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Assessing the impact of risk factors in public health projects

The implementation of Cyprus National Healthcare System

Eleni Ioannou

Supervisor

Pantelis Ypsilandis

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SUMMARY

Risk analysis in healthcare involves consideration of the sources of risk, their consequences, and the likelihood that those consequences may occur, involving patients and their safety, healthcare personnel, and the hospital itself, in an effort to distinguish minor acceptable risks from the unacceptable major risks.

The main purpose of this thesis is to identify the internal and external risk factors that might affect the planning, the effective implementation, the budgeting, the expected quality, and the long-term survival of the General Health System (GHS) of the Republic of Cyprus, and assess their impact.

In this thesis along with the study of the healthcare environment in general; the case of implementing GHS will be studied and further analysed.

The GHS is newly implemented and is the biggest step forward in the national healthcare system. It has provided access to doctors and medicines for all patients. With the digitalization of the healthcare system all patients and healthcare providers can have real time access to the patients' data.

The knowledge arising from this public project should be used in the future in similar projects and can be considered as the basis of a new study. This thesis will also attempt to provide information as for the risk factors that will affect the long-term survival of the General Healthcare System which can still be managed and mitigated.

The data mainly will be extracted from available literature and also can be requested from governmental bodies such as the Ministry of health, private and public sector doctors, nurses, pharmacists, pharmaceutical companies, and patients via survey.

The risk assessment technique to be used is based on the ICE 31010:2019, the 5*5, impact/ likelihood matrix.

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CHAPTER 1

1.1 INTRODUCTION

The Cyprus National Health System (GHS) is a recent and ambitious project of the Government of the Republic of Cyprus and it aims to provide universal health coverage to all permanent citizens and to temporary residents.

The implementation of GHS marks a significant change in the way healthcare services are provided in Cyprus, as it replaces the existing fragmented healthcare system with a comprehensive and integrated one. This change requires the coordination and cooperation of various stakeholders involved in the project, from policy makers to healthcare providers, patients and administrative staff.

The sector of health has a significant share on the Government's budget because one of the main Government's tasks is to provide high quality health services for all its citizens.

The implementation of such a large-scale project is not without risks. The success of GHS depends on many factors, including the effective planning, the adequate funding, the timely delivery of services and equipment, the proper use, the proper functioning of the IT infrastructure, and the cooperation of all parties involved. The project is subject to various internal and external risks that can affect its successful implementation.

The purpose of this master thesis is to identify and assess the internal and external risk factors that may affect the implementation of GHS in Cyprus, and to propose strategies for their mitigation or avoidance. The thesis aims to contribute to the existing literature on risk management in healthcare projects, and to provide useful insights for project managers, policymakers, and other stakeholders involved in the implementation of GHS.

The thesis will begin by providing an overview of the Cyprus healthcare system, the challenges it faces, and the rationale behind the decision to implement GHS. The next section will review the relevant literature on risk management in healthcare projects, and will identify the key internal and external risk factors that are likely to affect the implementation of GHS. The next section will describe the methodology used for the assessment of the risk factors, including the data collection and analysis techniques, the criteria for risk assessment, and the tools for risk

mitigation and avoidance. Finally the results of literature review will be presented and those will be compared to the survey finding. Finally, the thesis will conclude with study limitations and discussion of the implications of the findings for the successful implementation of GHS and will provide recommendations for future research.

CHAPTER 2

MANAGEMENT OF A PUBLIC PROJECT IN CYPRUS

2.1 PROJECT MANAGEMENT

The Concept of Project Management

The definition of "*project*" varies among professionals in the field of management and project administration. In order to grasp the concepts of "*project management*" and "*project risk management*," it is necessary to have a clear understanding of the basic concept of a "*project*." One commonly accepted definition is as follows: "*A project refers to the completion of a specific goal, involving a series of activities and tasks that require resources (such as time, money, labor, materials, and equipment). It must be accomplished within defined specifications, with definite starting and ending dates. The term 'temporary' refers to the fact that each project has a definite beginning and end. The unique nature of a project implies that the product or service is always distinct from all similar products or services.*[(1)]

According to Maylor (1999)[(2)] a project can be defined as a non-repetitive activity. This needs to be augmented by other characteristics:

The pursuit of a project is driven by a specific goal or objective. It operates under a specific set of limitations, often related to time and resources. The output of the project is quantifiable and can be measured. When planning and undertaking projects; the essential factors that are crucial to overall project management success and project success include some of the following:

- Good Project Definition and a Sound Business Case
- Appropriate Choice of Project Strategy
- Quick and Fair Resolution of Conflict
- Good Project Communication
- Availability of Sufficient Funds and other Resources
- Organisational Culture and Structure
- The Cost, Time and Performance Criteria

2.1.1 Project Management in Cyprus Health Care System

Public projects in Cyprus are an essential aspect of the country's development and growth. Public projects in Cyprus follow a regulated and systematic approach to ensure that they are delivered within budget, on schedule, and to the expected quality standards. In Cyprus, the healthcare system is a critical component of the country's development, and the government invests significantly in providing high quality healthcare services to its citizens. [3]

In the context of implementing the General Healthcare System (GHS) in Cyprus, project management involves applying specific knowledge, skills, tools, and techniques to ensure that the project is completed within scope, budget, and timeline while meeting expected quality standards. This requires defining project objectives, identifying necessary tasks and activities, allocating resources, establishing communication channels, monitoring progress, and implementing corrective actions to address any issues that arise during implementation.

Projects in the healthcare sector are complex and time-consuming and face unique and complicated challenges. Adopting a systematic approach to any health-related project is essential for risk minimisation and successful implementation.[4]

In conclusion, the implementation of a project management method plays a crucial role in the successful implementation of all public healthcare projects in Cyprus's healthcare sector, therefore, it is essential to adopt a systematic approach to project management and comply with the relevant regulations to ensure successful implementation.

2.1.2 The Phases of the Project Management in Public Healthcare projects

The implementation of a national healthcare system typically involves several key phases. During the planning phase, objectives and goals are defined, resources required for implementation are identified, and a feasibility study is conducted. The design phase involves determining the specific services to be offered, defining eligibility criteria, identifying funding sources, and establishing legal and regulatory frameworks. In the implementation phase, the actual rollout of the healthcare system occurs, including setting up necessary infrastructure and

ensuring integration with existing healthcare facilities. Monitoring and evaluation are critical components of the fourth phase, which involves tracking key performance indicators, collecting feedback from stakeholders, and conducting periodic evaluations to assess system effectiveness and identify areas for improvement. Finally, the continuous improvement phase involves conducting research, implementing new technologies and treatment methods, and adapting to changes in the healthcare landscape to continually improve and meet the changing needs of the population. In Cyprus, the design and implementation of the national healthcare system, GHS, a similar phased approach was followed. [5]

- The planning phase involved extensive consultations with stakeholders, including healthcare professionals, patient associations, and insurance companies.
- The design phase involved defining the benefits package, establishing the legal framework, and identifying the funding sources.
- The implementation phase involves setting up the necessary infrastructure, including the establishment of primary healthcare centers and the recruitment of staff. The monitoring and evaluation phase is ongoing, with regular reports published on the system's performance and feedback collected from stakeholders.
- Finally, the continuous improvement phase involves ongoing efforts to improve the system's effectiveness, including the introduction of new services and the expansion of coverage.

2.2 THE RISK MANAGEMENT PLANNING

As with any large-scale undertaking, implementing GHS poses inherent risks, and it is crucial to create a comprehensive risk management plan to recognize, evaluate, and mitigate these risks. Managing uncertainty is a common necessity for most projects that involve formal project management, where "uncertainty" refers to the lack of certainty in plain English.

During the launch phase, the primary process risk is that coordination and control procedures may prove to be insufficient. A typical perceived risk during this phase is the introduction of design changes or opportunities that should have been identified earlier to take full advantage

of them. Subsequent modifications to production plans, costs, and payments to affected contractors should be based on an evaluation of how project uncertainty is influenced by the changes and the degree to which revised risk management plans are required.

2.2.1 Risk Identification

The process of Risk Identification (RI) involves a series of activities aimed at detecting, describing and cataloging all potential risks that may have a negative impact on the achievement of a goal or objective. It is the first stage of the risk management process and sets the foundation for the subsequent steps, such as risk analysis and control. The effectiveness of risk management relies heavily on the accuracy of risk identification. Failing to identify all potential risks that could challenge an organization would result in unmanageable risks. (6)

The process of risk identification requires a systematic and methodical approach to ensure that all risks arising from project activities are identified. Relevant information gained from the context, such as SWOT analysis, should be used to identify the risks that are likely to affect the organization's goals or objectives. It should be noted that a risk can also be an opportunity or strength that has not yet been realized. To aid in the identification of risks, key questions should be considered, such as when, where, why, and how risks are likely to occur in order to achieve the organization's goals. Other important considerations include the risks associated with achieving priorities, as well as the risks of not achieving these priorities. Additionally, stakeholders and other parties involved in the project should also be taken into account during the risk identification process.

Sources of risk

There are various sources of risks in the implementation of GHS in Cyprus. Some of these sources of risks include:

1. Technical Risks: These are risks related to the technology and infrastructure used in the implementation of GHS. Technical risks include the failure of software or hardware, system downtime, and cyber threats.

2. Financial Risks: These are risks related to the funding and financing of GHS. Financial risks include insufficient funding, cost overruns, and budget constraints.
3. Legal and Regulatory Risks: These are risks related to compliance with laws, regulations, and standards. Regulatory risks include non-compliance with regulations and laws, changes in laws, and legal disputes.
4. Political Risks: These are risks related to changes in government policies, priorities, and agendas. Political risks include changes in government priorities, budget cuts, and changes in political leadership.
5. Operational Risks: These are risks related to the day-to-day operations of GHS. Operational risks include staff turnover, inefficient processes, and inadequate training.
6. Reputation Risks: These are risks related to the public perception of GHS. Reputation risks include negative media coverage, public complaints, and loss of trust.
7. Human Risks: These are risks related to the behavior of individuals involved in the implementation of GHS. Human-related risks include human errors and omissions, negligence, and/or fraud.

2.2.2 Risk Management

A project obviously does not exist in isolation of the environment. Risk management is therefore arguably required in order to manage the uncertainty and risk associated with the project. The environments in which projects are undertaken are themselves subject to change over the project life cycle involved. This perhaps requires flexibility of management and awareness of possible implications. The business environment of today is characterised by change, uncertainty and risk.

1. Treat the risk

An unacceptable risk requires treatment. The objective of this stage of the risk assessment process is to develop cost effective options for treating the risks. Treatment options, which are not necessarily mutually exclusive or appropriate in all circumstances, are driven by outcomes

that include: − Avoiding the risk, − Reducing (mitigating) the risk, − Transferring (sharing) the risk, and − Retaining (accepting) the risk.

2. Avoiding the risk - not undertaking the activity that is likely to trigger the risk.
3. Reducing the risk - controlling the likelihood of the risk occurring, or controlling the impact of the consequences if the risk occurs.
4. Transferring the risk totally or in part - This strategy may be achievable through moving the responsibility to another party or sharing the risk through a contract, insurance, or partnership/joint venture. However, one should be aware that a new risk arises in that the party to whom the risk is transferred may not adequately manage the risk.
5. Retaining the risk and managing it – Accept the risk as it is.

2.2.3 Risk Monitoring

Risk monitoring is a crucial component of the risk management process as it involves the continuous evaluation of the effectiveness of risk management strategies. Once an organization has developed and implemented a risk management strategy, it is essential to monitor and measure its success to identify any areas where improvements may be required. This ongoing monitoring process ensures that the organization can adapt its risk management strategy as necessary to address emerging risks and changing circumstances, thereby maintaining an effective risk management framework.

2.2.4 Communication and Reporting

Effective communication is crucial for successful risk management, encompassing clear and concise messaging of the objectives, the process itself, its components, as well as the outcomes and necessary actions resulting from the risk analysis. Risk management constitutes a fundamental part of an organization's overall management.

2.3 Risk Analysis

Risk analysis involves the consideration of the source of risk, the consequence and likelihood to estimate the inherent or unprotected risk without controls in place. It also involves identification of the controls, an estimation of their effectiveness and the resultant level of risk with controls in place (the protected, residual or controlled risk). Qualitative, semi-quantitative and quantitative techniques are all acceptable analysis techniques depending on the risk, the purpose of the analysis and the information and data available. (7)

Quantitative Analysis of the Risk

Quantitative risk analysis is a process that involves assigning numerical values to risks and estimating their potential impact on a project using mathematical and statistical methods. To conduct a quantitative analysis of the risks associated with implementing GHS, the following steps can be taken: identifying risks, defining their probability and impact, calculating their exposure, prioritizing risks, developing a risk response plan, and monitoring and controlling risks throughout the project. While quantitative analysis provides a more precise understanding of the potential impact of risks, it requires accurate data and can be costly and time-consuming. Thus, it's crucial to weigh the benefits and costs of this analysis before conducting it. (7)

To conduct a quantitative analysis of the risks associated with the implementation of GHS, the following steps can be taken:

- Identify the risks: The first step is to identify all the risks associated with the implementation of GHS. This can be done by reviewing historical data from similar projects, interviewing stakeholders, and conducting brainstorming sessions with the project team.
- Define the risk probability: Assign a probability value to each identified risk, which represents the likelihood of the risk occurring.
- Define the risk impact: Assign an impact value to each identified risk, which represents the potential impact of the risk on the project objectives.
- Calculate the risk exposure: Calculate the risk exposure for each identified risk by multiplying the probability and impact values.

- Prioritize the risks: Prioritize the risks based on their exposure value. The risks with higher exposure values require more attention and mitigation efforts.
- Develop a risk response plan: Based on the prioritized risks, develop a risk response plan that outlines the actions to be taken to mitigate or manage the risks.
- Monitor and control risks: Monitor and control the identified risks throughout the project to ensure that the risk response plan is effective and to identify any new risks that may arise during the project.

Quantitative analysis of risks provides a more precise understanding of the potential impact of risks on the project objectives. However, it requires accurate data and can be time-consuming and expensive. Therefore, it is essential to balance the benefits and costs of this type of analysis before conducting it.[7]

Quantitative Risk Analysis methods

Quantitative Risk Analysis (QRA) is a structured and systematic process of analyzing and evaluating risks using statistical and numerical methods. QRA methods help to provide more accurate and objective understanding of the likelihood and impact of potential risks to a project. Some commonly used methods for quantitative risk analysis are:

1. Monte Carlo Simulation: This method uses probability distributions to simulate the occurrence of risks in a project. It provides a range of possible outcomes and probabilities for each risk, allowing for the calculation of the overall project risk.
2. Sensitivity Analysis: This method examines how changes in one variable can affect the project's overall risk. It helps to identify which risks have the most significant impact on the project's success and which risks can be managed more easily.
3. Decision Tree Analysis: This method uses a tree diagram to represent possible decisions and their outcomes. It helps to evaluate the risks associated with each decision and determine the best course of action.

