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ANALYSE THE ACTUAL CENTRALISED REMOTE MEDICATION REVIEW SERVICE OF LUSÍADAS SAÚDE

Lusíadas Saúde's Centralised Remote Medication Review Service: Contextualising the Market

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Abstract

This thesis evaluates the viability of scaling and externalising Grupo Lusíadas Saúde''s Remote Medication Review Service. To achieve this objective, the paper is organised into two primary sections. The initial component comprises of multiple analyses of Lusíadas' current market context and internal operations. The second section includes a feasibility study, a business plan and guidelines for service set-up and optimisation.

Significant findings indicate that Lusíadas is well-positioned and equipped to provide this service, which has the potential to significantly improve patient safety and institutional efficiency.

Keywords: Healthcare, Hospitals, Management, Medical Services

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1. Introduction

Medication errors are a global issue and one of the leading causes of patient harm in healthcare services. As a response to the urgency of this problem, in 2017, the World Health Organisation (WHO) introduced a global initiative with the goal of decreasing medication errors by 50% within five years (World Health Organization 2017).

Additionally, organisations such as the Joint Commission International, a quality certifying body, also play a crucial role in improving standards by requiring a thorough and complete medication review process in order to accredit healthcare institutions. To safeguard the quality and safety of the service provided, it is advised the permanence of at least one specialised pharmacist per 60 hospital beds (Infarmed 2005), a figure which most are far from achieving. Scepticism over the benefits earned in comparison to the substantial additional costs incurred has led to healthcare providers sacrificing such a crucial standard.

Grupo Lusíadas Saúde, a leader in the Portuguese health sector, has taken significant steps in addressing medication errors. In addition to the traditional working hours of the in-house pharmacy team, it has developed a remote medication review service (RMRS) to handle the group's prescriptions from 17:00 to 21:00. This extension of the medication evaluation process has already shown significant benefits, most notably an increase in the percentage of prescriptions reviewed, and consequently an improvement in the safety of the care provided. This RMRS not only complies with accreditation standards, but most importantly, it enhances the quality and equity of the care across all units. Lusíadas' RMRS shows scalability potential to offer 24/7 medication review coverage, as well as the possibility of externalisation, ensuring the timely and complete validation of prescriptions.

This project consists in the creation of a comprehensive business approach to the externalisation of the remote medication review service offered by Lusíadas Saúde. To do so, it will explore key areas such as market demand to identify potential clients and determine the prospective

financial profitability, as well as consider the technological and compliance requirements in order to establish operational protocols and workflows. This RMRS has the potential to be offered as a solution to healthcare organisations to improve therapeutic care and reduce not only medication errors, but also financial costs.

The healthcare industry has been greatly impacted by the exponential technological advancements made in recent years, allowing for the implementation of practices such as telemedicine. The use of digital health systems has started to become a differentiating point for institutions, contributing to the optimization of resources, and most importantly improving patient safety and care.

This thesis is driven by a desire to contribute to the Portuguese healthcare industry by supporting the development of Lusíadas' Remote Medication Review Service (RMRS). The development and establishment of this initiative will expand the accessibility of digital health services in Portugal, therefore reducing medication errors and improving patient care and safety.

The primary objective of this project is to assess the feasibility of the scalability and externalization of Lusíadas' remote therapy service, while addressing the potential challenges associated with the implementation of this service and providing valuable suggestions and insights.

By the end of this project, an assessment of areas for improvement will be provided, along with recommendations and the identification of potential clients and financial projections for the service, which will allow for an evaluation of the financial viability of Lusíadas' RMRS.

An initial business plan will outline a potential implementation and marketing strategy for the service, while ensuring the engagement of essential stakeholders, including healthcare providers and potential investors.

