory from observation (Williams, 2007).

The main difference between quantitative research and qualitative research is that quantitative research answers to study problems that necessitate numerical or statistical data, whereas qualitative research necessitates textual data (Williams, 2007). Another difference is that quantitative research requires confirming the theory, whereas qualitative research requires observation to build a new theory (Williams, 2007).

This study is deductive in nature and is based on quantitative research design. The study is conducted in the healthcare sector of Yemeni hospitals to describe the impact of the factors like financial aids, organizational neglect, and technical awareness as independent variables that influence the breakdown of medical equipment which is a dependent variable in public hospitals.

Exploratory research explores the problem faced by a researcher to provide visions and understanding for more accurate analysis. It focuses on the exploration of concepts and ideas (Surbhi, 2017). However, a descriptive study is a sort of scientific study that focuses on defining the features of a certain person, group, situation or

phenomenon. It comprises particular forecasts, a person or group's characteristics or functions, and the recounting of facts. This type of study reduces bias and increases reliability (Surbhi, 2017).

When we have an idea about something in the world, we need to perform formal processing verification about this idea using statistical methods. This is exactly a hypothesis testing study, which arises from theories and is used by scientists to test specific forecasts (Bevans, 2021).

The main difference between exploratory research and descriptive research is that exploratory research is flexible and unstructured and has non-probability sampling and no pre-planned design for analysis, whereas descriptive research is rigid and structured and has probability sampling and a pre-planned design for analysis (Surbhi, 2017). This study is descriptive in nature as it describes the factors influencing the breakdown of medical equipment in public hospitals in Yemen.

There are two types of research investigation. One is the causal study that examines the relationship between cause and effect. This means a change in the independent variable, and it leads to a change in the dependent variable (Bhasin, 2020). The other one of research investigation is the correlation study, which is defined as the relationship between two variables using statistical analysis without using experimental research. A change in one variable leads to a change, increase or decrease or no change, in the other variable (Wu et al., 2021). The main difference between a causal study and correlation study is that a causal study involves a cause-and-effect relationship between variables, whereas a correlation study is a statistical indicator of the relationship between variables. This study follows the causal type of investigation as it examines the effect of independent variables or factors: financial aids, organizational neglect, and technical awareness on the dependent variable, breakdown of medical equipment in public hospitals.

It is important to use questionnaire survey tools to help collect the data from the target audience. The questionnaire of this study is an online survey and it has features like cost-saving, reaching people quickly, respondent anonymity, flexibility for respondents over where and when to complete their questionnaire, and data accuracy. The questionnaires were distributed to the target audience who are working in the healthcare sectors in public hospitals and medical equipment supplier companies in Yemen.

3.3 Population and Sampling

The population in research is the number of targeted audiences or a group of people required by a researcher to perform the research investigation. For example, customers may visit a specific mobile application to buy international brand clothing. The element is a single member of the population (Sekaran & Bougie, 2019). The sampling is a subset of the group if we talk about the entire customers who visit a specific mobile application to buy international brand clothing. For instance, if there are 800 visitors, the researcher will take 250 of the 800 visitors as a sample of the study (Sekaran & Bougie, 2019)

2.3.1 Population

The population of this study comprises the healthcare sectors of laboratories in public hospitals and medical supplier companies in Yemen. The number of the population is 500. The participants are employees in different functions in laboratories of public hospitals, and they deal directly with medical equipment. They are operators, technicians, biomedical engineers, and managers, and biomedical engineers and application services who work in medical supplier companies. They have different ages, genders, qualifications, and experience.

2.3.2 Sampling

The sample of this study includes biomedical engineers working in the maintenance departments of public hospitals, and biomedical engineers working in medical supplier companies. The sample also includes operators, technicians, managers of laboratory departments in public hospitals, and the application services workers in the medical supplier companies in Yemen. The sampling was taken from public hospitals in Sana'a: Al Thawra Modern General Hospital, Al Jumhouriy General Hospital, Kuwait University Hospital, Military General Hospital, National Blood Transfer Research Center, National Center of Public Health Laboratories, and Al Sabeen Maternity and Childhood Hospital. In Mukalla City, the public hospitals include Ibn Sina General Hospital, National Blood Transfer Research Center, and National Center of Public Health Laboratories. In Seiyun City, the public hospitals include Seiyun General Hospital, Tarim General Hospital, National Blood Transfer Research Center, and National Center of Public Health Laboratories. In Ibb City, the public hospitals include Al Thawra Modern General Hospital. The medical supplier companies in Sana'a are Diedo Corporation, Biolab Corporation, and Natco Al-Razi Company. The sample is convenience sampling because the population who are conveniently available to provide the information

(Surbhi, 2017). The sample size in this study is 220 individuals who are the most favorably placed to provide the required information.

3.4 Instrumentation

A questionnaire is a group of questions which can be arranged and sent by a researcher to responders in order to collect the research data. A questionnaire is considered a quantitative design to collect data. It can be given out in person or sent out electronically to responders. The specifications of a questionnaire are less expensive and require less time compared to an interview, but it is prone to errors and sometimes it gets no response from respondents to the questionnaire (Sekaran & Bougie, 2019).

A questionnaire consists of four parts. The first part is about the demographic and general information of responders like the gender, age, level of education, level of experience, and job title. The second part is about the measurement about the independent variable of the financial aids. The third part includes the measurement of the independent variable of organizational neglect. The fourth part consists of the measurement of the independent variable of technical awareness. Under the measurement of the variables, responders are requested to specify their level of agreement with items by using a 5–point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree).

3.4.1 Financial Aids Measurement

Measuring the financial aids involves the formulation of some questions from other studies talking about financial management. Some of the questions of this research were formulated through the researcher's experiences after they were reviewed by the judgment commission at the LIU (see Appendix A).

3.4.2 Organizational Neglect Measurement

Measuring organizational neglect involves the formulation of some of the questions from other studies talking about organizational neglect in organizations. Some of the questions were formulated through the researcher's experiences after they were reviewed by the judgment commission at the LIU (see Appendix A).

3.4.3 Technical awareness Measurement

Measuring the technical awareness involves the formulation of some of the questions from other studies talking about technical awareness. Some of the questions were formulated through the researcher's experiences after they were reviewed by the judgment commission at the LIU (see Appendix A).