4. Fault Tree Analysis: This method analyzes the relationship between events and their consequences in a system. It helps to identify the root causes of potential risks and provides a systematic approach to risk management.
5. Cost-Benefit Analysis: This method compares the costs and benefits of different risk management options to determine the best approach for the project.

CHAPTER 3

3.1 CASE STUDY OF GHS

3.1.1 Introduction to the healthcare System in Cyprus

In 450 BC, the first ever documented healthcare system in Cyprus was agreed upon between King Stasikypros and physician Onasilos, as evidenced in an ancient artefact which was unearthed in Cyprus back in the 1850s.

In 1981, Cyprus established and adopted a social policy based on three primary objectives:

(1) to ensure a basic standard of living for all citizens,

(2) to achieve a fairer distribution of national income and taxes across different income groups and regions, with a particular focus on improving the financial situation of those who were displaced, and

(3) to enhance existing social programs while introducing new institutions.

Efforts to establish a healthcare system in Cyprus date back to 1960, but the most significant attempt to implement major healthcare reform began in 1991. This was spurred by high-level government discussions aimed at achieving universal coverage. The Ministry of Health (MoH) invited experts from the universities of Leeds, York, and Harvard to study the existing system and propose solutions. By September 1992, they had submitted a final proposal for a comprehensive new system known as the "Proposals for a National Health Insurance Scheme, 1992". The proposed healthcare reform aimed to introduce changes to financing, coverage, provider payments, administration, auditing, and data collection. These changes were expected to improve the quality, accessibility, and efficiency of care, while also enhancing the financial

protection of beneficiaries, which were elements that were largely absent in the previous system. After a decade of debates and consultations involving the government, political parties, stakeholders, and interest groups, the House of Representatives passed the General Health System Law (No. 89 (I) / 2001) in 2001, based on the recommendations made by foreign experts. In accordance with the provisions of this law, the Health Insurance Organisation (HIO) was created as a public entity responsible for implementing the NHS, as well as organizing, monitoring, and managing the new system. However, there were yet again insignificant outcomes due to the lack of solid political will and influential interest groups, which prevented further progress toward implementation.

The severe economic crisis that followed (2012-2016), served as a convenient "excuse" or argument for the further delay of the venture, despite the Council Recommendation made by the European Commission that Cyprus should "complete and implement the national healthcare system without delay…". [(8)] After 16 years since the founding law of the new system, the House of Representatives passed two additional pieces of legislation in 2017, necessary for the implementation of the new system. The first bill amended the 2001 founding law and set the dates for the implementation of the two phases of the NHCS, while the second bill regulated the administrative and financial autonomy of state hospitals, promoting competition in a quasi-market environment. However, private doctors and hospitals withdrew from the dialogue with the Ministry of Health due to rejected demands for higher compensation fees and the right to practice private medicine within the new system. Despite this opposition, the first phase of the new system started as scheduled on June 1st, 2019, with satisfactory results from its first months of operation. The second phase began on June 1st, 2020, with the majority of private hospitals and clinics joining the system after lengthy discussions and the signing of a memorandum of understanding. After almost 60 years of efforts and delays, Cyprus now has a modern and comprehensive health system.

3.1.2 Implementation of the new national healthcare system in Cyprus

The Republic of Cyprus has undergone a major social reform with the implementation of the General Health System, which addresses the critical issue of providing healthcare services to the entire population. The GHS was launched on June 1, 2019, and as of June 2022, approximately the current population of the Republic of Cyprus 917,000 Cypriots were registered with a general practitioner through the GHS system. The National Health System was expected to save €292 million from 2016-2025 compared to the predicted expenditures of the previous system. [23]

The initial phase of the GHS implementation involved the participation of doctors from both the public and private sectors, with Health Insurance Organization HIO responsible for defining and disbursing their remuneration. However, public doctors faced challenges in receiving their compensation due to their employment by the government. To address this issue, the State Health Services Organisation (SHSO) was established in 2018 to recruit and manage public sector staff and settle their remuneration from GHS funds. Additionally, SHSO aims to promote the independence of public hospitals and will soon take on the responsibility of managing and equipping public hospitals throughout Cyprus. The establishment of HIO and SHSO resulted in changes to the Ministry of Health's strategic plans, including the restructuring of the country's health system, upgrading e-health, participating in European and international committees, promoting health awareness and disease prevention, managing and developing human resources, and fostering research, technological development, and innovation activities through projects.[9]

Prior to the implementation of the GHS, the political structure in Cyprus consisted of 11 ministries separated into different departments providing specific services within the Cypriot Government. The Ministry of Health (MoH) was responsible for the healthcare system of the island, including the formulation of national health policies, coordination of healthcare standards, promotion of relevant legislation, and regulation of activities in both the private and public sectors. The MoH was in charge of 10 departments/services, namely the Nursing Services, Purchasing and Supply Directorate, European Coordination Sector, Health Monitoring Unit, IT Unit, Blood Bank, Medical & Public Health Services, Pharmaceutical Services, Dental Services, Mental Health Services, and State General Laboratory.

The structure of the Ministry of Health in Cyprus involves Directors and Departments, with Heads, Senior Officers and Professional and Technical staff at each level as shown in Fig. 1.[10]

Fig. 1 – Schematic representation of the Ministry of Health Structure.

The primary goal of the national healthcare system is to reduce the gap in a country's population between the need for services and the use of those services, which implies that:

(i) all persons who need an intervention are aware of their need; and

(ii) all persons who are aware of their need are able to use the services that they require; And ensuring that services are of sufficient quality to increase the likelihood that they will improve (or promote, maintain, restore, etc., depending on the nature of the intervention) the health of those who use them.

3.1.3 Stages of the implementation of the new GHS

According to the provisions of The General Healthcare System (Amending) Law of 2017, the GHS is to be launched in two stages.

- The first stage of implementation, began June 1st 2019, and provided the introduction of outpatient healthcare, i.e. the provision of healthcare services by personal doctors and outpatient specialists, pharmacists and laboratories on June 1st, 2019.
- The second and final stage began in June 1st, 2020, and included introduction of all the remaining healthcare services, i.e. inpatient healthcare and services, services offered by allied health professionals (clinical dieticians, occupational therapists, speech pathologists, physiotherapists, and clinical psychologists), nurses and midwifes, the accident and emergency departments, ambulance services, dentists, palliative healthcare services and medical rehabilitation services.

GHS has been designed to provide equal access to all population along with fair contribution. The below categories are the beneficiaries of the GHS

I. Citizens of the Republic of Cyprus and ordinary residents of the areas controlled by the Republic of Cyprus or the sovereign territories of the United Kingdom of Great Britain and Northern Ireland bases in Cyprus and their dependents.
II. European Union (EU) Citizens and their dependents working in the areas controlled by the Republic of Cyprus, or have a permanent residence permit, in accordance with the provisions of The Right of EU Citizens and their Family Members to Move and Reside Freely within the Territory of the Republic of Cyprus Law
III. Third country nationals and their dependents, who have a permanent residence permit in the areas controlled by the Republic of Cyprus or have the right of equal treatment in the social insurance sectors, in accordance with the Aliens and Immigration Law
IV. Refugees who have been granted refugee or subsidiary protection status, in accordance with The Refugees Law

3.1.4 Legal Background of Public Healthcare System

The legal background of the public healthcare system in any country usually includes laws, regulations, and policies that govern the establishment, organization, and operation of healthcare institutions, as well as the provision of healthcare services.

The legal background of GHS provides the framework for the implementation of the public healthcare system in Cyprus. It sets out the legal basis for the establishment, organization, and operation of GHS, including the roles and responsibilities of the various stakeholders involved. The purpose of this legal background is to ensure that GHS operates within a transparent and accountable framework, with clear rules and regulations that protect the rights of patients and healthcare providers. It also establishes the mechanisms for monitoring and enforcing compliance with the legal framework, to ensure that GHS operates in a manner that is consistent with its objectives and goals. Overall, the legal background of GHS is essential for ensuring that the public healthcare system in Cyprus is efficient, effective, and provides high-quality care to all citizens.

The laws regulating GHS are:

V. General Health System Law of 2017: This law outlines the legal framework for the establishment, operation, and funding of GHS. It also defines the rights and responsibilities of patients, healthcare providers, and other stakeholders.
VI. Health Insurance Law of 2001: This law sets out the legal framework for health insurance in Cyprus, including the regulation of private health insurance providers.
VII. Health Services Law of 2001: This law regulates the provision of healthcare services in Cyprus, including licensing requirements for healthcare providers and facilities.
VIII. Pharmaceutical Services Law of 2003: This law regulates the sale, supply, and distribution of medicines and other pharmaceutical products in Cyprus.

IX. Medical Practitioners and Dentists Law of 1986: This law regulates the practice of medicine and dentistry in Cyprus, including licensing requirements for medical and dental professionals.

X. Nurses and Midwives Law of 1997: This law regulates the practice of nursing and midwifery in Cyprus, including licensing requirements for nurses and midwives.

XI. Public Procurement Law (Law 104(I)/2010): This law regulates public procurement in Cyprus, including the procurement of goods and services by GHS.

CHAPTER 4

4.1 RISK ASSESSMENT

The Risk Assessment technique of ISO 31000:2018 will be used in the process of identification, analysis and evaluation.

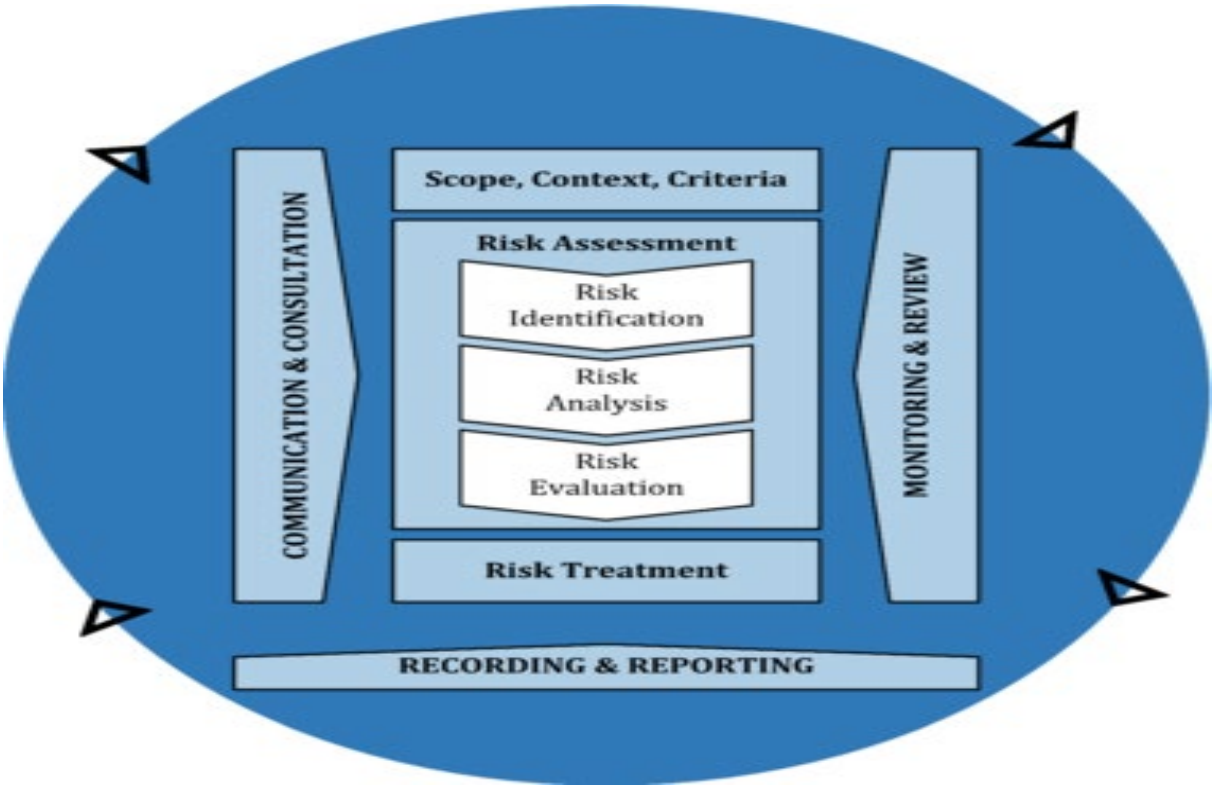


Fig. 2

Risks Identification

For the purpose of this thesis, the SWOT analysis will be employed to identify risks that could impede the achievement of the Healthcare system's goals and plans.

The idea of the risk identification is the recognition and description of the risks that may prevent the public authority to achieve its goals and plans. For the purposes of the research, the identification of the risks is based on SWOT analysis. [11]

This tool is a commonly used strategic analysis method that categorizes an entity's environment into internal and external sections. The former comprises strengths and weaknesses, while the latter encompasses opportunities and threats. [12]

The overall analysis of the internal and external factors that affecting the public health organizations is based on the local and international literature and data retrieved from the surveys that were distributed to general population and health care providers including doctors, nurses and pharmacists.

Analysis of internal and external strengths and weaknesses of the GHS.

The below SWOT analysis provided for the healthcare system in Cyprus, is based on general knowledge of the healthcare sector, industry, healthcare trends and challenges in healthcare systems globally, and the specific context of Cyprus. The information provided is intended to give a general overview of the potential strengths, weaknesses, opportunities, and threats facing the healthcare system in Cyprus.

The SWOT analysis conducted in this study was sourced from relevant literature, ensuring a comprehensive and informed evaluation of the subject matter. Extensive research was undertaken to gather insights from various articles, journals, and other sources. The literature review provided a solid foundation for the SWOT analysis, enabling a thorough examination of the strengths, weaknesses, opportunities, and threats associated with the topic under investigation. By relying on established sources, this analysis was able to integrate existing knowledge and perspectives, enhancing the credibility and validity of the findings of the analysis and of this thesis in general.