2. Literature Review

2.1. Medication Errors

Medical errors are the third most common cause of death in the United States in healthcare, with medication errors being one of the leading causes that contribute to these numbers (World Health Organization 2023). The World Health Organization reported that in the United States it's estimated that between 7000 and 9000 people die each year due to a medication error and over a million (around 1.3 million) experience harm from such errors, with between 50% to 70.2% of such harm being preventable (World Health Organization 2023) (World Health Organization 2022).

These medication errors occur in between 2 and 14% of all admitted patients (Williams 2007) and most medication errors (around 80%) occur in the first stage – prescription (Sin et al. 2015). Additionally, the greatest incidences of preventable medication-related harm occur in geriatric care units (17%) (World Health Organization 2023).

A medication error refers to any failure in the treatment process that leads to, or may lead to, patient harm (Ferner and Aronson 2006)**.** In turn, medication-related harm is characterised as the damage caused by unsafe practices or as the result of an error or problem, and is considered preventable when it results from a recognizable and modifiable cause and can be prevented from occurring in the future (World Health Organization 2023).

There are several factors that influence the occurrence and frequency of medication errors, including the healthcare professional's knowledge and training, the workload and work environment, as well as lack of accurate patient information (Williams 2007)**.**

<u>These errors can occur during any stage of the medication process:</u>

1) **Prescription Errors** include missing information, prescribing the wrong medication or dosage, and overlooking allergies or drug interactions. A UK study found that 1-5% of

prescriptions had a prescribing error (Williams 2007) and, according to the WHO, 53% of preventable medication-related harm occurs at this stage (World Health Organization 2023).

2) **Transcription Errors** result from miscommunication in spoken or written instructions, leading to issues such as the administration of the wrong medication (Cohen 2007, 212). However, since the adoption of the computerised physician order entry, in which medical professionals communicate medication prescriptions via a computer program, these errors have decreased (Cohen 2007, 214).
3) **Dispensing and Delivery Errors** occur when, for example, pharmacist provide the incorrect medication and dosage, or even when there is a mislabelling in the medication dispensed by the pharmacy (Cohen 2007, 205).

   These errors have the least prevalence amongst medication errors, at 4.24% (World Health Organization 2023).
4) **Administration Errors** include the administration of medications that do not correspond to the prescription, as well as the administration of expired medication, or the complete lack of administration (Williams 2007).

   They account for 22% of medication-related harm (World Health Organization 2023).
5) **Monitoring and Reporting Errors** result from the providers' failure to monitor a patient's reaction to the prescription or to report an adverse reaction in appropriate timing, hurting its resolution (Montesi and Lechi 2009). These errors are the second most common cause of medication-related harm, with a prevalence of 36.43% (World Health Organization 2023).

2.2. Understanding the Economics of Medication-Related Errors

Medication-related errors also have a high cost associated – globally, it's evaluated to be at around 38 Billion Euros (42 billion US dollars) per year. This accounts for almost 1% of the overall health-related expenses (World Health Organization 2023).

Additionally, it's estimated that medication-related harm considered to be preventable cost England's NHS over 98 Million Pounds annually (World Health Organization 2023).

These costs account for direct medical expenses, for example, treatments, critical interventions, and extended care required to address the complications caused by those errors. Furthermore, they also include indirect costs, such as possible legal fees and medication waste (World Health Organization 2023) (National Health Service 2020).

Preventing medication errors entails addressing problems in all stages in the medication process. By improving safety measures in place, involving pharmacists and taking advantage of new technologies, healthcare providers can identify and prevent these mistakes, leading to cost reductions but, most importantly, ensuring patient safety.

2.3. Medication Order Review

Medication Order Review is a fundamental aspect of pharmacist patient care. All health-system pharmacies have an obligation to provide a review of prescription orders, ensuring safe medication use. This process is essential in minimizing medication-related problems and optimizing therapeutic outcomes (Australian Commission on Safety and Quality in Health Care 2017).