3.5 Data Collection

Data collection is defined as the process of acquiring and measuring information on the research study's goal variables in any field either business, government, or academic purposes (Bhandari, 2020). There are two types of data. The first one is primary data which is collected by a researcher to understand and solve the topic problem in research. This type of data is collected via surveys, interviews, or experiments. The second type is the secondary data, which is found in previous researches, institutes, universities, and other sources. This type of data is required for verifying data files. The difference between primary data and secondary data is that primary data are involved in research problems and take a long time and money to be collected. However, the secondary data not specific, so they are quick to be obtained in the researcher's needs. They are not expensive and are considered past data (Wagh, 2021).

In this study, the researcher used primary data collected from online questionnaires and secondary data collected and improved from previous research about financial aids, organizational neglect, and technical awareness.

There are three methods for collecting data. The first one is the interview method. It is defined as a one-on-one situation in which two persons meet. The interviewer asks questions, and the interviewee gives answers that have information needed for research data (Hickson, 2014). The second one is the questionnaire, which is a group of questions arranged and sent by a researcher to respondents in order to collect data required by a research study (Sekaran & Bougie, 2019). The third method of data collecting is the observation method, which is defined as the technique used by a researcher to observe people over long periods of time and converse with them about what they are doing, thinking, and saying in order to gain better knowledge of a social group under investigation (Sekaran & Bougie, 2019). The type of data collection method used by the researcher in this study is the online survey. There are advantages to online surveys. It is much easier and faster. A researcher can access persons in remote regions and can reach difficult-to-contact participants. An online survey is known for its

simplicity of automated data collection and it saves time and effort for researchers (Wright, 2005). Another benefit of an online survey is that it is far more convenient to send responses by clicking a button rather than going to a post office (Lefever, Dal & Matthíasdóttir, 2007).

2.6.1 Instrumentation Translation

The questionnaire of this study was written in English. Then it was translated to Arabic because it is easier for the respondents to understand the questions and give the correct answer in Arabic. The researcher translated the questionnaire by using Google Translate, and it was reviewed by the researcher's supervisor at the LIU.

2.6.2 Administration of Questionnaire

The researcher used a Google form to design the questionnaire, and the respondents' answers were collected by using the Google form. The participants needed between ten to fifteen minutes to complete the survey. The online survey was left available for two weeks, and the repeated response button was disabled to prevent the redundancy of the same respondents. Each respondent received the survey link via a WhatsApp text message with instructions.

2.7 Scale Validity and Reliability

The terms "reliability" and "validity" are used to measure the quality of research (Middleton, 2019). The scale validity refers to how well observations correctly reflect the behavior you are interested in, whereas reliability refers to the consistency of the results of measurement, which take much time in different events and give the same results (Sekaran & Bougie, 2019). Reliability is involved in situations when two or more respondents give the same result in the same test at a different time (Cheung & Tai, 2021). The measurement of the score obtained must be consistent across the time by using a collection of individuals at one time and by using it again with the same collection of individuals later. Any measurement has a different result today from the previous result at a previous time is considered unreliable (Price, Jhangiani & Chiang, 2015). When researchers create a research design, it is important to create the reliability and validity of the variables involved in the study. When researchers perform a study on the variables of the same individuals at a different time, the same result must be obtained to ensure that the result is stable, precise and reproducible. However, if a different result is obtained on the same individuals and

at a different time, it means the answer obtained is not correct and the researcher cannot depend on the data results (Middleton, 2019). Schnell (2018) says, replication is a fundamental foundation of research; without it, how can we be sure a study wasn't duplicated only due to measurement error.

The scale reliability of the questionnaire of this study was measured by using Cronbach's Alpha to ascertain the internal consistency. Table 3.1 shows the output of the Cronbach Alpha test to all the questions of the questionnaire. The amount of reliability coefficient for the total survey for all factors is 84.3%, which means that the questionnaire is good and reliable ("Cronbach's Alpha: Simple definition, use, and interpretation," 2021).

Table 3.1

Cronbach Alpha

Variable	Cronbach Alpha	No. of Items
Financial Aids	72.9%	9
Organizational Neglects	66.0%	9
Technical Awareness	80.7%	8
All Variables	84.3%	26

2.8 Data Analysis

The method of data analysis is critical for answering the study questions (Sekaran & Bougie, 2019). This study utilizes the SPSS for analyzing the data collected from the questionnaires. The SPSS offers statistical methods like correlation analysis, descriptive statistics, one sample test, and reliability analysis. The correlation coefficient defines the direction and strength of the link between the variables (Sekaran & Bougie, 2019). The reliability evaluation is checked to ensure that the measures are fit for purpose. The descriptive analysis was used to define the respondents' characteristics. One sample test was used to test the hypothesis (Beers, 2021). Frequency analysis is a type of descriptive statistics that is useful in the field of statistics to deal with the number of times something is repeated ("What is frequency analysis," 2013).

2.9 Summary

Chapter 3 discusses the research methodology for the population sample, instrumentation, data collection, and analysis of the study. It describes how the population and sample were selected. It also describes how the questionnaire was designed and distributed to the participants. Finally, this chapter gives information about the data analysis conducted using statistical tools.

CHAPTER 4

DATA ANALYSIS

3.1 Introduction

Chapter 4 presents the data analysis to test the research hypotheses, which focuses mainly on the factors influencing the breakdown of medical equipment in public hospitals in Yemen. This chapter starts with data screening and describes the sample profile of the selected respondents presented as statistical frequency through figures and tables. Furthermore, the descriptive statistics is explained to determine the importance of the research variables. The chapter also presents the results of the correlation analysis, which explains the relationship between

all variables. At the end of this chapter, the hypothesis testing is explained to know whether the research hypotheses are supported.

3.2 Data Screening

According to Subramanian (2020), before you undertake any statistical studies, make sure your data is clean and ready to go in order to analyze the relevant questionnaire data of the targeted sample. In this study, 220 questionnaires were sent to participants, but only 151 questionnaires were received. The questionnaire was kept available to the participants for two weeks, from December 24, 2021 to January 7, 2022.

4.2.1 Erroneous Data Entry

The researcher thinks that there were no data entry errors, for the responses in the generated excel file were in words rather than numbers, and the data codes were reversed from words to numbers.

4.2.2 Missing Values

Because the questionnaire was provided to the respondents online and all of the items were answered, there are no missing values in the study data.

4.2.3 Normality Assessment

Table 4.1

Normality Assessment

	Skewness	Kurtosis
Financial Aid	-.495	.726
Organizational Neglects	.082	.134
Technical Awareness	-.099	-.119

In Table 4.1, all the values of kurtosis and skewness are within ± 1 , indicating that the data followed normal distribution. Therefore, parametric tests are to be used in the inferential statistics.