Strengths	Weaknesses
• Universal Coverage • Low Cost: The cost of healthcare services in Cyprus is relatively low compared to other countries in Europe.	• Lack of preparedness and poor risk management • High corruption rate in the country/ System Abuse[21] • Quantity payment program

• Preventative Care: The healthcare system in Cyprus places an emphasis on preventative care, with programs designed to promote healthy lifestyles, vaccines and prevention chronic diseases. • Technological Advancements: The healthcare system in Cyprus has made significant investments in technology, including electronic medical records and telemedicine, to improve patient care and increase efficiency.[31]	• Lack of quality measures and KPI's • Lack of Specialized Care: While the healthcare system in Cyprus provides general medical care, it may lack sufficient resources or specialized services to meet the needs of patients with complex or rare medical conditions. • Geographic Disparities: Remote areas in Cyprus might have less access to medical services.[32] • Aging Population: Cyprus has an aging population, which may place additional strain on the healthcare system in terms of providing long-term care and managing chronic diseases. • Loss of good professionals: healthcare professionals leave the country in search of better career opportunities abroad, leading to a shortage of medical professionals.[27]
• Medical Tourism [33] • Health IT- opportunity to invest in health information technology (IT) systems, such as electronic health records and telemedicine, to improve patient care and increase efficiency in healthcare delivery.	• Aging Population • Chronic Diseases • Economic Challenges • Pandemics and Emergencies • Workforce Shortages

• Collaborations and Partnerships- Hospitalizations in other countries where they have more expertise. Training and sharing best practices	

Fig. 4 SWOT analysis for the Cyprus healthcare System

Risk Assessment Techniques

According to the literature the assessment of risks in public health projects involves the use of standard techniques outlined in the "*Risk management - Risk assessment techniques*" (IEC 31010:2019) standard. The risk level is calculated using a 5*5 consequences/likelihood matrix. Consequence and likelihood scales, which are taken from the IEC 31010:2019 risk management standard, are provided in the tables below.

Rating	Financial	Health and safety	Environment and community	Etc.
a	Max credible loss ($)	Multiple fatalities	Irreversible significant harm; community outrage	
b				
c				
d				
e	Minimum of interest ($)	First aid only required	Minor temporary damage	

IEC

Fig. 5

Example of table defining impact scales (IEC 31010:2019)

Rating	Descriptor	Descriptor meaning
5	Likely	Expected to occur within weeks
4		
3		
2		
1	Remotely possible	Theoretically possible but extremely unlikely

IEC

Fig. 6

Example of table defining likelihood scales (IEC 31010:2019)

4.2 RESEARCH QUESTIONS AND METHODOLOGY

The first step in the risk assessment process is to identify potential risks, followed by risk analysis and risk evaluation. The objective of risk analysis is to gain an understanding of the risk's nature and characteristics, such as its level of severity, by considering uncertainties, consequences, likelihood, events, scenarios, and controls. Additionally, events can have various causes and consequences, affecting the project in multiple ways. Qualitative, quantitative, or a combination of both analysis techniques may be employed, depending on the circumstances. Risk analysis is usually based on risk perception and judgement, and factors such as information quality, assumptions, and limitations are documented, considered, and communicated.

The results of risk analysis are providing the information for the risk evaluation where the decisions for the risks are taken. The evaluation of the risk includes decisions such as:

- do nothing;
- study the choices for the treatment of the risks;
- proceed with further analysis for better understanding of the risks;
- apply the existing controls;

4.2.1 Research Questions

For the research purposes, the following questions are examined for each risk:

- What data can be found for the case study and the risk analysis?
- Is the data reliable?
- What are the external factors to be considered?
- What are the internal factors to be considered?
- What are the risks?
- What is being done already to control these risks?
- What are the available risk assessment techniques?
- What is the likelihood of an unpleasant event to occur?
- If occurs what will be the impact on patients, personnel, hospital and Cyprus government?
- Are there any trends?
- What triggers the risks?
- How did the responsible people respond to an unpleasant event?
- What further analysis was made following an unpleasant event?
- Are there sufficient procedures in place?
- Is there sufficient supervision in place?

4.2.2 Research Methodology

In conducting this study, a two-fold research methodology was employed, comprising desk research and a survey. The initial phase involved extensive desk research, which entailed the collection and analysis of existing literature, scholarly articles, reports, and relevant online sources.

A. Desk research

The Desk Research allowed a comprehensive understanding of the subject matter, facilitated the identification of key concepts and trends, and served as a foundation for the subsequent research phase.

B. Survey

The second part of the research methodology involved the implementation of a survey. A carefully designed questionnaire was developed to gather primary data directly from the target population which included health care providers but also the general population. The survey aimed to capture specific insights, opinions, and experiences from individuals in order to confirm or to refute the outcome of the desk research.

The combination of desk research and a survey provided a robust methodology for this study. Desk research ensured a solid theoretical framework by integrating existing knowledge, while the survey allowed the collection of primary data, enriching the findings with real-world experiences and perspectives.

The analysis of the first part, which involved desk research, revealed several key insights that served as the foundation for developing the questionnaire used in the second part. Through a systematic review of relevant literature, it was identified that there were various Risk factors influencing the healthcare sector.

This information guided the formulation of research questions and the selection of appropriate questions to be included in the questionnaire. By integrating the findings from the first part, the questionnaire aimed to gather primary data that would address the identified gaps, validate or challenge existing.

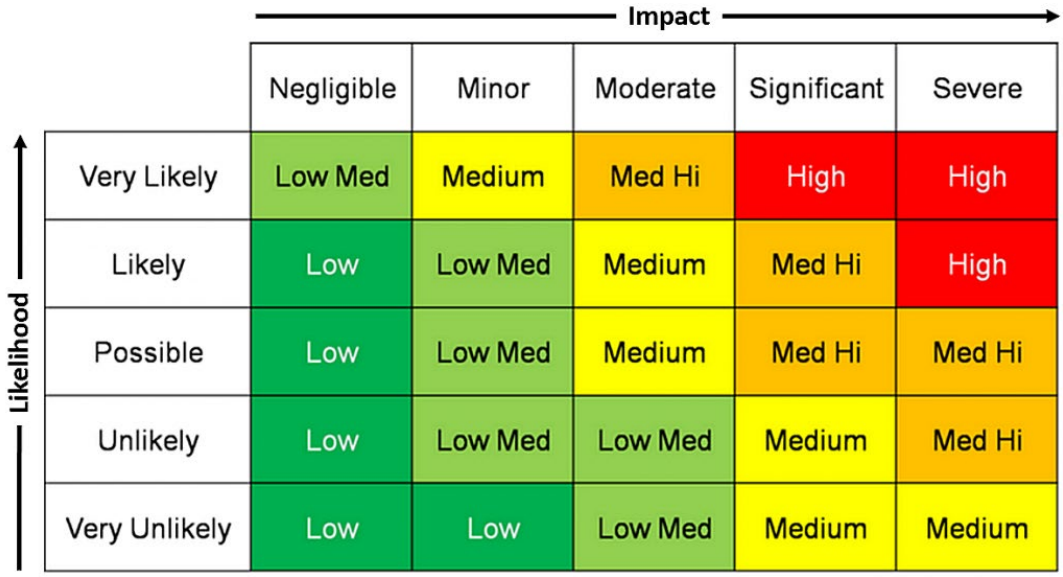
The alignment between the analysis of the first part and the questionnaire used in the second part enhanced the overall research validity and reliability, ultimately contributing to the generation of valuable insights and a deeper understanding of the research subject.

4.2.2.1 Data Collection

Data collection is a critical step in assessing the implementation of GHS in Cyprus. Various data sources can be used to collect information on different aspects of the implementation process. Part of the source of data comes from surveys from patients, providers, and other stakeholders involved in the GHS. Surveys can provide insights into the experiences and perceptions of those involved in the system, including satisfaction with the quality of care, ease

of use of the system, and any barriers or challenges encountered. In addition, data from literature sources such as academic literature, policy documents, and media reports can provide context and background information on the GHS system and its implementation. Overall, a combination of these data sources can be used to provide a comprehensive picture of the implementation of GHS in Cyprus, allowing for a thorough assessment of the system's successes, challenges, and areas for improvement.

For the purpose of this thesis the ratings of consequences and likelihood are based on literature search and survey results. The risk level was calculated by crossing the ratings of impact and likelihood according to the below 5*5 risk matrix.



Likelihood	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

Fig. 7

Impact/likelihood risk matrix 5*5 (IEC 31010:2019)

The crossed rates of the risk matrix are defining the risk level as below:

- High Risk
- Medium high Risk
- Medium Risk
- Low Medium Risk

- Low Risk

CHAPTER 5

5.1 FACTORS AFFECTING THE PUBLIC HEALTHCARE SECTOR IDENTIFIED IN LOCAL AND INTERNATIONAL LITERATURE

The factors affecting the public healthcare sector, such as funding, demographics, political and policy changes, technological advances, public health emergencies, and workforce issues, are highly relevant to the provision of healthcare services. These factors can impact the availability, accessibility, and quality of care, and addressing them requires a multifaceted approach that involves government policy, public health education, and investments in healthcare infrastructure and technology. Improving the quality of care is also a critical goal that requires ongoing attention and investment, as it has a direct impact on patient outcomes, the overall health of populations, and the cost-effectiveness of healthcare delivery.

Drawing from both local and international literature, the following risk factors have been identified as the main factors and thus they will undergo further analysis. In this section the risk factors will be analysed along with scenarios drawn mainly from local literature and media.

The main factors that have an impact / affect health care are as below (not in priority order):

- Government and Politics Risk Factors (Paragraph 5.2.1)
- Advanced Technology Risk Factors (Paragraph 5.2.2)
- Budget-Financial Risk Factors (Paragraph 5.2.3)
- Human Risk Factors (Paragraph 5.2.4)
- Quality Risk Factors (Paragraph 5.2.5)
- Legal and regulatory compliance Risk Factors (Paragraph 5.2.6)
- Ecological Risk Factors (Paragraph 5.2.7)
- Socio-culture Risk Factors (Paragraph 5.2.8)

5.2 RISK ANALYSIS AND RELEVANT SCENARIOS-BASED APPROACH

5.2.1 Government and Politics

Government and Political risk factor is the risk that a project may be affected as a result of political changes, political decisions or political instability in a country. The budgets of all ministries, public departments, demi-public organizations, and non-profitable organizations funded by the Government, are approved by the parliament.

The main actors in the health care system are the Ministry of Health, the Ministry of Finance, the Ministry of Labour and Social Insurance and to a lesser degree the Ministries of Education and Culture, Defence, Commerce, Industry & Tourism, and Agriculture, Natural Resources & Environment. Professional associations also play an important role. These include the Cyprus Medical Association, the Cyprus Nurses and Midwives Association, the Union of Public Doctors and the Union of Public Nurses, the Pancyprian Association of Private Hospitals, the workers' union of Pancyprian Federation of Labour (PEO), Cyprus Workers' Confederation (SEK), and Democratic Labour Federation of Cyprus (DEOK), and some voluntary organizations and NGOs. Most of them have enough power to influence political decisions regarding health care planning. (13)

This section includes:

A. the scenario of the rejection of the budget by the parliament
B. And the scenario of freezing the budged.

Scenario A:

Budget Rejection

Every year the Government's budget is approved by the parliament. In Cyprus, the approval of the budgets is made by the majority of the votes of the parliament.

In December 2020, the budget of 2021 was rejected by the parliament. (14)

In the extremely unlikely event of the rejection of the Government's budget by the parliament, the public organizations are dividing the last approved budget in twelve equal parts (monthly budget) to proceed with operational expenses until the approval of the new budget by the parliament.

The budget of 2021 was finally voted in February and consequently all the public projects were frozen for two months.
For this period the state's contribution to GHS (€425 million) was not disbursed and the system was in a risk of collapse or face severe shortages. (15)

The likelihood of this event is rated **"Unlikely**" to happen since there was only one event since 1960.
The impact of the rejection of the Government's budget can be rated as "**Severe**" because healthcare is a critical sector that affects the well-being of the entire population. The healthcare sector relies heavily on government funding to operate and provide essential medical services to the public. If the government's healthcare budget is rejected, it can result in lack of funding for hospitals, clinics, and other healthcare facilities, which can lead to a shortage of medical supplies, equipment, and staff. This, in turn, can result in a decline in the quality of care provided to patients, longer wait times, and increased patient mortality rates.
Thus, the Risk is categorised as **"Medium-high"** according to 5*5 risk matrix.

Scenario B:

Decrease of Budget

Financial crises occur about once every decade and the damages of a crisis are affecting the Governments' decisions for the budgets of the year. The last 20 years Cyprus faced 3 crises, the stock exchange crisis in 2000, the financial crisis in 2012 and corona virus crisis in 2020. A budget freeze in the healthcare sector can have significant impacts on the provision of healthcare services, as it limits the resources available to healthcare providers and organizations. When budgets are frozen, it means that funding levels are maintained at the same level as the previous year, and there is no additional funding for new initiatives or projects.
One of the main impacts of a budget freeze in the healthcare sector is that it can lead to a reduction in the quality and quantity of healthcare services that are provided. Healthcare providers may be forced to reduce staff, limit services, or delay necessary equipment upgrades and maintenance due to limited funding. (16)

A budget freeze can also impact access to healthcare services, particularly for vulnerable populations such as low-income individuals or those with chronic health conditions. With limited resources, healthcare providers may prioritize certain services over others or restrict the availability of certain treatments or medications.

Overall, a budget freeze in the healthcare sector can have far-reaching impacts on individuals, communities, and the economy. It highlights the importance of ensuring that healthcare funding is adequate to support the provision of high-quality healthcare services and to promote access to care for all individuals.

The Minister of Health in 2016, during a press conference for the budget of the Ministry of Health said that during crisis the cuts in the Health Ministry's budget in the last years are due to measures taken, namely payroll cutbacks and savings and the savings achieved were not at the expense of services, as they are the product of better and more rational management of public funds.

Cyprus healthcare spending for 2016 was $1,635, a 3.38% increase from 2015.

Cyprus healthcare spending for 2017 was $1,751, a 7.07% increase from 2016.

Cyprus healthcare spending for 2018 was $1,982, a 13.21% increase from 2017.

Cyprus healthcare spending for 2019 was $1,996, a 0.74% increase from 2018. [17]

In this case the likelihood of the event is "**Unlikely**" because there were events of budget deduction.

The impact of the freezing the Government's budget can be rated as "**Significant**" because when the healthcare budget is frozen, it can result in a temporary lack of funding for hospitals, clinics, and other healthcare facilities, which can lead to a shortage of medical supplies, equipment, and staff. This can result in longer wait times, decreased quality of care, and increased patient mortality rates. Moreover, the freezing of the healthcare budget can also lead to a decrease in the recruitment and retention of healthcare professionals, who may seek employment opportunities in other countries or sectors, further exacerbating the existing workforce shortage.