Medication review is defined as a methodical evaluation of a patient's drug management aimed at optimizing the quality use of medicine and minimizing medication-related problems. It is a multidisciplinary responsibility that ensures the ongoing safe and effective use of treatments throughout every stage of the medication management process (Australian Commission on Safety and Quality in Health Care 2017). Medication order reviews play a crucial role in primary care by helping to prevent adverse reactions from medications, improving patients' medical condition and reducing the usage of medicines. This process not only improves patient outcomes in general, but also promotes cost effectiveness (Sheperd 2018).

2.3.1. Evolution of Medication Review Services

In the early 1990s, national and international health departments developed initial guidelines and frameworks to implement medication reviews in primary care (World Health Organization 2011). These initiatives reinforced the responsibility of pharmacists in medication therapy management. The first countries to formally integrate medication review into primary care were Australia (2001), the United States (2003) and the United Kingdom (2005) (Chen 2016) (Bulajeva et al. 2014). Considering recent events, the COVID-19 pandemic has highlighted pharmacists' proficiency and crucial role in identifying and addressing medication-related problems while ensuring the safe and effective medication use (Kieck, Mahalick, and Vo 2023).

2.3.2. Remote Medication Review Service

When onsite pharmacist review is not available, health systems may adopt Remote Medication Review Service (RMRS) as a suitable alternative. RMRS enables pharmacists to provide pharmaceutical care to patients at a distance, improving access to care and optimizing medication use. According to the American Society of Health-System Pharmacists (2010), procedures for RMRS should ensure quality assurance, safety, ensure access to information, training, technical standards, confidentiality, regulatory compliance, and effective communication. Managing medication use and safety in the RMRS environment requires coordinated quality and safety practices between client and remote sites. Given the rapid evolution of RMRS technologies, continued evolution should be encouraged.

2.3.3. Responsibilities of the Pharmacist and Key Requirements

Pharmacists are essential members of the multidisciplinary healthcare team, responsible for reviewing prescriptions for clarity, validity, and appropriateness (Clinical Excellence Commission 2019). Through training and orientation, pharmacists must be competent to review and enter medication orders into a computerised database to maintain a complete and accurate patient profile. This includes accessing medication history and reconciliation reports, diagnosis,

allergies and prior adverse drug reactions, height, weight, age, sex, pregnancy status for women of childbearing potential, duplications of drug therapies, potential medication interactions, pertinent laboratory data, and other necessary information (American Society of Health-System Pharmacists 2010).

As it is essential for the prescriber, pharmacist, and nurse to communicate effectively to evaluate the patient's response to drug therapy and ensure the desired therapeutic outcomes are achieved, remote pharmacists must have a 24-hour contact number to communicate with the prescriber or the client site's nursing staff if needed (American Society of Health-System Pharmacists 2010). To maintain the confidentiality, privacy, and security of patient health care information, remote pharmacists are required to adhere to the client's confidentially policy and have a signed business associate agreement, along with specific access to the hospital's computer system.

2.3.4. Benefits and Challenges of the Remote Medication Review Service

One of the main advantages of the RMRS is the improvement of patient outcomes by increasing the number of prescriptions reviewed, reducing adverse drug events, improve medication adherence and decrease hospital readmissions. Additionally, operational efficiency is enhanced, as there is an optimization of resource utilization by allowing in-house professionals to focus on direct patient care, resulting in cost savings and improved service quality (Mekonnen, McLachlan, and Brien 2016). RMRS also enhances pharmacist satisfaction due to personal development opportunities and flexible remote work options (Almeman 2024). However, there are challenges to overcome, such as ensuring effective communication among healthcare providers, addressing resistance from medical professionals, and tackling technological barriers that might hinder the implementation and acceptance of RMRS (Bondi et al. 2021).

2.4. Hospital Pharmacy Workings Operational Review

Hospital pharmacies run already complicated systems and workflows, thus it is paramount that the RMRS is correctly and efficiently integrated into workflows. Bound by strict regulatory

protocols and internal procedures, pharmacists work in a very complex environment which requires maximum attention to detail and responsibility. Often understaffed and with excessive task assignment (Falconer, Barras, and Cottrell 2019), hospital pharmacies end up having to prioritise activities, leaving behind valuable tasks which ensure optimal service delivery.