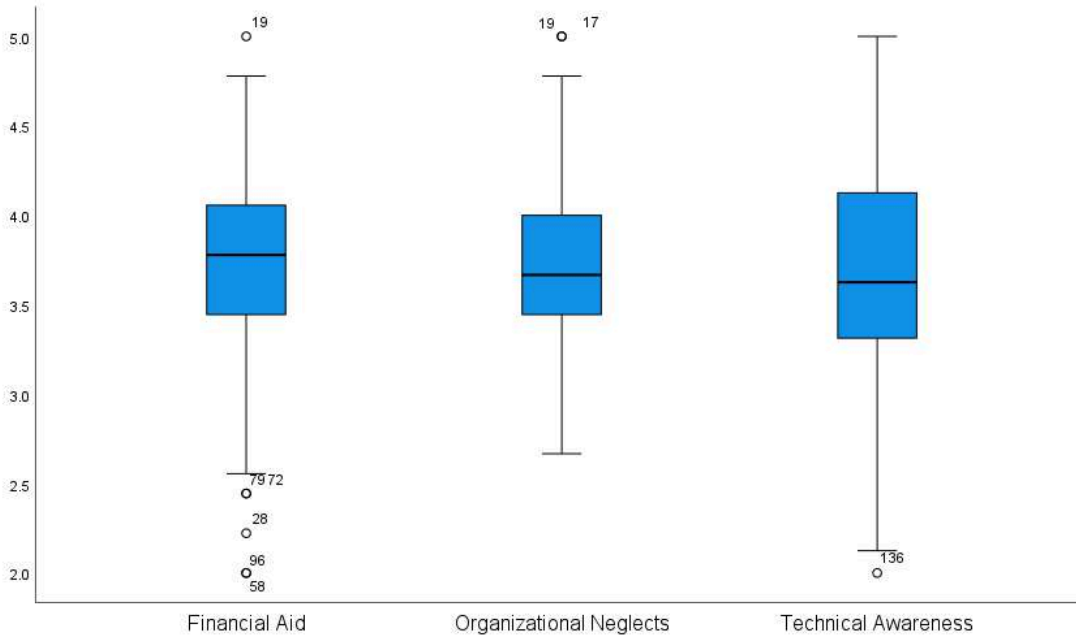


Figure 4.1 Univariate outliers.

Figure 4.1 shows the boxplot for six outliers in the Financial Aid, two outliers in the organizational neglects, and one outlier in technical awareness. These outliers are not excluded because they are not extreme and data is within normal distribution.

4.2.4 Checking the Quality of the Responses

There are no constant responses in the data. All respondents show variation in the responses.

Table 4.2

Unusual Cases or Out-of-Range Values

	Minimum	Maximum
Financial Aid	2.00	5.00
Organizational Neglects	2.67	5.00
Technical Awareness	2.00	5.00

There are no unusual cases in the data, and the data has no out-of-range values. Table 4.2 shows the minimum and maximum values with all of the values falling between 1 and 5.

4.2.5 Response Bias

The data was randomly divided into two groups in order to check the response bias. An independent T-Test was run to examine whether there are differences between the groups for all the dimensions of the study.

Table 4.3

Response Bias

	t	p
Financial Aid	.842	.201
Organizational Neglects	-1.251	.153
Technical Awareness	-1.085	.140

As shown in Table 4.3, all T-Test values are not statistically significant ($p > 0.05$), indicating that there is no response bias in the data of the study.

Levene T-Test was run to examine whether the variance between the two randomly selected groups is homogenous. As shown in Table 4.4, all F values are not statistically significant ($p > 0.05$), indicating that the variance of the data is homogenous. This supports what is mentioned earlier; there is no bias in the responses of the study.

Table 4.4

Response Homogeneity

	Levene's Test for Equality of Variances	
	F	Sig.
Financial Aid	3.213	.075
Organizational Neglects	2.495	.116
Technical Awareness	3.448	.065

4.2.6 Data Management Procedures

For achieving the inferential statistics, the codes of financial aid and technical awareness were reversed in order to meet the hypotheses of the study. Code 5 was changed to 1, code 4 was changed to 2, code 1 was changed to 5, code 2 was changed to 4, and code 3 remained as it is. Table 4.5 shows the details of the code change.

Table 4.5

The Code Change

Label	Code	Reversed label	Reversed code
Strongly agree	5	Strongly agree	1

Agree	4	Agree	2
Strongly disagree	1	Strongly disagree	5
Disagree	2	Disagree	4
Neutral	3	Neutral	3

4.3 Sample Profile

The sample size of this study is 15. The sample was taken from different laboratory of public hospitals in Sana'a, Mukalla, Seiyun, and Ibb. The survey questionnaire was sent to 220 employees: heads of departments, biomedical engineers, technicians, and others. Only 151 questionnaires were received. Therefore, the response rate is 68.6%, Table 4.6 summarizes the questionnaires' results. The characteristics of the respondents are explained using a frequency analysis in the next subsection.

Table 4.6

Questionnaire Response Rate

Response	Frequency/Percentage
Number of questionnaires was sent	220
Number of received questionnaires	151
Number of not return questionnaires	69
Response Rate	68.60%
Number of incomplete questionnaires	0
Number of analyzed questionnaires	151

3.3.1 Gender Frequency

Table 4.7 and Figure 4.1 show 70.2% (106) of the respondents are male, and 29.8% (45) of the total respondents are female. Gender is widely used as a segmentation criterion.

Table 4.7

Frequency Analysis of Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	106	70.2	70.2	70.2
Female	45	29.8	29.8	100
Total	151	100	100	

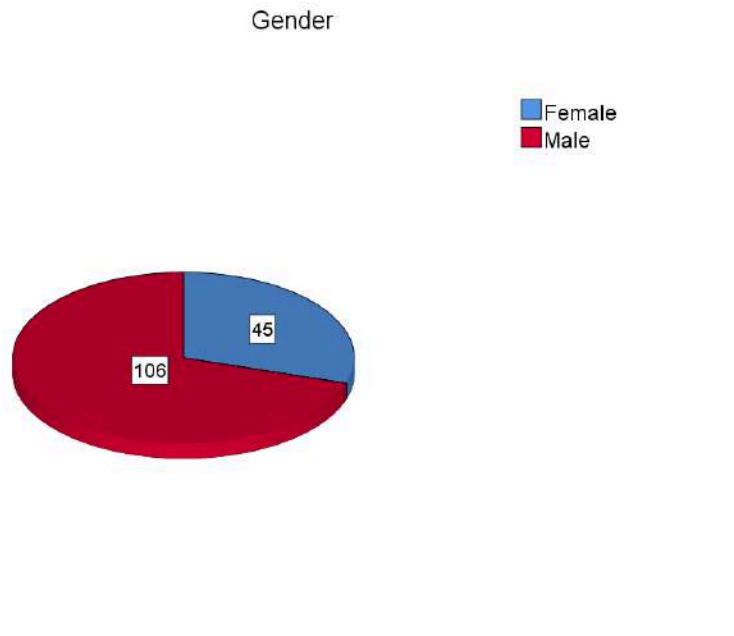


Figure 4.1 Frequency analysis of gender.