Thus, the Risk is categorised as **"Medium"** according to 5*5 Risk Matrix

5.2.2 Advanced Technology Risk

New technology options offer promising results for healthcare organizations in areas including value-based patient care and the revenue cycle. Although block-chain, robotic process automation, machine learning, and artificial intelligence might not currently be used widely in the healthcare industry, organizations need to be ready for their adoption and be knowledgeable about all of their potential benefits – and risks. Often, risks introduced by new technologies are overlooked in favour of focusing on the rewards they promise. But having a thorough understanding of risks involved and potential impacts to the organization can make for a smoother implementation when an organization takes steps toward new technology adoption. New technologies, when not tested or understood sufficiently by healthcare organizations, can pose risks to data quality, data security and user access, confidence in results, return on investment, and human oversight, among others. A lack of familiarity should not be an excuse to overlook these technologies, but associated risks should be understood and identified so that healthcare organizations can mitigate them before experiencing unforeseen impacts.

In our case study, part of the ambitious plan to upgrade the health sector, the Health Ministry focused on digitizing medical provision and developing an integrated e-health monitoring system. This involves the introduction of digitized health records, the expansion of medical services to remote areas via telemedicine and robotics, and access to international medical data banks. Also, part of this evolution is to take actions to encourage further investments in areas such as e-health, medical tourism, rehabilitation services, medical schools, and pharmaceutical services. This category includes Risk of Cyber-attack, Risk of Technology company access to data, Risk of Interoperability and future technologies, risk of non-implementation of systems and Inefficient/ineffective Business continuity and disaster recovery plan [18]

Scenario A

Cybersecurity – Risk of Cyberattack

As technology-enabled care and communication with patients grows, cybersecurity continues to be a top concern for healthcare executives, audit committees, and boards. Well-established guidance for cybersecurity programs focuses on identifying information assets and related cyber-risks, applying protective controls, detecting, and responding to security threats, and recovering from incidents that occur. Regulations and continual breach reports have demonstrated to healthcare organizations the importance of cybersecurity, and many organizations have been taking steps to perform the necessary risk assessment activities and implement robust preventive controls.

While healthcare organizations continue to mature in identifying and protecting physical property, intellectual property, and data assets, a lack of preparedness for detecting and responding to cyber-threats persists. Detecting cyber-threats requires significant investment in personnel and technology to support monitoring of networked systems, which presents challenges to thinly stretched IT and security budgets. To complicate matters, the healthcare industry is unique in the sense that it has to consider security events, which require healthcare entities to also plan for violations of patient privacy and inappropriate access to sensitive patient information. This combination increases the complexity of the detective capabilities and incident response plans. Preparedness measures such as walk-throughs of response plans, table-top exercises, and disaster recovery tests require coordination and time from several groups beyond IT. The healthcare industry's high integration rate of mobile devices, cloud services, and network-connected biomedical devices further hinders even the best efforts to monitor all systems and have proper response plans in place. It is easy to overlook the costs of resources required to develop, maintain, and continually improve security detection and response capabilities. Security incidents are, unfortunately, inevitable, and leadership is seeing the need to shift its focus to developing strong detective and corrective processes and controls to support the protective controls already in place.

In May 2021, GHS experienced a significant cyber-attack that affected the system's functionality and accessibility. The attack, which was believed to be a ransomware attack, affected several aspects of the system, including the central data centre, primary healthcare centres, and hospitals across Cyprus.

The attack caused disruptions to GHS services, including appointment scheduling, prescription renewals, and access to medical records. Healthcare providers were unable to access patient information, leading to delays and disruptions in patient care.

GHS responded quickly to the attack, isolating the affected systems and disconnecting them from the network to prevent further spread of the malware. GHS also engaged cybersecurity experts to investigate the attack and mitigate the damage.

While GHS has not disclosed the details of the attack, it is believed that it originated from an email phishing scam that targeted GHS employees. The attackers were able to gain access to the system by exploiting vulnerability in the system's security. [19]

The cyber-attack on GHS highlights the importance of cybersecurity in healthcare systems, especially those that rely heavily on technology. It also underscores the need for ongoing training and education for employees on how to recognize and respond to potential cyber threats. GHS has since implemented additional security measures to prevent future attacks, including stronger password policies, regular security audits, and employee cybersecurity training.

The likelihood of Cyber-attacks in any given situation depends on several factors, including the vulnerability of the systems in place, the motivation and capability of potential attackers, and the existence of effective security measures to deter and prevent such attacks. In the case of cybersecurity threats in general, it is difficult to determine the exact likelihood of an attack, as attackers are constantly adapting and evolving their methods, and new vulnerabilities are discovered all the time.

The likelihood in this case is ranked "**possible**" because there were recorded such events and as per records were more than one.

The impact of a Cyber-attack can be "**Severe**" The impact of such loss and delay of access in the system can result in two severe outcomes. One is the loss of human lives, or creation of human disabilities due to delayed response or the second is the leak of sensitive personal identifiable information that will violate GDPR and might cause severe issues to some population.

Thus, the Risk is rated **Medium-High** as per 5*5 risk Matrix.

Scenario B

Risk of Technology company access to data

Third-party companies have been provided access to healthcare organizations' data more than ever before. Technologies such as IoT devices, blockchain, 5G wireless networks, mobile apps, and partnerships with tech companies are creating excitement for patients and customers who have easy access to their data. But these technologies also are a big concern within the healthcare industry. While more data being made available for enhanced analytics and shared across various organizations offers many benefits, it also introduces an emerging significant risk of patient data exposure that organizations need to control.

Interoperability of systems, technology platforms, and data sharing across the healthcare industry is on the rise. These features exacerbate the data privacy concern related to tech companies having access to protected health information. Healthcare executives should be aware of new data sharing technologies and new regulations, and they need to understand what tech companies are doing to make patient and customer records more electronically available, how they are limiting access, and how they are implementing increased security to protect patient data. Although cyber threats and data access have been significant risks within the healthcare industry for more than a decade, with the increasing complexities introduced by using advanced technologies and sharing large quantities of data with third-party technology companies, these risks continue to grow. [18]

When technology companies access data of GHS, there is always a risk that the data could be used in ways that violate patient privacy and confidentiality. The risk is especially high if the technology company does not have appropriate measures in place to protect the data from unauthorized access or if they have a history of data breaches or privacy violations.

For example, if a technology company were to access GHS's patient data without proper authorization or consent, they could use the data for commercial gain, such as targeted advertising or selling the data to third-party organizations. They could also use the data to

discriminate against patients based on their medical history, leading to negative health outcomes and reduced access to healthcare services.

Another risk is that the technology company may not have the expertise or experience to manage sensitive healthcare data properly, leading to accidental data breaches or unauthorized access to patient data. This risk can be mitigated by ensuring that any technology company working with GHS has appropriate security and privacy policies and procedures in place to protect patient data.

Overall, while technology can offer significant benefits to the healthcare sector, it is essential to carefully evaluate the risks and benefits of allowing technology companies access to sensitive patient data. It is crucial to ensure that appropriate measures are in place to protect patient privacy and confidentiality, and that any technology company that works with GHS adheres to strict security and privacy standards.

The likelihood in this case is ranked "**Very Unlikely**" since no such event was recorder in local literature neither in media.

The impact of a Cyber-attack can be "**Severe**".

Medical records are sensitive information and if such intentionally or unintentionally is leaked then it can result to discrimination against patients based on their medical history, leading to negative health outcomes and reduced access to healthcare services. It can also result in further issues related to personal life and a huge impact in psychological status of the person.

Thus, the Risk is rated "**Medium**" as per 5*5 Risk Matrix

Scenario C

Risk of non-implementation of Systems

System implementations typically are major projects requiring significant resources and time. Examples of projects include electronic health record applications, ancillary applications, operating systems, and databases, individual modules within applications, interfaces, and upgrades, among others. If a comprehensive implementation plan is not completed, approved, and followed, implementations might not be successful or might fall short of clinical,

operational, financial, and IT management expectations. Such deficits could lead to inefficient system operations, system disruption, negative impacts to expected production, and ultimately untimely and ineffective patient care. Implementation plans should include requirements for design, testing, training, and support for all user types and departments. Implementation risks include lack of user access controls, inadequate cybersecurity considerations, lack of interface operability, inadequate data privacy controls, poor change management, inadequate backup and recovery, improper segregation of duties, insufficient infrastructure to sustain and optimize systems after implementation, insufficient user training, elevated numbers of administrative users, incomplete policy and procedure updates to reflect new processes, and ineffective user issue management and remediation.

The non-implementation of systems can pose significant risks to patient safety, quality of care, and overall healthcare efficiency. For example:

- Fragmented patient records: Without a unified system in place, patient records can be stored in silos, making it difficult for healthcare providers to access and share critical patient information. This can lead to medical errors, duplicated tests and procedures, and ultimately, poorer health outcomes for patients.
- Delayed or missed diagnoses: A lack of digital systems can result in delayed or missed diagnoses, particularly in cases where critical patient information may be stored in a separate system or location. This can lead to delayed treatment and poorer patient outcomes.
- Inefficient workflow and resource utilization: A lack of digital systems can lead to inefficient workflow processes, which can impact healthcare staff's productivity and morale. Manual processes, such as paper-based record-keeping, can be time-consuming and prone to errors, leading to wasted resources and increased costs.
- Limited access to critical information: Without a unified system in place, healthcare providers may not have access to critical patient information, such as medication allergies or previous medical procedures. This can lead to medical errors, delayed treatment, and poorer health outcomes.

- Compliance and legal risks: The non-implementation of digital systems can lead to non-compliance with data protection regulations, such as GDPR, which can result in legal and financial liabilities for healthcare organizations. [18]

Some real-life scenarios include but are not limited to

1. Limited telemedicine services: During the COVID-19 pandemic, the limited availability of telemedicine services in Cyprus made it difficult for patients, particularly those living in remote or rural areas, to access healthcare services. This resulted in delays in diagnosis and treatment, leading to poorer patient outcomes.
2. Inadequate digital infrastructure: In 2018, the Cyprus News Agency reported that many healthcare facilities in Cyprus lacked the necessary digital infrastructure to support the implementation of new digital systems. This resulted in limited access to critical patient information, inefficient workflows, and wasted resources.
3. Limited data sharing: In 2019, the Cyprus Data Protection Commissioner criticized healthcare providers for their reluctance to share patient data with other providers due to concerns about data security and privacy. This led to fragmented patient records and missed opportunities for collaboration and coordinated care.

The likelihood in this case is ranked as "**Possible**" because as we can see from literature that there are cases within or without healthcare that damages are recorded due to improper software update or on delayed updates.
The impact can be "**Moderate**" because in Cyprus the healthcare is not still disconnected from the paperwork thus archives and medical files can be still accessible.

Thus, the Risk is rated "**Medium**" as per 5*5 Risk Matrix.

Scenario D

Inefficient/ineffective Business continuity and disaster recovery plan

Business continuity refers to the processes and procedures that GHS has in place to ensure that essential healthcare services can continue during and after an unexpected event or disruption, such as a natural disaster or cyber-attack. This may involve maintaining redundant systems, ensuring access to critical supplies, and having emergency response plans in place.

Disaster recovery refers to the processes and procedures that GHS has in place to recover essential healthcare services after an unexpected event or disruption has occurred. This may involve restoring IT systems, facilities, and supply chains to normal functioning.

The plan shall include the following key elements:

- Risk assessment: regular risk assessments to identify potential risks and vulnerabilities that could affect healthcare services. This includes risks related to natural disasters, cyber-attacks, and other potential threats.
- Business impact analysis: regular business impact analyses to assess the potential impact of disruptions on healthcare services and patient care. This helps to identify critical systems and processes that need to be prioritized for business continuity and disaster recovery.
- Emergency response plans: emergency response plans in place to respond to different types of disruptions, including natural disasters, cyber-attacks, and other events. These plans include procedures for communication, evacuations, and other emergency measures.
- IT systems: maintenance of redundant IT systems and backup procedures to ensure that critical healthcare services are available even in the event of a disruption.
- Facilities and supply chains: also, maintenance of redundant facilities and supply chains to ensure that essential supplies and equipment are available even in the event of a disruption.

Testing and training: regular tests and train its staff on business continuity and disaster recovery procedures to ensure that they are effective in the event of an actual disruption.

The risk of inefficient/ineffective business continuity and disaster recovery plan in Cyprus healthcare can have significant consequences for patients, healthcare providers, and the overall healthcare system. Here are some specific risks associated with this issue:

- Patient safety: In the event of a disaster or major disruption, patient safety can be compromised if healthcare providers do not have a comprehensive plan in place to continue providing care. For example, a lack of backup systems or redundant data storage could result in the loss of critical patient information or the inability to access necessary medical equipment, leading to delays in diagnosis and treatment.
- Increased downtime: Without a robust business continuity and disaster recovery plan, healthcare providers may experience longer periods of downtime in the event of an unexpected disruption. This can lead to lost revenue, reduced productivity, and decreased patient satisfaction.
- Data breaches: In the absence of a solid disaster recovery plan, healthcare organizations may be more vulnerable to cyberattacks and data breaches. This can result in the theft of sensitive patient information, financial losses, and reputational damage.
- Wasted resources: Without an effective business continuity plan, healthcare organizations may struggle to allocate resources efficiently during a crisis. This can lead to wasted resources, increased costs, and reduced profitability.
- Legal and regulatory compliance: Inadequate business continuity and disaster recovery planning can also result in non-compliance with legal and regulatory requirements. This can lead to fines, legal action, and reputational damage.

From international data the below incidences where recorded:

- Hurricane Katrina (2005) - The hurricane caused severe damage to healthcare facilities and disrupted the healthcare system in Louisiana and Mississippi. The lack of an effective business continuity and disaster recovery plan resulted in patient evacuations, the loss of medical records, and a delay in critical medical care. [29]
- NHS Cyber Attack (2017) - In May 2017, the UK's National Health Service (NHS) suffered a major cyber-attack that affected 80 out of 236 hospital trusts. The attack was caused by a ransomware virus that encrypted data and demanded payment for its release.

The lack of a comprehensive business continuity and disaster recovery plan resulted in the disruption of patient care, including cancelled appointments and surgeries, and the loss of patient data. [28]

- Hurricane Maria (2017) - The hurricane caused significant damage to healthcare facilities in Puerto Rico, resulting in the loss of power, medical supplies, and medical records. The lack of an effective business continuity and disaster recovery plan resulted in patient deaths, delays in medical care, and a significant impact on the healthcare system. [30]

The likelihood in this case is ranked "**Likely**" because we have everyday cases of continuity failure in all public services for example the governmental servers and land registry case case. The impact can be "**Severe**" because there might be loss of data and loss of lives.