The hospital pharmacists' are responsible for the most varied activities, from the selection, purchase and reception of drugs, the storage/preparation of incoming stock, quality control, preparation and distribution of drugs and prescriptions, all under strict procedural directives, registration/traceability norms plus safety and hygiene measures which must be practiced. Furthermore, hospital pharmacists are responsible for the management of pharmacy devices and reagents, management of clinical trial drugs and the creation and implementation of budgets, protocols and drug informative documentation (Infarmed 2005).

Notwithstanding, it must be considered that a hospital pharmacy is running its internal operations alongside general hospital operations, generating a complex system which must have the correct means for communication and operational tools if timely and comprehensive service is to be provided to the patient.

According to a study carried out between NOVA SBE and the Associação Portuguesa de Farmacêuticos Hospitalares (Gomes et al. 2021), there is an imperative need for a better allocation of human resources, giving increased importance and attention to patient therapeutic reconciliation and not just internal pharmacy logistical requirements. There must be an increased role of the pharmacist on the clinical care provided to the patient.

Given the complexity of hospital operations coupled with the increased need for a comprehensive clinical review, many point for the need to introduce prioritisation mechanisms, effectively ranking patients given level of risk, for a full in-depth medication review (Botelho, Pantuzza, and Reis 2024). There must be technics to filter those who would further benefit from the service. Not just having mechanisms for defining priorities but the need to further free up

human resources from administrative and simple routinary cases, the introduction of artificial intelligence tools can help alleviate operational pressures (González-Pérez, Delgado, and Sesmero 2024). Peréz further comments that in fast paced environments, like hospitals and its pharmacies, there is a need to reconcile AI advancements and learn how to integrate these tools to personalise care, reduce human error and predict outcomes, creating synergies between the power of human intervention and judgment with machine learning predictability capacities.

The ability to read massive datasets in seconds is ever more important where technology, constantly bringing medical advancements and a diversity of treatments, forces pharmacists to validate prescriptions for more complex and diverse cases where sometimes information and understanding is lower. Furthermore, remote systems brought an increasing need for the development of empathetic professionals who are able to, through a screen or phone, generate enough empathy for change and for information to be accepted and welcomed (Cordero-Cruz et al. 2024). Pharmaceutical responses need to be catered for an ever-changing social scenery where patients have changing habit and access to all types of (dis)information. Societal philosophies and needs change, professionals need to adapt how they respond and deliver the service.

After providing a brief literature contextualisation over medication errors, remote medication review services and the general operations and constraints of hospital pharmacies, there is space to further existing research, attempting at resolving some of the concerns raised in the literature, and providing optimisation solutions for this increasingly crowded sector.

3. Methodology

To approach this project, a methodology combining qualitative and quantitative findings was chosen. The project was initiated with a face-to-face kick-off meeting in September to align expectations and scope, involving the thesis advisor, Dr Filipa Breia Fonseca, and Dr Andreia Duarte, the project lead from Lusíadas Saúde. Subsequently, visits to Lusíadas Hospital were

conducted, where the pharmaceutical validation process was observed, and interviews were held with various stakeholders (Appendix 1) for data collection purposes. The main objective was to gain a detailed understanding of the existing processes flows and identify opportunities for improvement. Regular communication with stakeholders was maintained both in person and online via Microsoft Teams. In parallel, detailed research was carried out on market opportunities and challenges, along with an assessment of technological and operational risks, to position the proposed service within the current sector context.

The choice of qualitative data was driven by the need to capture the perceptions and nuances of stakeholders. Furthermore, within a European context, review services are not developed and operationalized yet, especially not to an extent where comparative quantitative data could be used for analysis. Within the short time frame of this project observational qualitative data proved the only feasible option. As for quantitative data, benchmarks based on the latest available statistics and historical data from Grupo Lusíadas were used.