3.3.2 Age Frequency

Table 4.8 and Figure 4.2 show the age frequency. The frequency distribution of this demographic variable shows that respondents aged between 35 and 45 years old have the highest percentage (47.7%). The respondents aged between 25 and 35 years old get the second rank (37.7%). The respondents who are more than 45 years old get the third rank (11.9%). The respondents whose age is less than 25 years old have the lowest rank (2.6%). The number of respondents is 151.

Table 4.8

Frequency Analysis of Age

	Frequency	Percent	Valid Percent	Cumulative Percent
Under 25 Years	4	2.6	2.65	2.65
25-35 Years	57	37.7	37.75	40.4
35-45 Years	72	47.7	47.7	88.1
More than 45 Years	18	11.9	11.9	100
Total	151	100	100	

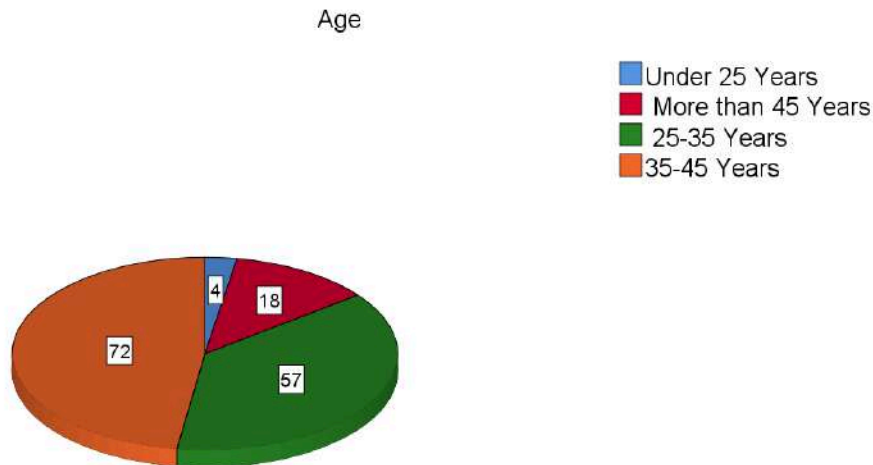


Figure 4.2 Frequency analysis of age

3.3.3 Education Frequency

The respondents participating in this study have different educational qualifications. Table 4.9 and Figure 4.3 show the differences in the education of the respondents. The frequency distribution of this demographic variable indicates that most of the respondents have a bachelor degree (59.6%). The second rank is scored by the respondents who have a diploma degree (20.5%), followed by the respondents holding a master degree in the third rank (16.6%). The respondents holding a PhD. degree represent 2%, and the respondents with high school certificates represent 1.3%.

Table 4.9

Frequency Analysis of Education

	Frequency	Percent	Valid Percent	Cumulative Percent
High School	2	1.3	1.3	1.3
Diploma	31	20.5	20.5	21.8
Bachelor	90	59.6	59.6	81.4
Master	25	16.6	16.6	98
PhD	3	2	2	100
Total	151	100	100	

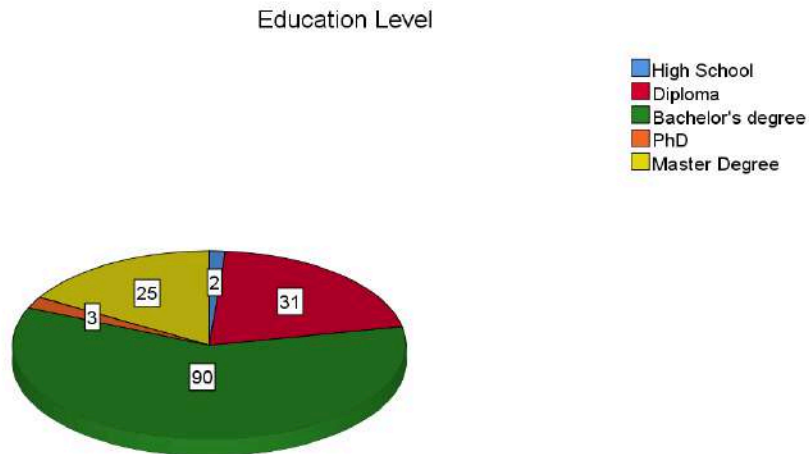


Figure 4.3 Frequency analysis of education.

3.3.4 Position Frequency

The respondents have different positions. Table 4.10 and Figure 4.4 show the different positions of the respondents. The frequency distribution of this demographic variable shows that the highest percentage is scored by the technicians (43.7%), who deal directly with medical equipment. The second rank is scored by the heads of departments with a percentage of 25.8%. The third rank is scored by biomedical engineers with a percentage of 18.5%. The fourth rank is scored by other positions like administrators who do not deal directly with medical equipment with a percentage of 7.3%. The fifth and sixth ranks are scored by doctors and nurses with percentages of 3.3% and 1.3% respectively.

Table 4.10

Frequency Analysis of Position

	Frequency	Percent	Valid Percent	Cumulative Percent
Head of Department	39	25.8	25.8	25.8
Doctor	5	3.3	3.3	29.1
Technician	66	43.7	43.7	72.8
Biomedical Engineer	28	18.5	18.5	91.3
Other Position	11	7.3	7.3	98.7

Nurse	2	1.3	1.3	100
Total	151	100	100	

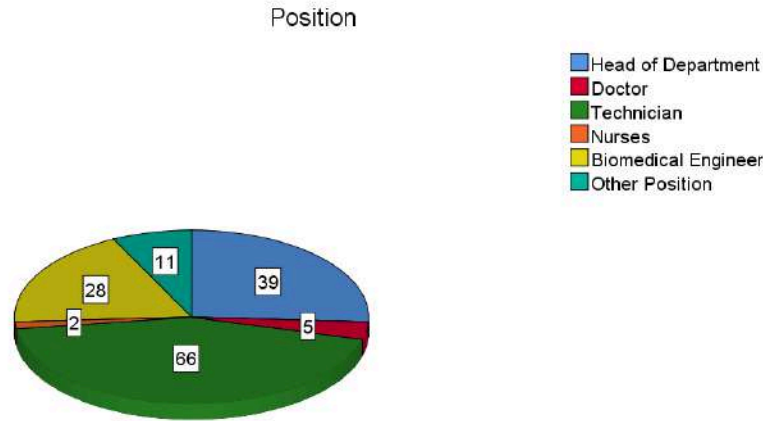


Figure 4.4 Frequency analysis of position.