Thus, the Risk is rated "**High**" as per 5*5 Risk Matrix

5.2.3 Budget-Financial Risk

There is no authority responsible for the regulation of capital investment in the health care sector. In practice, planning and regulation of the public sector is the responsibility of the Ministry of Health, mostly on an ad hoc basis. The most common criterion to ensure equitable distribution of capital investment is area population size, although political pressures from within localities often play a role. The parliament is the body that approves the budget related to the healthcare and then is distributed to the two main agencies responsible for the healthcare, the state health services organization (SHSO) and the health insurance organization (HIO).

This risk includes lack of flexibility and inability to adapt the budget top the new situations. This includes but not limited to Increase in the number of residents that are reliant on health services, shortage of medications and necessity to be replaced by other more expensive and even monopoly, disease outbreaks that require bigger allocation of resources and higher expenses at the healthcare sector.

Scenario A:

Increase of budget due to epidemic or pandemic event (increase in patient inflow and demand of supplies)

An increase in the number of patients accessing healthcare services can have both positive and negative impacts on the healthcare system. On one hand, it may indicate that more people are able to access healthcare services and receiving the care they need. On the other hand, an increase in patient volume can also lead to challenges for healthcare providers, such as longer wait times, increased workload, and potential staff shortages.

One of the main impacts of an increase in patient volume is the potential for longer wait times for appointments, procedures, and other healthcare services. This can lead to delays in diagnosis and treatment, which can impact patient outcomes and satisfaction. Longer wait times can also lead to increased stress and frustration for patients and healthcare providers alike.

To address the challenges posed by increased patient volume, the stakeholders may need to consider strategies such as expanding capacity, increasing staffing levels, and implementing new technologies or processes to improve efficiency.

One example of an increase in healthcare budget due to an increase in patient demand for healthcare services in Cyprus is the case of the public healthcare system in 2020 during the COVID-19 pandemic. The pandemic led to a surge in patients accessing healthcare services, particularly in the public healthcare sector. The demand for healthcare services increased significantly, resulting in a strain on the healthcare system and an increase in healthcare expenditure.

In response to the increased demand, the government of Cyprus allocated additional funds to the healthcare system to support the increased workload and ensure that patients received the necessary care. The government announced several measures to support the healthcare system, including the hiring of additional medical and nursing staff, the procurement of medical equipment and supplies, and the expansion of hospital facilities to accommodate the growing number of patients. While the increased funding was necessary to support the healthcare system

during the pandemic, it also highlighted the need for a more sustainable approach to healthcare financing in Cyprus. The government recognized this need and has since announced plans to increase investment in the healthcare system, including the development of a new hospital and the expansion of primary care services.

Cyprus has spent over €200 million in tackling Covid-19 since 2020 to date, Health Minister Michalis Hadjipantela said on Monday. Presenting his ministry's budget at the House finance committee, he outlined a five per cent increase for 2023 compared to the previous year, totaling €1.1 billion. The government of Cyprus also received financial support from the European Union to assist in the country's response to the pandemic. [20]

The likelihood in this case is ranked as "**Possible**". Through the years as per literature we have seen many epidemies and pandemics

The Impact of this scenario is "**Significant**". As described above in budget rejection and budget decrease and other any financial shortage in healthcare can result in lack of funding for hospitals, clinics, and other healthcare facilities, healthcare providers, and can lead to a shortage of medical supplies, equipment, and staff. This can result in a decline in the quality of care provided to patients, longer wait times, and increased patient mortality rates.

The Risk is classified as "**Medium-High**" as per 5*5 Risk Matrix.

Scenario B

Risk of Inefficient use of resources

Inefficiencies in the healthcare system can lead to wasted resources, which can impact the budget. This includes unnecessary hospitalizations, overuse of medical tests and procedures, and administrative waste.

Some of the factors that contribute to inefficient use of resources include:

- Overuse of medical tests and procedures: In some cases, medical professionals may order tests and procedures that are not medically necessary, which can lead to unnecessary costs and waste.
- Unnecessary hospitalizations: Patients may be admitted to hospitals when they could have received care in an outpatient setting. Hospitalization can be costly and can lead to the spread of hospital-acquired infections.
- Administrative waste: Administrative waste, such as duplicate paperwork, unnecessary bureaucracy, and inefficient processes, can lead to wasted time and resources.
- Lack of coordination between healthcare providers: In some cases, healthcare providers may not communicate effectively with each other, leading to duplicated tests, procedures, and medications.
- Ineffective use of technology: Although technology has the potential to improve healthcare efficiency, its implementation may not always be effective. For example, if healthcare providers are not properly trained to use new technology, it may not lead to improved outcomes.

This event overlaps with Corruption-system abuse and Quality-medicine abuse, thus will be discussed further in Human Risk Factor.

5.2.4 Human Risk Factor (Corruption-Bribery Risk will be mainly explored due to the results of the survey)

The Special Eurobarometer 397 (published in February 2014) shows that corruption in healthcare is not an isolated phenomenon. In general, perceived corruption in healthcare is correlated with general levels of perceived corruption. Greece, Lithuania, Romania, Slovakia, and Cyprus are among the countries with both the highest levels of perceived general corruption and specific healthcare corruption, while at the other side of the continuum the Scandinavian countries score well on both indicators. [21]

Compliance with local laws remains a top concern for government, healthcare governance and management teams. Healthcare is a highly regulated industry with special rules applicable to

transactions between health systems and physicians to avoid referrals of Medicare or Medicaid patients where financial relationships exist filing of fictitious, miscoded, non-medically necessary, or otherwise inaccurate claims for Medicare or Medicaid beneficiaries and many other compliance matters.

Possible results of noncompliance with the many regulations faced by healthcare organizations include class-action lawsuits and significant legal, regulatory, and financial consequences. Other common results of noncompliance include fines, reputational loss, and costly corporate integrity agreements.

To avoid these risks, it is important that healthcare providers understand the government's focus areas relative to combating fraud, waste, and abuse, which can be accomplished through regular review of state and federal regulator websites.

Health systems also should be proactive and undertake audits of physician transactions, care coordination functions, billing, and claims coding. In addition to these audit areas, health systems should consider periodic reviews of the effectiveness of their compliance programs, which help safeguard against regulatory and legal action through providing means to report and take corrective action internally.

Scenario A

Abuse of the healthcare system from health care from the providers or Abuse of the healthcare system from health care from the patients

In the case of GHS three different types of abuse were identified. In the first case the health professionals request compensation for services they have never offered. In the second case, doctors and patients jointly cheat the system and in the third case recipients demand to be sent for various exams and tests at the time when their physician does not deem it necessary. All three risks can result in the failure of the system due to the overstated and unreasonable expenses. Another outcome of the third case is minimizing the access to the patient that actually need those services resulting in pure provision of healthcare services to patients that are in need and that might result in serious disabilities and even loss of human lives. In February 2022

there was a cut out in the GHS row after the finance ministry drew its scalpel and trimmed €150m from the Health Insurance Organisation's (HIO) budget. The finance minister centred his arguments on the auditor general's scathing report, released early February 2022, which highlighted alleged illegalities on part of the HIO, along with systemic overspending and incompetence.

The consequences of the System Abuse include reduced access to healthcare. Unnecessary tests and visits can result in reduced access to healthcare for those who need it most, lower quality of care, misuse of public funds which can lead to a lack of investment in critical areas of healthcare, such as disease prevention and primary care and last, but not least loss of public trust in the healthcare system and its providers [22]

The likelihood in this case is ranked as "**Very Likely**". As per surveys made by the EU and as per available literature Cyprus is one of the most corrupted countries in the EU.

The Impact of this scenario is "**Significant**" The impact is significant because as previously described this will result in pure provision of healthcare services to patients that are in need and that might result in serious disabilities and even loss of human lives.

The Risk is classified as "**High**" according to 5*5 Risk Matrix

5.2.5 Clinical quality Risk

Clinical quality can be measured with processes, experiences and/or outcomes of patient care, observations or treatment that relate to one or more quality aims for health care such as effective, safe, efficient, patient-centred, equitable, and timely care.

Cyprus is a country that proportionally spends less on health than most EU countries. In 2019, EUR 1 881 per capita went towards health (adjusted for differences in purchasing power), which is about half the average of EUR 3 521 for the EU as a whole. Despite gradual increases over the past decade, this amount translates to 7 % of GDP, a significantly lower share compared to the total EU average of 9.9 %. In addition, only 8 % of the government budget was spent on health, compared with a 14 % EU average. State of Health in the EU Cyprus (2021)[23]

Another point to mention here is the austerity of the policies that were a major setback in the plans for implementation of the GHS [3], arousing strong feelings among health professionals as well as a perceived increase in the suffering of patients. Ultimately, the austerity policies put the quality of health services at risk and, by extension, decrease patient satisfaction.

The COVID-19 pandemic has highlighted the importance of strong processes and contingency plans to maintain quality performance through catastrophic times. For example, healthcare organizations need to consider how they will staff quality functions and other administrative responsibilities during an emergency, how they will deliver the consistent application of important nurse-driven protocols, and how they will address scope-of-practice issues as staff is redirected to other duties.

The clinical quality requires among others physician alignment, patient safety, emergency preparedness, budget and effective medicine control.

Scenario A

Lack of Physician/Provider-Government alignment

The lack of physician-government alignment is a significant risk for the healthcare systems. When healthcare providers and government officials are not aligned in their goals and priorities, it can lead to inefficiencies, miscommunication, and decreased quality of care.

For example, if the government prioritizes cost-cutting measures over patient care, healthcare providers may be pressured to reduce services or cut corners to save money. This can lead to decreased quality of care for patients and decreased job satisfaction for healthcare providers.

On the other hand, if healthcare providers prioritize patient care above all else, they may be resistant to changes or reforms that are necessary for the sustainability of the healthcare system. This can lead to inefficiencies and a lack of innovation in the system.

To address this issue, it is important for healthcare providers and government officials to work together and communicate effectively. This can be done through regular meetings and consultations, as well as the development of clear goals and priorities for the healthcare system. Additionally, transparency and accountability can help to ensure that all stakeholders are working towards the same goals and priorities.

One example of a lack of physician-government alignment in Cyprus is the ongoing issue of the shortage of doctors in the public healthcare system. In recent years, there has been a significant shortage of doctors in the public sector, leading to long waiting times and limited access to care for patients.

The government has attempted to address this issue by increasing the number of doctors in training and offering financial incentives for doctors to work in the public sector. However, these efforts have not been sufficient to address the shortage, and healthcare providers have criticized the government for not doing enough to attract and retain doctors in the public sector.

Additionally, there have been issues with the government's handling of the COVID-19 pandemic, with some healthcare providers criticizing the government's response as slow and inadequate. This has led to tensions between healthcare providers and government officials, with some calling for greater collaboration and communication between the two groups.

Overall, the lack of physician-government alignment in Cyprus has led to challenges in providing adequate healthcare services to the population, particularly in terms of access to care and quality of care. It highlights the need for greater collaboration and communication between healthcare providers and government officials to ensure that the healthcare system is functioning effectively and efficiently.

The likelihood in this case is ranked as "**Possible**". As we can see from the history of the Republic of Cyprus the non-alignment between sectors, ministries, bodies, etc, has been a fact. The phenomenon is very usual as there is always limited communication and alignment between instructing party, executing party and receiving party.

The Impact of this scenario is "**Moderate**" as it will have direct impact of the patients' lives.

The Risk is classified as "**Medium**" as per 5*5 Risk Matrix

<u>Scenario B</u>

Lack of Emergency preparedness

The risk of healthcare providers being unprepared in the event of a natural or human-created disaster that leads to a large influx of patients has been significant in the past but has gained

attention as healthcare organizations around the world work to address the COVID-19 pandemic.

Some of the measures that GHS implemented during the pandemic include:

- Increased testing capacity: GHS rapidly expanded its testing capacity to identify and isolate COVID-19 cases, helping to prevent further spread of the virus.
- Dedicated COVID-19 treatment facilities: GHS established dedicated treatment facilities for COVID-19 patients to ensure that they received appropriate care and prevent the spread of the virus to other patients.
- Telehealth services: GHS increased its use of telehealth services, allowing patients to receive medical care remotely and reducing the risk of exposure to the virus.
- Personal protective equipment (PPE): GHS ensured that healthcare workers had access to appropriate PPE, reducing the risk of infection among healthcare workers.
- Vaccination rollout: GHS was also involved in the national vaccination rollout, providing vaccines to the population as they became available.

When the pandemic first hit Cyprus in March 2020, there was a shortage of personal protective equipment (PPE), testing supplies, and ICU beds. There was also a lack of coordination and preparedness among healthcare providers and government agencies. As a result, healthcare workers were put at risk of infection due to the shortage of PPE, and patients faced delays in testing and treatment. The healthcare system was quickly overwhelmed, and there was a significant strain on hospital capacity and resources. [25]

The government of Cyprus responded by implementing measures to increase hospital capacity, expand testing capacity, and procure more PPE and medical equipment. However, the initial unpreparedness highlighted the need for better emergency preparedness and coordination in the healthcare system. To address this issue, the government has since announced plans to invest in emergency preparedness and response capabilities, including the development of a national emergency response plan and the establishment of a central emergency operations centre. Additionally, healthcare providers have emphasized the importance of ongoing training and preparedness for emergency situations.

The likelihood in this case is ranked as "**Likely**" It unlikely because pandemics do not happen very frequently. The Impact of this scenario is "**Severe**" as it will have direct impact of the patients' lives. Having in mind how the COVID19 was handled we can see that the actual preparedness and risk management was very bad. We can assume that pandemic was not even assessed as a potential risk factor. A serious issue that was pre-existing came up again and this time the consequence of ICU beds insufficiency was very critical.

The Risk is classified as "**High**" as per 5*5 Risk Matrix

Scenario C

Lack of Medication Control

Few areas in healthcare are at the intersection of patient safety, cost management, compliance, and community health risk quite like pharmacies. Pharmacists play an important role in preventing and detecting drug abuse and controlled substance diversion. An additional area of patient safety and community health risk is the growing resistance of many diseases to antibiotics; this development has occurred through overuse and noncompliance with evidence-based prescribing practices.

Antibiotics are a critical tool for treating bacterial infections, but overuse can lead to the development of antibiotic-resistant bacteria. In Cyprus, there has been a high rate of antibiotic use in healthcare, which has contributed to the development of antibiotic resistance.

A study conducted in Cyprus found that antibiotics were frequently prescribed for viral infections, which are not treatable with antibiotics. The study also found that there was a lack of adherence to guidelines for antibiotic prescribing and that patients often received antibiotics for longer than recommended.