The resulting proposal for service externalization focused on three main areas: marketing orientations, operational solutions, and financial analysis with an emphasis on cost structure. This integrated approach aimed not only to propose operational improvements to the validation process but also to ensure the services' alignment with the strategic objectives of the group and its financial sustainability in the long run.

4. Corporate Assessment and Contextual Overview of Lusíadas Saúde

4.1. Lusíadas Saúde

Lusíadas Saúde is a private healthcare group in Portugal, established in 1998, with an extensive network of 14 hospitals and clinics across the country. Now part of Vivalto Santé, it has grown to become a key player in the Portuguese healthcare sector and offers a wide range of medical services. The group's commitment to excellence, innovation and rigor is matched by its dedication to patient-centered care, ensuring patients feel they are in good hands. Its mission is

to continuously improve life quality, building trust as a partner. Innovation and continuous improvement are central to Lusíadas Saúde's operations, underpinned by significant investments in staff training and professional development, as well as active participation in partnerships and medical research. By combining advanced medical services with a passionate approach to care, Lusíadas Saúde continues to shape the future of Portuguese healthcare (Lusíadas Saúde n.d.).

4.2. The Healthcare Industry

To better understand the core of this project, it is important to contextualise the healthcare industry in Portugal.

4.2.1. Healthcare System Structure

Portugal's healthcare system is a combination of public and private sectors:

The Public sector (Serviço Nacional de Saúde – SNS), established in 1979, is the publicly funded healthcare system that provides health coverage for all Portuguese citizens and residents. It offers a wide range of medical services either free of charge or at a subsidised cost. The system consists of a network of hospitals, health centres, and specialised units and is the pillar of the country's healthcare provision, focusing on equity and accessibility.

Conversely, the Private sector consist of privately owned hospitals, clinics and healthcare facilities that operate independently (as Lusíadas Saúde). The private sector often complements the public system through Public-Private Partnerships (PPPs). Private entities are known for innovation, advanced technology adoption, and specialised services, catering to patients seeking alternative options to public healthcare.

4.2.2. Essential Statistics and Trends

In 2022, the National Institute of Statistics (Instituto Nacional de Estatística 2022) reported 243 hospitals in Portugal, 112 of which belonged to SNS. Despite the growth of the private sector, the National Health Service (SNS) continues to provide most of the healthcare in Portugal.

Although public hospitals lead in medical consultations, accounting for 62% of the total, private hospitals have been gaining ground, representing 38% of consultations - an increase of 6.2% compared to 2021.

Private hospitalisation is an increasingly important pillar of the Portuguese health system. The sector's turnover increased 53%: from 1486.3 million euros in 2014 to 2275 million euros in 2022 (Expresso 2024). There has been significant investment resulting in increased differentiation, characterised by greater territorial coverage, extending also to the interior regions of Portugal, as well as Madeira and the Azores. This growth is reflected in higher activity levels, a larger number of people served, an expanded workforce of health professionals, and the integration of state-of-the-art technological equipment. Furthermore, Portugal stands out among OECD countries for its high use of emergency services, with 63 emergency consultations per 100 people, which is double the European average of 27 consultations. In addition, the number of hospital beds in Portugal is 3.5 per 1,000 inhabitants, below the OECD average of 4.3 beds per thousand inhabitants. The bed occupancy rate is also one of the highest, at 78%, while the OECD average is 70% (Organisation for Economic Co-operation and Development 2023).

In 2022, medical consultations also reached a new high of approximately 21.9 million consultations - an increase of 3% compared to 2021. In emergency services, around 8 million consultations were carried out, of which 6.6 million took place in SNS hospitals (an increase of 20.1% on the previous year) and 1.5 million in private hospitals, the highest number since 1999 (Instituto Nacional de Estatística 2022).