3.3.5 Experience Frequency

The respondents have different years of experience. Table 4.11 and Figure 4.5 show the different years of experience of the respondents. The frequency distribution of this demographic variable shows that the highest rank (65.6%) is scored by respondents who have more than ten years of experience. The second rank is scored by respondents who have experience between five and ten years with a percentage of 22.5%. The last rank is scored by respondents who have less than five years of experience with a percentage of 11.9%.

Table 4.11

Frequency Analysis of Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
More than 10 Years	99	65.6	65.6	65.6
Between 5 to 10 Years	34	22.5	22.5	88.1
Less than 5 Years	18	11.9	11.9	100
Total	151	100	100	

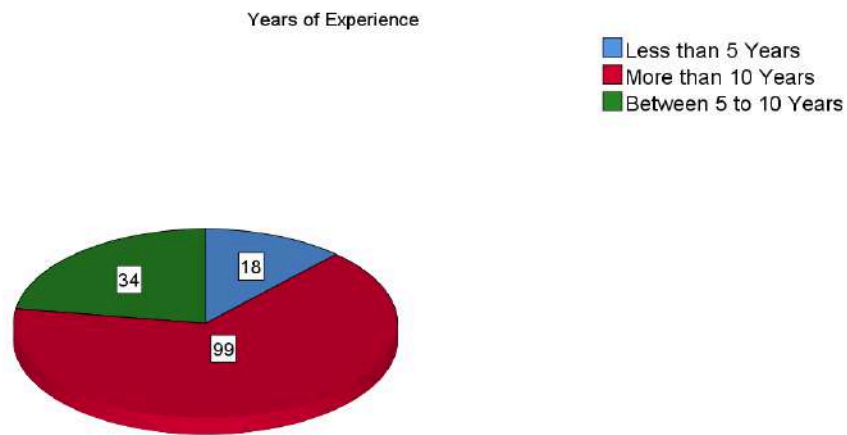


Figure 4.5 Frequency analysis of experience.

3.4 Descriptive Statics

The content of descriptive analysis includes the means and standard deviation for independent variables and are explained in the following sub section. Table 4.12 shows the range of answers used to describe the Likert scale of questionnaire.

Table 4.12

Range of Answer Options of the Likert Scale

Range	Agreement
4.21 – 5.00	Strongly Agree
3.41 – 4.20	Agree
2.61 – 3.40	Neutral
1.81 – 2.60	Disagree
1.00 – 1.80	Strongly Disagree

3.5.1 Descriptive Statics of Financial Aids

Table 4.13

Descriptive Statistics of Financial Aids

No	Items	N	Mean	Std. Deviation	Agreement
1	Public hospitals in Yemen are completely dependent on financial aids.	151	3.79	0.940	Agree
2	When there is a lack of financial aids in public hospitals, the hospital cannot perform the medical service adequately to the patient.	151	3.99	0.891	Agree
3	Financial aids help public hospitals maintain their needs from spare parts for emergency cases.	151	3.86	0.938	Agree
4	In hospitals, financial aids help the maintenance department to conduct all the maintenance needs on medical equipment.	151	3.56	1.105	Agree
5	In hospitals, financial aids will help to improve the environmental conditions required to decrease the breakdown of medical equipment.	151	3.62	0.992	Agree
6	The supervisor in hospitals fairly distributes the rewards between each employee.	151	2.35	1.041	Disagree
7	When there is financial aid in a hospital, it is best to choose medical devices from international brand companies.	151	4.55	0.763	Strongly Agree
8	Training budgets assigned to employees participate in decreasing the level of medical breakdown faced by your hospital.	151	3.95	1.002	Agree
9	Financial aids will help to contract with external companies to perform the maintenance, which will help to reduce the breakdown of medical equipment.	151	3.67	1.100	Agree
	Total	151	3.7	0.551	Agree

Table 4.13 shows the descriptive statistics of Financial Aids. Item 7 has the first rank with a mean of 4.55 (Strongly Agree), and a standard deviation of 0.763, which indicates that medical equipment bought from international brand companies is an important factor in decreasing the level of breakdown of medical equipment in

public hospitals. Item 2 has the second rank with a mean of 3.99 (Agree), and a standard deviation of 0.891. Item 8 has the third rank with a mean of 3.95 (Agree), and a standard deviation of 1.002. Item 3 has the fourth rank with a mean of 3.86 (Agree), and the standard deviation of 0.938. Item 1 has the fifth rank with a mean of 3.79 (Agree), and a standard deviation of 0.940. Item 9 has the sixth rank with a mean of 3.67 (Agree) and a standard deviation of 1.100. Item 5 has the seventh rank with a mean of 3.62 (Agree) and a standard deviation of 0.992. Item 4 has the eighth rank with a mean of 3.56 (Agree) and a standard deviation of 1.105. Item 6 has the last rank with a mean of 2.35 (Disagree) and a standard deviation of 1.041, which confirms that the lack of supervisors' fair distribution of reward among employees may increase the rate of medical equipment breakdown. In conclusion, the general average of the items of variables is 3.7 with the mean (Agree), and the standard deviation is 0.551.