This overuse of antibiotics can lead to increased healthcare costs due to the development of antibiotic-resistant infections, longer hospital stays, and the need for more expensive treatments. It can also lead to decreased quality of care for patients who may not receive the appropriate treatment for their condition.

To address this issue, the Cyprus Ministry of Health has implemented several initiatives to promote the appropriate use of antibiotics. These initiatives include the development of

guidelines for antibiotic prescribing, education for healthcare professionals and the public about the appropriate use of antibiotics, and monitoring of antibiotic use in healthcare. [26]

The likelihood in this case is ranked as "**Possible**". Many steps were taken following the implementation of GHS to control medication use. The dispassion of prescription medicines without prescriptions has been decreased due to the strict controls imposed in the Pharmacies.

The Impact of this scenario is "**Significant**" as it will have direct impact of the patients' safety due to overdoses, misuses that can lead to resistance. This scenario would also negatively impact the economics of the country.

The Risk is classified as "**Medium-High**" as per 5*5 Risk Matrix

5.2.6 Legal and regulatory compliance

The implementation of the GHS is regulated by laws. The healthcare services are vulnerable to lawsuits. The outcome of the lawsuits can be financial damages and personal liabilities of the healthcare providers and other individuals.

Some of the legal issues include:

- Medical malpractice claims: Patients may file medical malpractice claims if they believe they have been harmed as a result of negligence or errors by healthcare professionals within the system.
- Contractual disputes: contracts with healthcare providers and vendors to provide services and supplies to patients. Disputes may arise over contract terms, pricing, or other matters.
- Employment disputes: employs healthcare professionals, administrators, and support staff. Disputes may arise over employment contracts, wages, or other employment-related issues.
- Data privacy breaches: Patient data and breaches of patient privacy can result in legal liability and financial penalties.

- Compliance with regulations: compliance with regulations related to healthcare, data privacy, and other matters. Failure to comply can result in legal liability and financial penalties.

Scenario A

Criminal cases against GHS providers for negligence

Negligence in healthcare can occur when a healthcare provider fails to provide the expected standard of care, resulting in harm to the patient. In cases where negligence results in harm or death, criminal charges may be brought against the provider. This can include charges of manslaughter, assault, or other criminal offenses depending on the severity of the harm caused. In Cyprus, there have been a few cases where GESY providers have been charged with criminal negligence. These cases have involved a variety of medical procedures and situations, ranging from surgical errors to misdiagnosis and failure to provide adequate care. While these cases are relatively rare, they serve as a reminder of the importance of maintaining high standards of care in the healthcare sector. In May 2022 an ER doctor has been found guilty and a medical director acquitted in the death of a young student, whose fatal head injury during gym class in Larnaca had gone unnoticed after an X-Ray at the hospital. [34]

To prevent criminal cases of negligence in the GESY system, it is important that healthcare providers adhere to established standards of care, regularly update their skills and knowledge, and prioritize patient safety in all aspects of their practice. Additionally, effective regulatory oversight and enforcement can help to ensure that providers are held accountable for any instances of negligence.

The likelihood in this case is ranked as "**Unlikely**" There were not too many cases recorded thus it is unlikely

The Impact of this scenario is "**Significant**" as it will have direct impact of the patients' safety

The Risk is classified as "**Medium** as per 5*5 Risk Matrix

5.2.7 Ecological Risk Factors

As already discussed above the protection of the environment is significant goal of public hospitals and public health centers. As the major producers of medical waste in Cyprus, public hospitals and public health centers have waste management policies to ensure that their medical wastes are transferred and managed by licensed organizations in order to avoid the pollution of the environment by chemical or toxic wastes.

Another environmental factor that can affect GHS is the increase of energy consumption associated with the operation of healthcare facilities and medical equipment and this can result in increased emissions and contribute to climate change. To address such risk, the Republic of Cyprus may prioritize the use of energy-efficient equipment and facilities, as well as explore the use of renewable energy sources such as solar power.

Scenario A

Increase of Healthcare medical Waste

Health care waste management (HCWM) is a process to help ensure proper hospital hygiene and safety of health care workers and communities. It includes planning and procurement, construction, staff training and behaviour, proper use of tools, machines and pharmaceuticals, proper disposal methods inside and outside the hospital, and evaluation. Its many dimensions require a broader focus than the traditional health specialist or engineering point of view.

The need for proper waste management can:

- help control nosocomial diseases (hospital acquired infections), complementing the protective effect of proper hand washing.
- reduce community exposure to multi-drug resistant bacteria.
- dramatically reduce HIV/AIDS, sepsis, and Hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items.
- control zoonoses (diseases passed to humans through insects, birds, rats and other animals).
- cut cycles of infection.
- easily and cost-effectively address health care worker safety issues, including reducing risk of needle sticks.

- prevent illegal repackaging and resale of contaminated needles.
- avoid negative long-term health effects, eg, cancer, from the environmental release of toxic substances such as dioxin, mercury and others.

Medical waste in hospitals and clinics across Cyprus has gone up by 35% since the start of the COVID pandemic. The waste included gloves, masks and rapid tests kits and the figures were given to the Environment Department by the three companies which collect medical waste in Cyprus, from the public and the private sector. (26)

Due to the fact that collecting facilities are limited there was an increase in the frequency of collection.

The likelihood in this case is ranked as "**Possible**" as we know that such scenario occurred.

The Impact of this scenario is "**Significant**" due to the reasons already described above loss of control nosocomial diseases (hospital acquired infections), Increase in multi-drug resistant bacteria; increase HIV/AIDS, sepsis, and Hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items; increase of zoonoses (diseases passed to humans through insects, birds, rats and other animals); not cut cycles of infection; inability to prevent illegal repackaging and resale of contaminated needles; inability to avoid exposure to negative long-term health effects; eg, cancer, from the environmental release of toxic substances such as dioxin, mercury and others.

The Risk is classified as "**Medium**" According to 5*5 Risk Matrix

5.2.8 Socio-culture Risk Factors

Demographic risk factors refer to factors related to the demographic characteristics of a population that can impact the demand for and provision of healthcare services. In the context of Cyprus healthcare, demographics risk factors can include a range of factors that influence the health and healthcare needs of the population.

In Cyprus, the aging population demographic factor is becoming increasingly relevant as the country experiences a demographic shift towards an older population. According to data from the Cyprus Statistical Service, the proportion of the population aged 65 years and over is projected to increase from 7.3% in 1982 to 14.7% in 2021 and it is expected to increase to 26.6% by 2050. [27]

Cyprus has one of the highest rates of smoking in the European Union, and this is a significant public health concern. The government has implemented various policies and programs to address smoking and other lifestyle-related health risks.[23]

Cultural beliefs and attitudes can also have an impact on public health outcomes. In Cyprus, traditional beliefs and practices can sometimes conflict with modern medical practices, leading to delays in seeking medical care or using alternative treatments that may not be effective. Health promotion efforts need to take into account cultural beliefs and attitudes to effectively address public health challenges.

This demographic shift towards an older population in Cyprus is expected to lead to an increased demand for healthcare services, particularly for chronic disease management and long-term care services. Healthcare providers in Cyprus may need to adapt to this changing demographic by developing specialized services for older adults, including home health care, assisted living facilities, and nursing homes.

Additionally, healthcare providers in Cyprus may need to invest in training and education for healthcare professionals who specialize in geriatric care to meet the unique needs of older adults. Policymakers in Cyprus may also need to consider initiatives that promote healthy aging and disease prevention to reduce the burden on the healthcare system.

Furthermore, as the demand for healthcare services for older adults in Cyprus increases, there may be challenges in meeting the growing need for trained healthcare professionals and sufficient funding to support these services. Therefore, healthcare providers and policymakers in Cyprus must develop strategies to address the healthcare needs of an aging population and ensure that older adults have access to high-quality, affordable care.

Scenario A

Increase demand due to Aging population.

If the aging population is large and the health system is not adequately prepared to meet their healthcare needs, the impact can be severe. This can result in longer wait times for healthcare services, increased healthcare costs, decreased access, and lower quality of care.

The likelihood in this case is ranked as "**Very likely**" due to available prognosis.

The Impact of this scenario is "**Minor**" because the population was aging since 1982 and there were no major issues with provision of services.

The Risk is classified as "**Medium**" According to 5*5 Risk Matrix

Table of Risk Classification and Risk Classification of Scenarios

No	Description	Cause	Effect	Likelihood	Impact	Risk Level	Actions
Government and Politics Risk							
1	Reject of Government's budget	Issues between political parties. Political instability	Inability to contribute to GSH resulting in patient safety and wellbeing issues	Unlikely	Severe	Medium-high	• Establish financial reserves or contingency funds specifically earmarked for healthcare projects. • Develop long-term financial plans that consider potential budgetary constraints.
2	Decrease of budget	Economic Crisis	Inability to contribute to GSH resulting in patient safety and wellbeing issues	Unlikely	Significant	Medium	• Establish financial reserves or contingency funds specifically earmarked for healthcare projects. • Develop long-term financial plans that consider potential budgetary constraints.

Advanced Technology Risk							
3	Cyber attack	Inefficient security program, lack of expertise	Loss of data, leak of data, lack of access to data	Possible	Severe	Medium-High	• Robust Cybersecurity Framework • Employee Education and Training • Secure Network Infrastructure • Regular Security Assessments and Audits • Incident Response Plan • Data Encryption and Privacy • Regular Software Updates and Patching • Data Backup and Recovery • Continuous Monitoring and Threat Intelligence • Strong access controls
4	Risk of Technology company access to data	Inefficient security program, lack of expertise, lack of trained employees, low ethics	Loss of data, leak of data, lack of access to data	Very Unlikely	Severe	Medium	• Data Classification and Access Controls • Vendor Due Diligence • Data Protection Agreements • Data Minimization • Encryption and Anonymization • Regular Security Audits and Assessments • Monitoring and Incident Response • Employee Training and Awareness • Continuous Vendor Management • Ensure compliance with laws and regulations

5	Risk of non-implementation of Systems	Lack of long-term planning, lack of standards.	Delays in diagnosis, fragmented patient records, compliance with the law,	Possible	Moderate	Medium	• Developing standards • Training and education • long term planning
6	Inefficient/in effective Business continuity and disaster recovery plan	Lack of controls and lack of efficient and long-term planning, lack of quality measures	Deaths	Very unlikely	Severe	Medium	• Risk Assessment and Impact Analysis • Clear Objectives and Scope • Comprehensive Planning • Regular Testing and Exercises • Offsite Data and System Backups • Employee Training and Awareness
Budged and Financial Risk							
7	Increase of budget due to increase of patient inflow (change in demographics and epidemiological data)	Changes in demographics with aging population, Increase of refugees and temporary residents in Cyprus or due to epidemics or pandemics	Extra cost	Possible	Significant	Medium-High	Accept the Risk and finance further the sector

Human Risk							
8	Abuse of the healthcare system from health care from the providers or from patients	low perception of corruption, low law enforcement on corruption resulting in impunity	Collapse of the system due to unnecessary co-payments	Very Likely	Significant	Medium	• Establish and communicate a comprehensive code of ethics and professional conduct • Development and implementation of Compliance Programs and Policies • Conduct regular monitoring and auditing of healthcare activities, including billing practices, prescription patterns, and utilization of resources • Implement strong internal controls and risk management practices
Quality Risk							
9	Lack of Physician/Provider-Government alignment	Refuse to change	Decreased quality of care for patients and decreased job satisfaction for healthcare providers.	Possible	Significant	Medium-high	• Establish Regular communication channels • Stakeholder Engagement • Aligned Goals and objectives • Evaluation and feedback • Training and education
10	Emergency un-preparedness risk	Lack of risk-based approach, lack of procedure to test efficacy of policies in real life	Disaster, inability to keep continuity in healthcare services, poor medical services	Unlikely	Severe	Medium	• Emergency response plan • Training • Resource allocation • Coordination and collaboration • Public communication • Post emergency evaluations • Ensure Continuity of operations • Compliance with policies

11	Medicine Abuse/Missuses	General population has Inadequate knowledge on harm of medicine and pharmacists no not comply with law and regulations	Decrease patient safety	Unlikely	Significant	Medium	• Public education • Physicians and pharmacists education • Prescription drug monitoring programme
	Legal and regulatory risk						
12	Criminal case against GHS provider for negligence	Lack of supervision and lack of skills	Decrease patient safety, disabilities or death, loss of trust	Unlikely	Significant	Medium	• Adherence to standards • Professional development • Adequate Staffing and Resources • Implementation of Key performance indicators
	Environmental risks						
13	Increase of Healthcare medical Waste	Lack of waste collecting facilities, lack of training to general	Increase of infections	Possible	Significant	Medium	• Create more facilities • Educate the patients and the healthcare providers

		population regarding healthcare waste and their harm					
	Demographic risks						
14	Increased demand for healthcare services	Aging population	Increased healthcare costs, decreased access, and lower quality of care	Possible	Minor	Medium	• create more facilities • educate the general population for healthy lifestyle

5.3 STATISTICAL ANALYSIS OF SURVEY RESULTS

The literature offers a valuable framework for comprehending the multitude of factors that influence the public healthcare sector, while survey results furnish empirical evidence to corroborate or challenge these factors within a specific context.

The findings and statistical analyses of the survey results contribute valuable insights into the tendencies, patterns, and preferences of the targeted audience. Consequently, this section presents a comprehensive analysis of the survey data.

*The results from the survey for the questions regarding the:

1. Main challenges in the implementation of a national health care system,
2. Main risk factors that may affect the implementation of a national health care system,
3. Policies that the government should implement to ensure that the national health care system is successful, and
4. Factors that are necessary for a national health care system to be successful in improving the overall health outcomes of the population were categorised as per my understanding of the response received. These questions didn't have predefined answers thus responders gave more than one response.

The survey was conducted in April 2023 with a sample of 71 people, randomly selected. The survey was conducted through electronic form, face-to-face meetings, and phone calls. From the one hand the Response rate among people that responded through the phone call, or the face-to-face meetings was 100% and on the other hand the response rate among people that responded through the electronic questionnaire was approximately 40% from the initial distribution. Some of the responders although forwarded the survey further thus response rate can't be determined with accuracy.

The results of the survey are presented as below.

The ages were categorized in five categories and the higher response rate was among ages 31-50.