4.2.3. Expenditure and Challenges in the Healthcare Sector

Over the last two decades, hospital spending in Portugal has increased consistently. Between 2000 and 2019, current hospital expenditure in relation to GDP showed a gradual upward trend, corresponding to an average annual growth of around 3% in real terms. This increase was

mainly driven by higher spending by private hospitals. In 2021, private hospital provision accounted for 24% of total hospital expenditure (Banco de Portugal 2022).

On average, over the last decade, hospitals in Portugal have accounted for around 42% of total current health expenditure, excluding residential long-term care facilities. A notable feature of the provision of private hospital services in Portugal is the significant funding from public administrations, with an average of 50% over the period 2012 to 2021. This collaborative funding model is exemplified by initiatives such as ADSE (Public sector workers covered by ADSE health insurance have access to medical services provided by private sector establishments) and Surgery vouchers (allow patients registered with the Integrated System for Managing Surgical Enrolments (SIGIC) to be referred to private institutions if the maximum waiting time for surgery is exceeded) (Banco de Portugal 2022).

Despite the continuous increase in the allocation of financial resources from public administrations to hospitals and medical services, a tangible improvement in efficiency remains necessary and some discontent is visible among the population. Critical aspects related to the functioning of hospitals in Portugal are often highlighted, such as long waiting lists for surgeries and other medical procedures, staff shortages and limited access to specialised emergency care. Such inefficiencies are also evidenced by the shortage of doctors in the public sector, as well as perceived deficiencies in budgeting and centralised control. Notably, there has been a reduction in the average efficiency of hospitals, especially since 2017 (Banco de Portugal 2022).

4.2.4. Economic and Demographic factors in Portugal

Portugal's population is aging. Over the past two decades, the median age has increased from 38.5 to 47 years and since 2019, the elderly population (65 years and over) has been growing by more than 2% per year, reaching over 2.5 million people, including more than 3,000 centenarians. With an elderly-to-youth ratio of 186 elderly people for every 100 young people,

Portugal is placed as the second highest in the EU and fourth in the world in terms of aging rate and proportion of elderly population (Pordata 2024).

Moreover, hospitalisations have increased significantly, rising by 11% in one year. For the SNS, this results in a cost of over 68 million euros (Associação Portuguesa de Administradores Hospitalares 2024). According to INE, private hospitals also experienced considerable growth, with a 27% increase in hospitalisations recently.

4.2.5. Leveraging RMRS to Optimize the Healthcare Service at Lusíadas Saúde

The key factors previously highlighted create an opportunity for Lusíadas Saúde to externalize the RMRS. This service improves patient safety by ensuring precise and timely medication reviews, which decreases the likelihood of adverse medication events, particularly common among elderly patients with more complex medication schedules. Hospitals can take advantage of this specialised pharmacological knowledge to reduce staffing costs, lower expenses, and potentially shorten hospitalisations. This service has potential to extend high-quality care standards throughout the healthcare system in Portugal, leading to overall cost savings.

5. Market Insights

This analysis explores the growing opportunity for Lusíadas to externalize its centralised remote medication review service to hospitals across Portugal. It evaluates internal and external factors, identifies market opportunities and challenges, and outlines strategic positioning to ensure the service's successful adoption and growth.

5.1. 5C's Analysis

To evaluate the feasibility of externalizing the RMRS, this analysis applies the 5C's framework. By employing this structured approach, this study explores its market potential, strategic positioning, and the environmental factors thar influence how the business operates.

5.1.1. Company

A detailed description of Lusíadas Saúde has already been conducted in Section 4.1.

5.1.2. Customers

The target customers for this service are hospitals and healthcare institutions in Portugal that manage patient hospitalisations. There is a critical need for cost reduction, as hospitals are pressured to minimise operational expenses, particularly in human resources and efficiency, while preventing medical errors and improving patient safety.