3.5.2 Descriptive Statics of Organizational Neglect

Table 4.14

Descriptive Statistics of Organizational Neglect

No	Items	N	Mean	Std. Deviation	Agreement
1	In your hospital, employees work and deal with medical equipment honestly and faithfully.	151	3.12	0.864	Neutral
2	In your hospital employees who work with the medical equipment share responsibility for tasks.	151	3.47	0.893	Agree
3	The engineering department in your hospital follows up the planned preventive maintenance by the supplier companies.	151	2.78	1.039	Neutral
4	When there is an emergency requested in hospital to repair a medical device, there is a fast response by the engineers.	151	3.37	1.093	Neutral
5	The principle of reward and punishment in avoiding fault and continuing work will reduce organizational neglect in the hospital.	151	4.10	0.900	Agree
6	The follow-up for employees by managers in hospitals will enhance the work and decrease the organizational neglect regarding the medical equipment.	151	4.32	0.779	Strongly Agree
7	I have been assigned to the right medical device as per my knowledge and experience.	151	3.64	0.920	Agree
8	Any financial crisis in your public hospital will cause organizational neglect from employees.	151	3.88	0.945	Agree

No	Items	N	Mean	Std. Deviation	Agreement
9	Paying attention to the financial rewards of the employees in the hospital will automatically enhance the productivity of employees and decrease organizational neglect.	151	4.54	0.681	Strongly Agree
	Total	151	3.69	0.471	Agree

Table 4.14 shows the descriptive statistics of organizational neglect. Item 9 has the first rank with a mean of 4.54 (Strongly Agree) and a standard deviation of 0.681. This indicates that rewards of employees are a very important factor in decreasing the breakdown of medical equipment in public hospitals. Item 6 has the second rank with a mean of 4.32 (Strongly Agree) and a standard deviation of 0.779. Item 5 has the third rank with a mean of 4.10 (Agree), and a standard deviation of 0.900. Item 8 has the fourth rank with a mean of 3.88 (Agree) and a standard deviation of 0.945. Item 7 has the fifth rank with a mean of 3.64 (Agree), and a standard deviation of 0.920. Item 2 has the sixth rank with a mean of 3.47 (Agree) and a standard deviation of 0.893. Item 4 has the seventh rank with a mean of 3.37 (Neutral) and a standard deviation of 1.093. Item 1 has the eighth rank with a mean of 3.12 (Neutral) and a standard deviation of 0.864. Item 3 has the last rank with a mean of 2.78 (Neutral) and a standard deviation of 1.039, and this indicates that one of the main reasons for the increase of breakdown of medical equipment in public hospitals is the lack of following up the preventive maintenance suggested by supplying companies. To sum up, the general average of the items of variables is 3.69 with the mean (Agree), and the standard deviation is 0.471.

3.5.3 Descriptive Statics of Technical Awareness

Table 4.15

Descriptive Statistics of Technical Awareness

No	Items	N	Mean	Std. Deviation	Agreement
1	Employees who work with medical equipment in hospitals have the needed training at their jobs.	151	2.93	1.078	Neutral
2	Employees working with the medical equipment in hospitals show a very high professional attitude.	151	3.26	0.913	Neutral

No	Items	N	Mean	Std. Deviation	Agreement
3	Supplier companies provide enough training, documents, and instruction after installing new medical devices in hospitals.	151	3.29	0.970	Neutral
4	Training and the seminars performed to employees in hospitals will help to increase technical awareness.	151	4.17	0.883	Agree
5	You feel a good impression about the amount of information regarding the operation manual of the medical device presented in hospitals.	151	3.56	0.861	Agree
6	Specialist staff certification in hospitals contributes to improving performance and reducing the breakdown of medical equipment.	151	4.06	0.947	Agree
7	Technical staff in hospitals dealing with technologically advanced medical equipment help to reduce the number of breakdowns to medical devices.	151	3.91	0.904	Agree
8	The level of education and years of experience in hospitals will help to prevent/decrease the number of the breakdown of medical equipment.	151	4.36	0.706	Strongly Agree
	Total	151	3.69	0.595	Agree

Table 4.15 shows the descriptive statistics of technical awareness. Item 8 has the first rank with a mean of 4.36 (Strongly Agree) and a standard deviation of 0.706. This indicates that recruiting educated and experienced staff are the most influential factor in decreasing the breakdown of medical equipment in public hospitals. Item 4 has the second rank with a mean of 4.17 (Agree) and a standard deviation of 0.883. Item 6 has the third rank with a mean of 4.06 (Agree) and a standard deviation of 0.947. Item 7 has the fourth rank with a mean of 3.91 (Agree) and the standard deviation of 0.904. Item 5 has the fifth rank with a mean of 3.56 (Agree) and the standard deviation of 0.861. Item 3 has the sixth rank with a mean of 3.29 (Neutral) and a standard deviation of 0.970. Item 2 has the seventh rank with a mean of 3.26 (Neutral) and a standard deviation of 0.913. Item 1 has the last rank with a mean of 2.93 (Neutral) and a standard deviation of 1.078, and this indicates that the lack of adequate training among the staff is the main factor for increasing the breakdowns of medical equipment in public hospitals. To conclude, the general average of the items of variables is 3.69 with the mean (Agree), and the standard deviation is 0.595.

3.6 Correlation Analysis

The correlation analysis is a phrase that describes the strength and link between two or more quantitative variables. This analysis is built on the statement of a straight line score obtained by participants (Gogtay & Thatte, 2017). Correlation analysis indicates whether the hypothesis is providing evidence to be supported or not (Sekaran & Bougie, 2019).

3.7.1 Construct Validity

Construct validity refers to convergent validity and discriminant validity. However, convergent validity refers to the correlation between the overall mean of the dimension and its items (Sekaran & Bougie, 2019). The items should be significantly correlated with the dimension ($R > 0.400$), and those dimensions should account for at least 16% of the variance of each item. Discriminant validity indicate that the dimensions of the study are different from each other, and they are not highly correlated ($R < 0.90$).

3.7.2 Convergent Validity

As shown in Table 4.16, the dimension of financial aids is significantly correlated with its items ($p < 0.001$), indicating that the dimension accounts for more than 16% of the variance of each item. Therefore, the convergent validity is achieved, and the items measure what they are intended to measure.

Table 4.16

Convergent Validity of Financial Aid

	Financial Aid	
	R	p
FA1	.365	.000
FA2	.444	.000
FA3	.731	.000
FA4	.712	.000
FA5	.742	.000
FA6	.369	.000
FA7	.458	.000
FA8	.524	.000

FA9	.683	.000
-----	------	------

As shown in Table 4.17, the dimension of organizational neglect is significantly correlated with its items ($p < 0.001$), indicating that the dimension accounts for more than 16% of the variance of each item. Therefore, the convergent validity is achieved, and the items measure what they are intended to measure.

Table 4.17

Convergent Validity of Organizational Neglect

	Organizational Neglects	
	R	p
ON1	.497	.000
ON2	.614	.000
ON3	.600	.000
ON4	.658	.000
ON5	.513	.000
ON6	.534	.000
ON7	.580	.000
ON8	.265	.001
ON9	.382	.000

As shown in Table 4.18, the dimension of technical awareness is significantly correlated with its items ($p < 0.001$), indicating that the dimension accounts for more than 16% of the variance of each item. Therefore, the convergent validity is achieved, and the items measure what they are intended to measure.