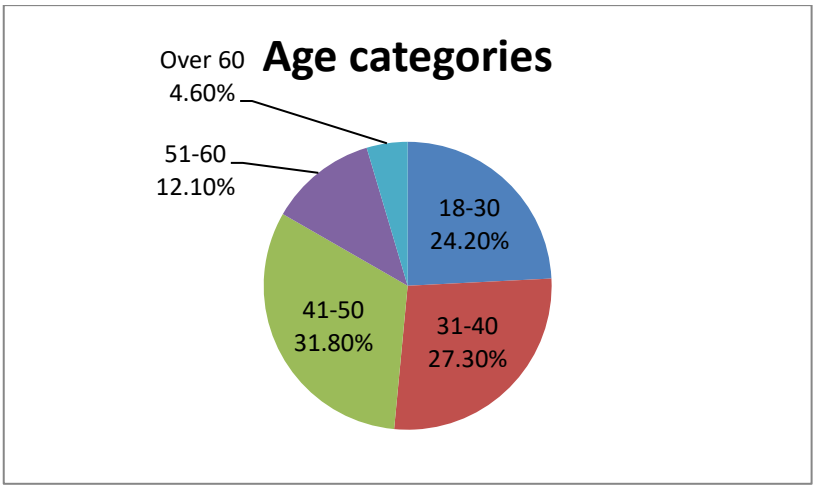


Fig. 8

The responses were received almost equally from males and females as per Figure 9.

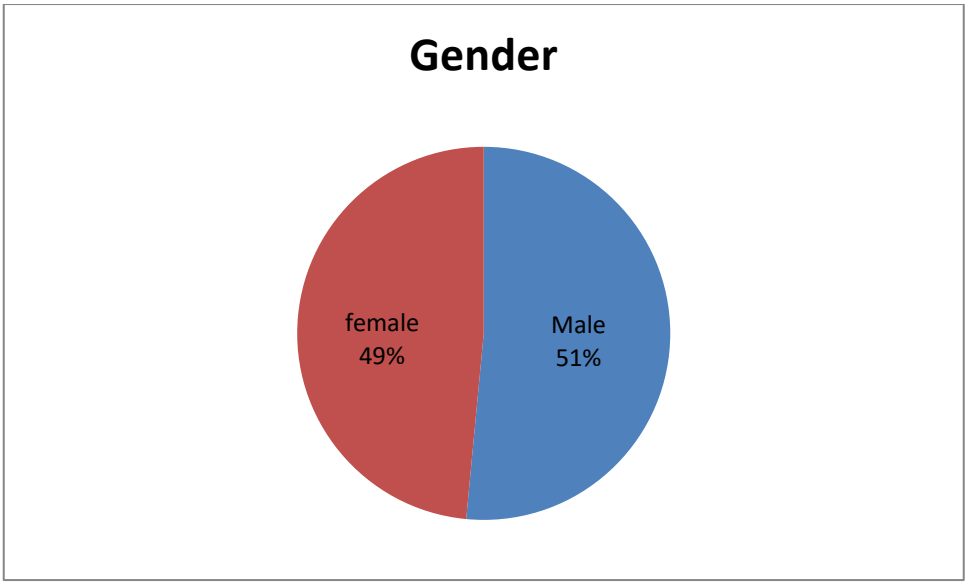


Fig. 9

Among the responders there were Health care Providers and General population as shown on Figure 10.

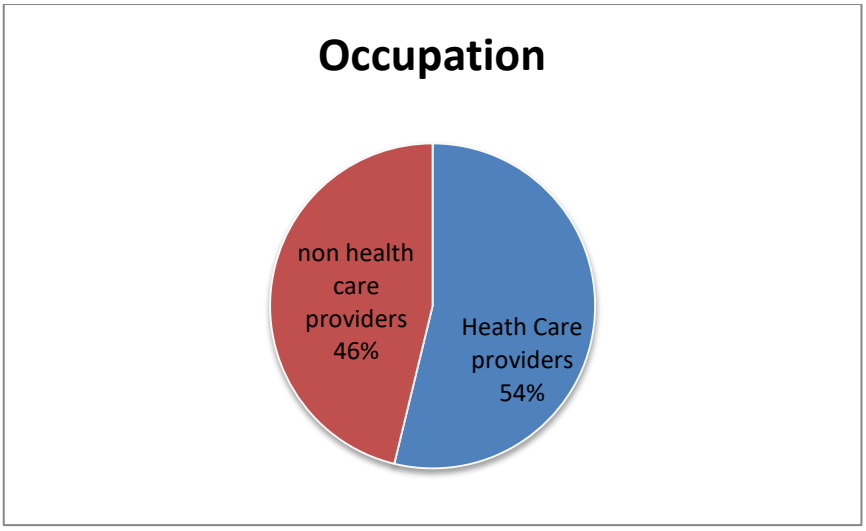


Fig. 10

The Positions of respondents in Health sector were categorized as follows having majority to be equally doctors and pharmacists.

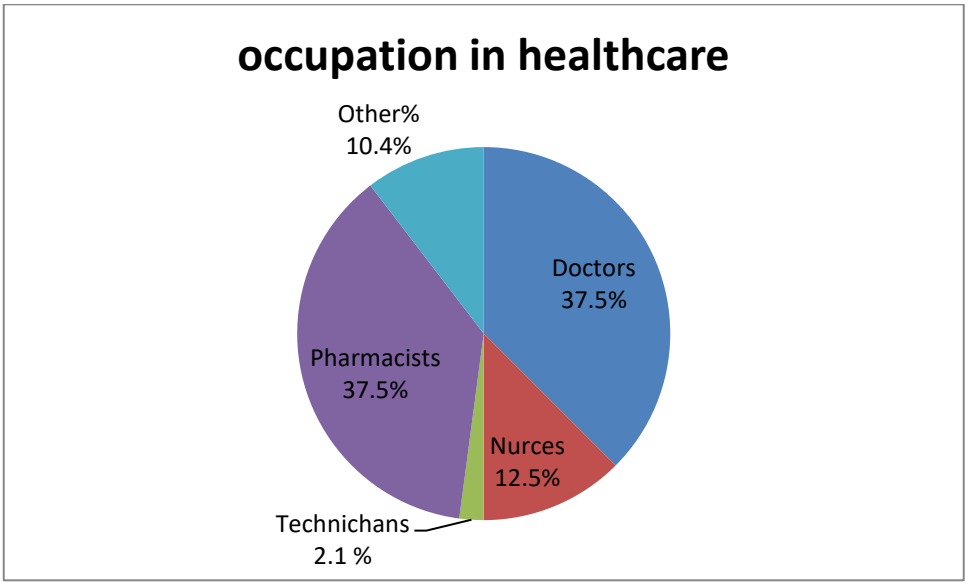


Fig. 11

And Healthcare professionals' work environments were as shown on Figure 12 Public Hospital, Private Hospital, Pharmacy, Individual Practice and Ministry of health.

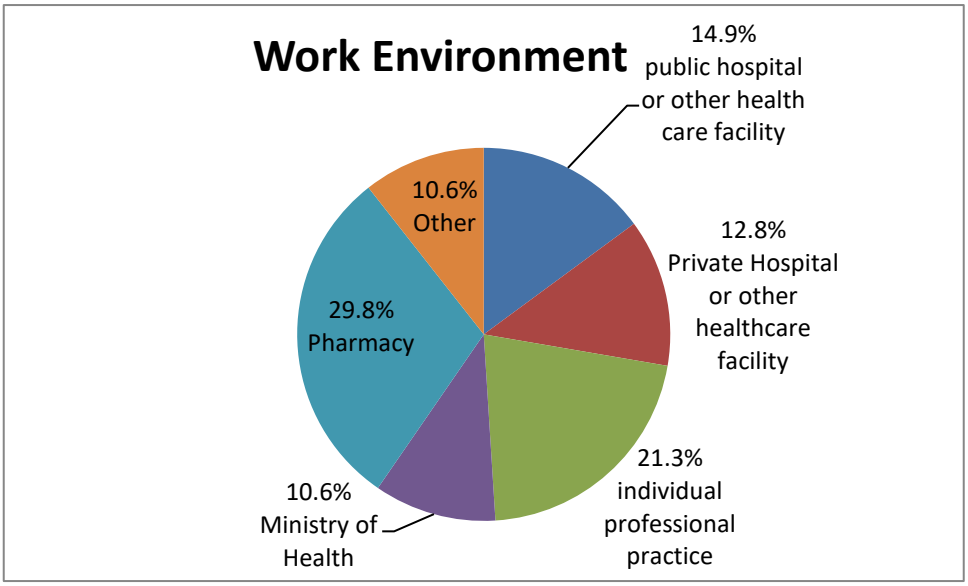


Fig. 12

The Majority of the responders and specifically 89.4% believe that they are familiar with the concept of the national healthcare system and Based on their opinion the main goals of a national health care system were classified as follows:

1. 89.4% improving the health of population

2. 69.7% improving the responsiveness of the health system to the population it serves

3. 66.7% Fairness in financial contribution

4. 4.5% Other

The Majority of the responders 81.8% have used the services of GHS and the overall satisfaction was rated as follows.

A. Appointments (1-10)

Overall satisfaction was 6/10

B. Staff (1-10)

Overall satisfaction was 6.3/10

C. Responsiveness (1-10)

Overall satisfaction was 6.3/10

D. Medical services (1-10)

Overall satisfaction was 6.2/10

Based on the responder's opinion the main challenges in the implementation of a national health care system were Access and equity, Human and other resources, facilities, Quality, Human Factor, Perception, Demographics, and Political changes and instability.

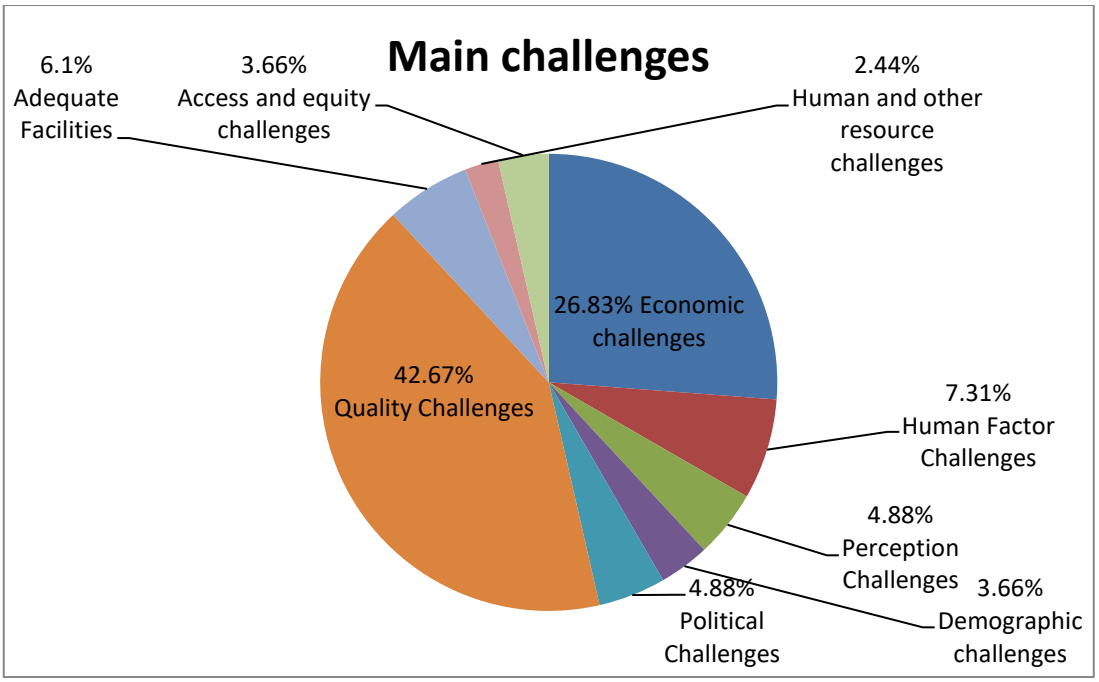


Fig. 13

The major of the responders believe that Quality is the major Challenge followed by the economic challenges.

The Main risk factors identified by the responders that may affect the implementation of a national health care system were as per Figure below.

From the one hand among individual practitioners the main risk Factor was Politics, and on the other hand among responders from ministry of health was the budget.

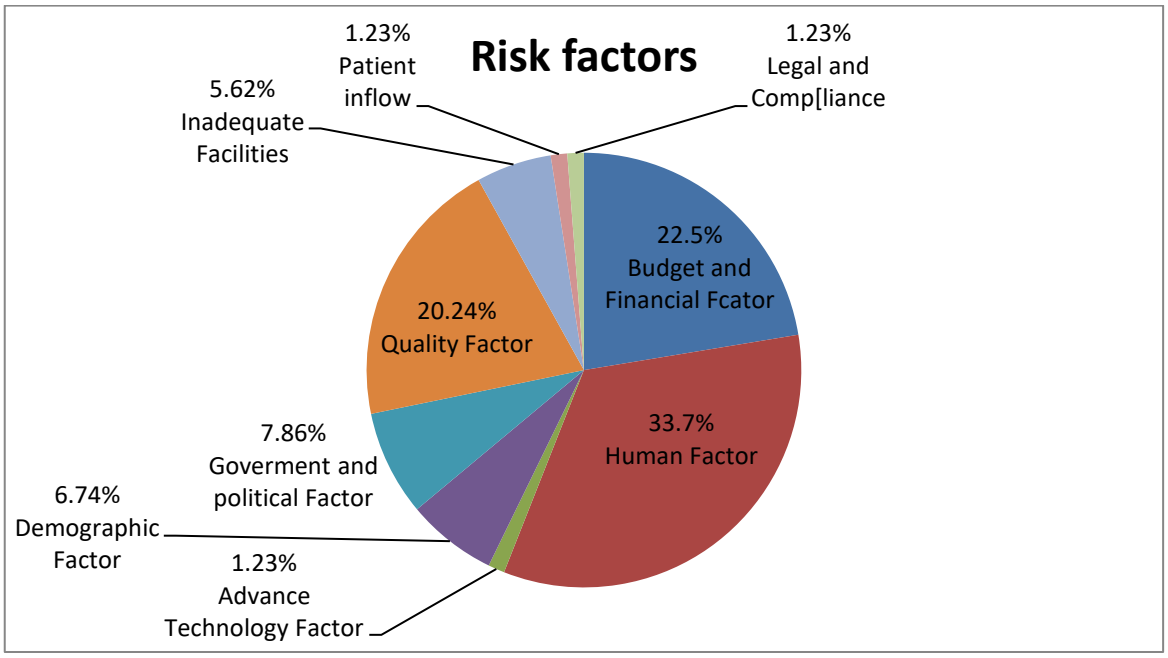


Fig. 14

In question if the responders faced such factors, 39.4% had a positive response while 60.6% has a negative response and the overall satisfaction on how the event was managed was 5.08/10

In question if the government should have a role in the provision of healthcare services

1.5% responded Exclusive.