It is expected that public hospitals may present challenges or may even be unfeasible markets, at least during the initial years of the service's implementation, due to their larger scale, protocols, and distinct regulatory frameworks. Their strict policies and bureaucratic procedures, along with budget constraints and data security concerns, may further complicate the adoption of external services. Regarding major private hospital groups, such as CUF and Luz Saúde, they could pose difficulties as initial markets. These large-scale institutions have extensive resources and probably prefer to maintain full control over their clinical processes, being less inclined to adopt external solutions from direct competitors. However, they might be open to utilizing Lusíadas Saúde's service in the short term, on necessary occasions, without committing to a fixed long-term contract.

As a strategic starting point, it would be advisable to focus on smaller private clinics and hospitals since these institutions may not have the capacity to maintain a full-scale in-house pharmacy team and often operate with limited resources. Additionally, tight financial and human resources make it difficult to hire and retain a specialised team of qualified pharmacists dedicated to medication validation. Thus, there is a need to optimize operational workflows and improve patient safety without incurring additional costs, presenting a clear opportunity for Lusíadas's RMRS to add value. A list of potential initial clients is presented in Appendix 2.

5.1.3. Competitors

Despite being a pioneer in the Remote Medication Review Service (RMRS), Lusíadas Saúde may face competition in the future. Other major private hospital groups could potentially develop and offer similar RMRS solutions, utilizing their substantial resources and existing healthcare infrastructure. Additionally, firms like Farminveste, a Portuguese investment group focused on the healthcare and pharmaceutical market, and Philips Healthcare, a major player in the healthcare technology industry offering products and solutions for healthcare providers in Portugal, may also enter the market. These organizations may have the capacity to provide comparable services, either through their own initiatives or by partnering with other institutions, thereby potentially intensifying the competitive environment for Lusíadas Saúde.

5.1.4. Collaborators

Healthcare staff may include pharmaceutical service providers, either as external specialists for RMRS or existing Lusíadas Saúde employees, depending on their contracts. This arrangement offers flexibility, enabling Lusíadas Saúde to either integrate their current pharmacists into their operations or partner with external professionals, thereby optimizing resource efficiency and improving the overall quality of the service.

5.1.5. Context

To assess the projects' viability, it is necessary to frame the service within a context. By resorting to a crucial framework – the PESTEL Analysis – we can better map contextual ideas, opportunities, and areas where extra precautions should be taken.

a) <u>Political Environment:</u>

Political environment remains stable with little legislation being approved or altered which could hinder the project. Apart from administrative alterations to public hospital management and funding, the political climate is stable. Furthermore, years of insufficient investment in the public health sector has led to the expansion of the private sector, including in more remote

areas of the country, providing a greater pool of potential clients. Nonetheless, the massive disparities which still subside between the investment made in the interior and coastal regions is significant and can pose some challenges.

b) Economic environment:

Current inflationary trends, coupled with unattractive career progressions and low salaries for pharmacists, have led to many leaving the profession and aiming for relatively higher paying careers, which significantly reduces the pool of human resources available. On the other hand, low paying jobs at traditional hospital and community pharmacies act as an incentive for pharmacist to take on other functions and opt for service provision, motivated be the opportunity for multiple income sources. Lastly, it is expected that the number of hospitals and patients in Portugal continues to rise, influenced by public disinvestment, an ageing population, and a more health-conscious society.

c) Social environment:

Increased social concerns over the safety and quality of the care provided and prescriptions issued increase service attractiveness. Furthermore, an increasingly ageing population and the rapid rise in the number of chronic patients intensify the need for prescription validation. Rising urbanisation has also reduced access to healthcare resources and professionals in rural communities, where hiring a full-time pharmacist is becoming increasingly challenging. Lusíadas Saúde's RMRS facilitates the access to clinical pharmacy services in these areas, providing crucial support without the costs associated with employing a full-time pharmacist.

On the supply side, since the COVID-19 pandemic, people are placing greater importance on their work life balance, craving a shift to remote working. This trend will increase the attractiveness of the service when it comes to recruiting the best professionals.