Table 4.18

Convergent Validity of Technical Awareness

	Technical Awareness	
	R	p
TA1	.652	.000
TA2	.661	.000
TA3	.662	.000
TA4	.677	.000
TA5	.619	.000
TA6	.667	.000
TA7	.711	.000

3.7.3 Discriminant Validity

Table 4.19 shows that the dimensions of the study have a statistically significant correlation with each other. The correlation between the dimensions is between 0.318 and 0.654, indicating that the correlation is not greater than 0.90. Thus, the dimensions of the study are discriminant.

Table 4.19

Discriminant Validity

	Financial Aid	Organizational Neglects	Technical Awareness
Financial Aid	1		
Organizational Neglects	.322	1	
Technical Awareness	.318	.654	1

3.8 Hypotheses Testing

H1: There is an impact of financial aid on the breakdown of medical equipment in public hospitals.

H2: There is an impact of organizational neglect on the breakdown of medical equipment in public hospitals.

H3: There is an impact of technical awareness on the breakdown of medical equipment in public hospitals.

To test these hypotheses, one sample T-Test was conducted to compare the hypothesized mean (3) with the calculated mean of each dimension. As stated earlier, the means of financial aid and technical awareness are reversed.

Table 4.20

Sample T-Test

	N	Mean	SD	t	p
Financial Aid	151	2.2973	.55460	-15.570	<.001
Organizational Neglects	151	3.6917	.47126	18.036	<.001
Technical Awareness	151	2.3204	.60872	-13.720	<.001

As seen in Table 4.20, the results show that the financial aid has a negative impact on medical equipment breakdown ($t=-15.570$, $p<.001$), indicating that the calculated mean is significantly lower than the hypothesized mean. In other words, if the financial aids decrease, the medical equipment breakdown increases. Therefore, the first hypothesis is supported.

The organizational neglect has a positive impact on the medical equipment breakdown ($t=18.036$, $p<.001$), indicating that the calculated mean is significantly larger than the hypothesized mean. The increase of organizational neglect leads to an increase in the level of breakdowns of medical equipment. Therefore, the second hypothesis is supported.

The technical awareness has a negative impact on the medical equipment breakdown ($t=-13.720$, $p<.001$), indicating that the calculated mean is significantly lower than the hypothesized mean. In other words, when the technical awareness decreases, the medical equipment breakdown increases. Therefore, the third hypothesis is supported. Table 4.21 summarizes the results of the hypothesis test.

Table 4.21

Hypothesis Test Results

H#	Statement	Result
H1	The impact of financial aids on the breakdown of medical equipment in public hospitals.	Accepted
H2	The impact of organizational neglect on the breakdown of medical equipment in the public hospital.	Accepted
H3	The impact of technical awareness on the breakdown of medical equipment in public hospitals.	Accepted

3.9 Summary

This chapter discusses data screening, frequency analysis, descriptive statistics, correlation analysis, and the hypothesis test. The chapter presents the findings collected from the respondents based on the data gathered. The correlation analysis indicates a correlation between the variables. In addition, this chapter tests the hypotheses H1, H2, and H3, and all of these hypotheses are accepted.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Recapitulation of the Study

The purpose of this study is to examine the factors influencing the breakdown of medical equipment in public hospitals. The study targets the staff of health care sectors in public hospitals and medical supplier companies in Yemen. The sample of this study includes biomedical engineers working in the maintenance departments of public hospitals and biomedical engineers working in medical supplier companies. The sample includes operators, technicians, managers working in the laboratory departments of public hospitals and the application services workers in the medical supplier companies in Yemen. The questionnaire was designed and sent to the participants online via WhatsApp. The questionnaire was sent to 220 participants, but only 151 valid responses were received. The Cronbach's Alpha is 84.3% for all questions of the questionnaire, whereas the response rate is 68.6%.

The result of the correlation between the dimensions ranges between 0.318 and 0.654, indicating that the correlation is not greater than 0.90. and this means there is no regression. Instead, one sample T-Test was conducted to compare the hypothesized mean (3) with the calculated mean of each dimension.

5.2 Discussion

The primary objective of this study is to examine the factors influencing the breakdown of medical equipment in public hospitals in Yemen. To achieve this, the research hypotheses were developed to answer the three main research questions.

Q1. What is the impact of financial aids on the breakdown of medical equipment in public hospitals?

Answer. Research hypothesis H1 was developed. It assumes that there is an impact of financial aids on the breakdown of medical equipment in public hospitals. The result of one sample T-Test for financial aid shows that there is a negative impact on medical equipment breakdown ($t=-15.570$, $p<.001$), indicating that the calculated mean, which is equal to 2.2973, is significantly lower than the hypothesized mean (3).

Q2. What is the impact of organizational neglect on the breakdown of medical equipment in public hospitals?

Answer. Research hypothesis H2 was developed. It assumes that there is an impact of organizational neglect on the breakdown of medical equipment in public hospitals. According to the results of one sample T-Test, organizational neglect has a positive impact on the medical equipment breakdown ($t=18.036$, $p<.001$), indicating that the calculated mean, which is equal to 3.6917, is significantly larger than the hypothesized mean (3).

Q3. What is the impact of technical awareness on the breakdown of medical equipment in public hospitals?

Answer. Research hypothesis H3 was developed, and it assumes that there is an impact of technical awareness on the breakdown of medical equipment in public hospitals. The results of one sample T-Test indicate that technical awareness has a negative impact on the medical equipment breakdown ($t=-13.720$, $p<.001$), indicating that the calculated mean, which is equal to 2.3204, is significantly lower than the hypothesized mean (3).

5.3 Recommendations

The study gives the following recommendations:

1. Public hospitals must manage and monitoring financial resources to help provide medical services to patients.
2. It is very important for managers, supervisors, and line managers to take care of public hospitals' employees through fair distribution rewarding, medical insurance, and other bonuses to decrease organizational neglect.
3. Employees in public hospitals must share the responsibilities, knowledge, tasks, and information related to medical equipment, which in turn contributes to decreasing the breakdown of medical equipment.
4. Set regular training by coordination between public hospitals and medical supplier companies for employees' development to increase technical awareness.
5. Public hospitals need to pay attention to applying the PPM to their medical equipment to increase the operation time and decrease the repairing cost.
6. The selection of medical equipment from brand companies with high durability machines will help to decrease the breakdown of medical equipment and save the cost of repairing.
7. Medical supplier companies should make regular check to the medical equipment in public hospitals to ensure the efficiency of medical equipment.
8. The government must take the necessary to support the public hospitals, and determine an annual budget to support these hospitals.