28.8% As a main but not the exclusive provider

60.6% As a provider along with private providers

9.1% Not at all, should only regulate the system.

Among the responders 74.2% consider necessary the participation of private providers of Health Care services in equal terms as government providers.

In the question regarding Policy implementation the majority of the responders considered the Financial Controls to be the most important with 72.46%. It was more expected in this category to receive more answers related to anticorruption policies due to the identification of the Human Factor as a major Risk.

The percentages are as follows:

4.35 % Transparency and Anti-Corruption

72.46 % Financial Controls

17.39 % Quality Measures KPIs and Quality Assurance

4.35 % Training Plan

1.45 % Public health Statistics

89.4% of the responders believe that the GHS will improve the overall healthcare outcomes of the population and finally, the main identified factors necessary for a national health care system to be successful in improving the overall health outcomes of the population were the

13.1 % Sufficient Budget-Financial Support

10.71 % High Quality of Services

17.86 % Access and Equity

19.05 % Communication and Alignment

19.05 % Effective Resource Management

1.19 % Responsibility and Accountability

1.19 % Adaptability and Change ability

7.14 % Quality Measures, Continues Improvement and Key Performance Indicators

2.38 % Pro-activeness, Innovation, Strategic focus

1.19 % Proper legislation

5.4 FINDINGS OF SURVEY

Based on the findings provided, the main risk factors that may affect the implementation of a national health care system are:

1. Budget-Financial Factor: This was the highest-rated risk factor, with 22.47% of respondents identifying it as a concern. Implementing a national health care system requires significant financial resources, and funding may be a challenge.
2. Human Factor: This was the second-highest rated risk factor, with 33.7% of respondents identifying it as a concern. This category includes corruption, bribery, and system abuse by patients and healthcare providers. The main response in this category was relevant to corruption.
3. Advanced Technology Factor: This was low-rated factor, with only 1.23% of respondents identifying it as a concern. However, the use of advanced technology is one of the most catastrophic factors that are mentioned in bibliography. The Factor Advance technology in this question was underestimated by the responders. There were no engineers, information and technology specialists and cyber security specialists among responders, thus I believe there is lack of knowledge to assess the impact of such incidences.

4. Demographic Factor: This was voted with 6.74% of respondents identifying it as a concern. Demographic changes such as population growth, aging, and changing health needs may require significant adjustments to the national health care system.
5. Government and Political Factor: This was rated with 7.86%. Only 7.86% of respondents identified it as a concern. The success of a national health care system may depend on government support, and political changes in government or political instability may affect the system.
6. Quality Factor: This was high rated factor, with 20.24% of respondents identifying it as a concern. Ensuring high-quality health care services is essential for the success of a national health care system, and maintaining quality may be a challenge.
7. Inadequate Facilities: This was rated with 5.62%. Only 5.62% of respondents identified it as a concern. Adequate facilities and infrastructure are necessary for the delivery of health care services, and a lack of facilities may hinder the implementation of a national health care system.

8. Patient Inflow: This was rated as a low-risk factor, with only 1.23% of respondents identifying it as a concern. However, an increase in patient demand for health care services may put strain on the system and require additional resources.
9. Legal and Compliance: This was rated as a low-risk factor, with only 1.23% of respondents identifying it as a concern. However, complying with legal and regulatory requirements is essential for the success of a national health care system.

CHAPTER 6

6.1 CONCLUSIONS

The implementation of the General Healthcare System (GHS) in Cyprus has brought about significant changes in the healthcare system, including improved risk identification and management. The adoption of a risk-based approach is crucial for enhancing patient safety and elevating the quality of care. Several measures have been implemented to address potential risks.

An in-depth analysis of various factors and their impact on the implementation process, along with survey results, has revealed key findings. Government and political factors exert a substantial influence on the healthcare system in Cyprus. The approval of the government's budget by the parliament plays a critical role in allocating funds to the healthcare sector and ensuring the smooth operation of healthcare organizations. However, certain scenarios can pose risks, such as insufficient funding leading to shortages of medical supplies, equipment, and staff, resulting in a decline in the quality of care provided.

Advanced technology presents both opportunities and risks. Technologies like blockchain, robotic process automation, machine learning, and artificial intelligence hold promise in enhancing patient care and the revenue cycle. However, the healthcare sector must be prepared for their adoption and understand the potential risks involved. One significant risk is the threat of cyberattacks. As technology-enabled care and communication with patients increase, ensuring cybersecurity becomes a top concern. Healthcare organizations need to

invest in personnel and technology to effectively detect and respond to security threats. The recent cyber-attack on GHS serves as a reminder of the importance of cybersecurity and the need for ongoing training and education for employees. While data sharing and interoperability have benefits, they also raise concerns about patient privacy and data exposure. Healthcare executives should carefully evaluate the risks and benefits of granting technology companies access to sensitive patient data and ensure appropriate security and privacy measures are in place. Without a unified system in place, healthcare organizations may face challenges such as fragmented patient records, delayed diagnoses, inefficient workflows, limited access to critical information, and compliance and legal risks. Real-life scenarios in Cyprus have highlighted the impact of inadequate digital infrastructure and limited data sharing on patient care. Additionally, inefficient or ineffective business continuity and disaster recovery plans pose risks to patient safety, increased downtime, data breaches, wasted resources, and non-compliance. It is crucial for healthcare organizations to have comprehensive plans in place to ensure the continuity of essential healthcare services during and after unexpected events or disruptions.

Budget and financial risks in the healthcare sector in Cyprus have implications for the overall functioning and quality of care. The absence of a regulatory authority responsible for capital investment regulation creates challenges in planning and equitably distributing funds. Relying solely on population size as a criterion for investment allocation, coupled with political pressures, can lead to resource distribution inequities. The risk of inadequate budget allocation and inflexibility to adapt to new situations poses significant challenges. Increased patient demand during epidemics or pandemics can strain healthcare systems and result in longer wait times, increased workload, and potential staff shortages. Inefficient resource utilization, including overuse of medical tests and procedures, unnecessary hospitalizations, administrative waste, lack of coordination between healthcare providers, and ineffective use of technology, can lead to wasted resources, increased costs, and decreased quality of care. Regular audits, effective compliance programs, and adherence to government regulations can help address these risks.

Corruption and bribery risks in the healthcare sector can have severe consequences, including reduced access to healthcare, lower quality of care, misuse of public funds, and loss of public trust. Cyprus has been identified as a country with high levels of perceived corruption in healthcare. The risk of a lack of alignment between physicians/providers and the government can result in inefficiencies, decreased quality of care, and reduced job satisfaction. Collaborative efforts, effective communication, and clear goals and priorities are essential to address this risk. The shortage of doctors in the public healthcare system and the government's response to the COVID-19 pandemic in Cyprus have highlighted the need for better alignment and collaboration between healthcare providers and government officials. The lack of emergency preparedness in healthcare systems poses significant risks, as evidenced during the COVID-19 pandemic. Adequate planning, increased testing and treatment capacity, telehealth services, and access to personal protective equipment are crucial for effectively responding to emergencies. The initial unpreparedness in Cyprus emphasized the need for better emergency response capabilities and coordination.

The survey results are mostly in line with the available local literature that was analysed with real scenarios within the previous section. The main Risk Factor for age category 18-30 was quality. For categories 31-40 and 41-50 were corruption (human factor) and quality and finally in age category over 60 the only risk factor was politics.

Through the survey data, we were able to confirm the literature's findings regarding Risk factors such as Political, Financial, Technology, Human, Demographics, Quality, and technology. The alignment between the survey results and the literature strengthens our understanding of the risks associated with the public healthcare sector and emphasizes the need for targeted interventions to mitigate or prevent these risks. Overall, the survey results provide a valuable empirical perspective that complements the theoretical framework provided by the literature.

Patient safety should always be the top priority for the National Healthcare system. Given the significant impact of factors affecting patient safety, it is crucial for regulators, authorities, and healthcare providers to continually monitor and assess potential risk factors. This

proactive approach aims to minimize the likelihood of adverse events and ensure that patients receive safe and effective care. Measures such as regular training and education for healthcare staff, leveraging technology to improve communication and reduce errors, and prioritizing quality improvement initiatives to address areas of concern are vital. By adopting this proactive approach in identifying and managing risk factors, healthcare providers can foster a culture of safety and deliver the highest possible standard of care to their patients.

6.2 SIGNIFICANCE OF THE RESULTS

In Cyprus generally the decisions are taken based on budget and not based on risk and long term efficiency. A lack of risk-based approach in decision-making can have significant negative consequences. Without considering potential risks and their potential impact, decisions may be made without adequate preparation or planning, leading to increased likelihood of failure or harm. This can be particularly problematic in fields such as healthcare, finance, and environmental policy, where decisions can have far-reaching and long-lasting effects.

By contrast, taking a risk-based approach involves systematically identifying potential risks, assessing their likelihood and potential impact, and developing appropriate strategies to mitigate or manage them. This approach can help decision-makers to make more informed choices and reduce the likelihood of negative outcomes.

In general, a lack of risk-based approach in decision-making can be attributed to a variety of factors, including lack of information, or understanding of potential risks, biases or assumptions, and pressure to make decisions quickly or without adequate consultation. To address these issues, it is important to prioritize risk management and implement processes and procedures that support a risk-based approach, such as data collection and analysis, stakeholder engagement, and ongoing monitoring and evaluation.

The results of this study highlight the importance of adopting a risk-based approach in procedures within public health care system. Due to the fact that the healthcare system in Cyprus is recently implemented, I believe there is space for improvement by adopting risk based approach and by implementing Key performance indicators so we will move from quantitative era to qualitative era.

6.3 LIMITATIONS

A limitation in this essay is the availability and reliability of data. Access to accurate and comprehensive data on healthcare outcomes and risk factors in Cyprus following the GHS implementation is limited, which could impact the accuracy of the study findings.

Another limitation is the complexity of measuring the impact of risk factors in a multifactorial system such as a national healthcare system. National healthcare systems are complex, multifaceted systems that involve many different stakeholders, including healthcare providers, patients, policymakers, and administrators. The impact of risk factors is not linear or straightforward and could be influenced by a range of factors that are difficult to quantify or measure. Also, some of the references are no longer available and as a result the reliability of this paper can't be verified completely.

Appendix 1

SURVEY QUESTIONNAIRE

Section 1: Participant Information

1. **Age:**

- 18-30
- 31-40
- 41-50
- 51-60
- Over 60

2. **Gender:**

- Male
- Female
- Other

3. **Occupation:**

Are you a health care provider? (Yes / No)

If yes what is your position

- Doctor
- Nurse
- Technician
- Pharmacist
- Other

AND

What is your work environment?

- Public hospital or other health care facility
- Private hospital or other health care facility
- Individual professional practice
- Ministry Of health
- Pharmacy
- Other

If no, what is your occupation?

…….

4. **Educational level:**

- Primary/Secondary school
- High school
- Bachelor's degree
- Master's degree
- PHD

Section 2: Risk Factors in the Implementation of National Health Care System

1. **Are you familiar with the concept of national health care system? (Yes / No)**

If Yes for how long (in months)

2. **In your opinion, what are the main goals of a national health care system? (**Choose all appropriate)

- Improving the health of population
- Improving the responsiveness of the health system to the population it serves
- Fairness in financial contribution
- Other

3. **Have you been engaged with the services provided by the national health care system? (Yes / No)**

If Yes for how long (in months)

If yes, please rate your overall satisfaction with the services provided by the national health care system on a scale of 1 to 10 (1 being very unsatisfied and 10 being very satisfied) in respect of:

E. Appointments (1-10) (*please consider the below but do not rate each one of the bullet points-provide only one evaluation for each category)

……

- Ease of making appointments by phone
- Appointment available within a reasonable amount of time
- Getting care for illness/injury as soon as you wanted it
- Getting after-hours care when you needed it
- The efficiency of the admission process
- Waiting time in the reception area
- Ease of getting a referral when you needed one

F. Staff (1-10)

……

- The courtesy of the person who took your call
- The caring concern of the nurses/medical assistants
- The helpfulness of the people who assisted with billing or insurance
- The professionalism of lab or x-ray staff

G. Responsiveness (1-10)

……

- Your phone calls answered promptly
- You received advice or help when needed during office hours
- Your test results reported in a reasonable amount of time
- You manage to contact your doctor after hours
- You manage to obtain prescription refills by phone
- You manage to obtain referrals to special doctors easily when is needed

H. Medical services (1-10)

……

- Willingness to listen carefully to you
- Taking time to answer your questions

- Amount of time spent with you
- Explaining things in a way you could understand
- Instructions regarding medication/follow-up care
- The thoroughness of the examination
- Advice given to you on ways to stay healthy
- Medical outcome

4. **In your opinion, what are the main challenges in the implementation of a national health care system?**

   1.....

   2.....

   3…….

   4…….

   5……

5. **What do you think are the main risk factors that may affect the implementation of a national health care system?**

   1.....

   2.....

   3…….

   4…….

   5……

6. **Have you ever experienced any of these risk factors in the implementation of a national health care system? (Yes / No)**

If yes, please describe your experience and how those risks were managed.

……
……

……
……

……
……

How satisfied are you with the way it was managed (1-10)

……..

Section 3: Health Care Policy and System

1. **Do you think that the government should have a role in the provision of healthcare services? (Yes / No)**

   If Yes, then choose one of the below

   A. Exclusive
   B. As a main but not the exclusive provider
   C. As a provider along with private providers
   D. Not at all, should only regulate the system

2. **Do you consider necessary the participation of private providers of Health Care services in equal terms as government providers? (Yes / No)**

3. **In your opinion, what policies should the government implement to ensure that the national health care system is successful?**

   1.....

   2.....

   3…….

   4…….

   5……

4. **Do you think that the implementation of a national health care system will improve the overall health outcomes of the population? (Yes / No)**

5. **In your opinion, what factors are necessary for a national health care system to be successful in improving the overall health outcomes of the population?**

1.....

2.....

3…….

4…….

5……

Section 4: Personal Information

1. **Do you have any chronic illnesses or conditions that require regular medical attention? (Yes / No)**

If yes, do you think that the implementation of a national health care system would improve your access to healthcare services? (Yes / No)

2. **Are you willing to pay additional taxes to support the implementation of a national health care system? (Yes / No)**

Thank you for your participation in this survey.

GLOSSARY

GHS-General Health-care System

RI- Risk Identification

QRA- Quantitative Risk Analysis

MoH- Ministry of Health

SHSO- the State Health Services Organisation

HIO-Health Insurance Organization

IoT-Internet of Things

IT- Information and Technology

EU- European Union

SWOT –Strengths, Weaknesses, Opportunities and threads

NHS-National Health System

NHCS- National Health-care System

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