5.4 Limitations

This study aims to examine the factors influencing the breakdown of medical equipment in public hospitals in Yemen. One of the limitations of this study is the difficulty to reach all public hospitals in Yemen. Another limitation is that the period of the study is limited to six months, which prevents the researcher from getting more questionnaire responses. Another limitation is the inability to access some useful literature sources without paying for them. Finally, it was difficult to get some questionnaires from some previous studies.

5.5 Future Research

This study gives some suggestions for future researchers. First, future researchers may need to expand the scope of this study to enhance the variety of perceptions and results. Second, future researchers can develop the same research in other public hospitals in Yemen. Third, researchers should search for other factors or variables influencing the breakdown of medical equipment in Yemen. Finally, it is worth mentioning that some important factors like contracts, currency exchange fluctuations, trade barriers, planning, control, scope and requirements may influence the breakdown of medical equipment in public hospitals and they need to be studied.

5.6 Conclusion

This study examines the factors influencing the breakdown of medical equipment in public hospitals in Yemen. Based on the literature review, the researcher found evidence that financial aids, organizational neglect, and technical awareness affect the breakdown of medical equipment in public hospitals. In addition, the researcher reached an approval for the three hypotheses related to the impact of financial aids, organizational neglect, and technical awareness on the breakdown of medical equipment in public hospitals.

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APPENDICES

APPENDIX A: English Version of Questionnaire

الجمهورية اليمنية

وزارة التعليم العالي والبحث العلمي

الجامعة اللبنانية الدولية

FACTORS INFLUENCING BREAKDOWN OF MEDICAL EQUIPMENT IN PUBLIC HOSPITALS

Dear participant,

The survey below is for a research study to get a Master's degree in business administration. The survey is about the factors influencing the breakdown of medical equipment in public hospitals. Please choose the best answer for the following questions. With sincere gratitude and great appreciation for your response and contribution to the achievement of this research that enhances the medical services in Yemen.

The researcher:

Eng. Ebrahim Salem Alsakkaf

Mobile: 00967771593331

E-mail: sakkaf_90@icloud.com

Part 1: Personal Information

The first part is providing questions about the personal information

Gender	<input type="checkbox"/> Male. <input type="checkbox"/> Female.
Age	<input type="checkbox"/> Less than 25 Years. <input type="checkbox"/> Between 25 - 35 Years. <input type="checkbox"/> Between 35 - 45 Years. <input type="checkbox"/> More than 45 Years.
Level of Education	<input type="checkbox"/> Secondary. <input type="checkbox"/> Diploma. <input type="checkbox"/> Bachelor's degree. <input type="checkbox"/> Master Degree. <input type="checkbox"/> Ph.D. Degree.
Years of experiences	<input type="checkbox"/> Less than 5 years. <input type="checkbox"/> Between 5 to 10 Years. <input type="checkbox"/> More than 10 Years.
Job position title	<input type="checkbox"/> Biomedical Engineer. <input type="checkbox"/> Technician. <input type="checkbox"/> Head of Department. <input type="checkbox"/> Nurse. <input type="checkbox"/> Doctor. <input type="checkbox"/> Other Jobs.

Part 2: Financial Aids

The second part of the questionnaire is about financial aids in the public hospital

No.	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Public hospitals in Yemen are completely dependent on financial aid.	5	4	3	2	1
2	When there is a lack of financial aid in a public hospital, the hospital cannot perform the medical service adequately to the patient.	5	4	3	2	1
3	Financial aids help public hospitals maintain their needs from spare parts for emergency cases.	5	4	3	2	1
4	In hospitals, the financial aids help the maintenance department to conduct all the maintenance needs on medical equipment.	5	4	3	2	1
5	In hospitals, the financial aids will help to improve the environmental conditions required to decrease the breakdown of medical equipment.	5	4	3	2	1
6	The supervisor in the hospital fairly distributes the rewards between each employee.	5	4	3	2	1
7	When there is financial aid in a hospital it is best to choose medical devices from international brand companies.	5	4	3	2	1
8	Training budgets assigned to employees participate in decreasing the level of medical breakdown faced by your hospital.	5	4	3	2	1
9	Financial aids will help to contract with external companies to perform the maintenance, which will help to reduce the breakdown of medical equipment.	5	4	3	2	1

Part 3: Organizational Neglect

The third part of the questionnaire is about organizational neglect in the public hospital.

No.	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	In your hospital employees work and deal with medical equipment honestly and faithfully.	5	4	3	2	1
2	In your hospital employees who work with the medical equipment share responsibility for tasks.	5	4	3	2	1
3	The engineering department in your hospital follows up the planned preventive maintenance by the supplier companies.	5	4	3	2	1
4	When there is an emergency requested in a hospital to repair a medical device, there is a fast response by the engineers.	5	4	3	2	1
5	The principle of reward and punishment in avoiding fault and continuing work will reduce organizational neglect in the hospital.	5	4	3	2	1
6	The follow-up for employees by managers in hospitals will enhance the work and decrease the organizational neglect regarding the medical equipment.	5	4	3	2	1
7	I have been assigned to the right medical device as per my knowledge and experience.	5	4	3	2	1
8	Any financial crisis in your public hospital will cause organizational neglect from employees.	5	4	3	2	1
9	Paying attention to the financial rewards of the employees in the hospital will automatically enhance the productivity of employees and decrease organizational neglect.	5	4	3	2	1

Part 4: Technical Awareness

The fourth part of the questionnaire is about technical awareness in the public hospital.

No.	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The employees who work with medical equipment in hospitals have the needed training at their jobs.	5	4	3	2	1
2	The employees working with the medical equipment in the hospital show a very high professional attitude.	5	4	3	2	1
3	The supplier companies provide enough training, documents, and instruction after installing new medical devices in hospitals.	5	4	3	2	1
4	The training and the seminar performed to the employees in the hospital will help to increase technical awareness.	5	4	3	2	1
5	You feel a good impression about the amount of information regarding the operation manual of the medical device presented in the hospital.	5	4	3	2	1
6	Specialist staff certification in hospitals contributes to improving performance and reducing the breakdown of medical equipment.	5	4	3	2	1
7	Technical staff in hospitals dealing with technologically advanced medical equipment help to reduce the number of breakdowns to medical devices.	5	4	3	2	1
8	The level of education and years of experience in hospital will help to prevent/decrease the	5	4	3	2	1

	number of the breakdown of medical equipment.					
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