However, known tensions between doctors and pharmacists, combined with the fact that when validations are done via a remote external service, trust levels can be further affected,

potentially decreasing the effectiveness of interventions. There is inherent scepticism over the competency of those unknown to us.

d) Technological environment:

The rapid development of AI models, powerful tool to increase service delivery and satisfaction, will aid in streamlining the validation process, providing additional support to professionals, and helping with the prioritisation of patients. Furthermore, advancements in technology will allow the standardisation and integration of platforms and interfaces which will further optimize the service and decrease technological barriers posed by diverse information systems.

Currently, an externalised remote validation system with fast paced technological changes happening successively, will require continuous training for professionals and constant adaptations to the service delivery method. This will probably require ongoing technical support, which could be operationally costly.

Additionally, the growing prevalence cyber security threats and increased sophistication of attacks, exponentially increase risks, especially in scenarios involving direct exchanges of information, as opposed to remote platform access.

e) Environmental environment:

Corporate governance directives are increasingly pointing for the protection of scarce resources and reduction of waste. A correct validation minimises misuse of medication, resulting in decreased waste and more efficient treatments, eventually using less resources.

Conversely, e-waste concerns have been calling the attention of legislators (Onyango 2021), which can lead to higher costs and additional regulatory burdens for institutions that depend heavily on technology.

f) Legal Environment:

Most medical institutions have clear established processes and procedures in place, which can be effectively implemented and understood. Furthermore, hospitals have the incentive to validate all prescriptions aiming at complying with international certifying body standards. There are also clear institutional guidelines from Infarmed on pharmaceutical best practices and drug administration, which act as an incentive for compliance.

On the other hand, there are grey lines when it comes to shared responsibilities in cases where medication errors occur. Moreover, rivalry between doctors and pharmacists accentuates risks of disputes. There are also strict policies and laws on data protection which must be strictly followed, although they may complicate operations.

5.2. Micro-Environment

To evaluate the projects' ability to thrive in the RMRS business, it is necessary to consider the different forces that may influence its prosperity. By resorting to a different essential framework – the Porter's Five Forces – it is possible to have a deeper understanding of the various aspects to consider when doing such assessment.

5.2.1. **Threat of New Entrants:** Moderate

The creation of a RMRS requires significant initial investments in technology, resources, and qualified professionals, which can discourage prospective entrants. Lusíadas Saúde has a competitive advantage due to its resources, financing, established reputation in the Portuguese healthcare industry and public trust, making it challenging for new entrants to compete at a similar level. However, other major healthcare institutions in Portugal, such as CUF and Luz Saúde, may also have the capacity to develop their own RMRS. As direct competitors, these institutions might enter the market to expand and diversify their services. Additionally, technology advancements are likely to reduce entry barriers for future competitors, potentially increasing telepharmacy services in the future.

5.2.2. **Threat of Substitutes:** Moderate

Hospitals may use their in-house pharmacy team for a similar service rather than outsourcing to a RMRS. Although this transitioning requires significant costs, making Lusíadas' RMRS a potentially more affordable alternative, internal teams are already acquainted with the hospital's systems, protocols, and regulations.

Advancements in AI and technological pose a significant threat, as it may lead to the development of software's that operate continuously, reducing the reliance on pharmacists. In this situation, hospitals might keep smaller in-house pharmacist teams supplemented by AI systems or eventually adopt totally automated review systems, potentially eliminating the necessity for a specialised pharmacist team.

5.2.3. **Bargaining Power of Suppliers:** Moderate

Technology suppliers are essential for a remote medication review service, providing the necessary software's and infrastructures. However, given the considerable number of platforms that provide similar services and features, Lusíadas Saúde has the flexibility to choose from different suppliers. Additionally, specialized pharmacists, particularly in more complex fields, have greater bargaining power due to the demand for their skillset.

5.2.4. **Bargaining Power of Buyers:** High

Hospitals have high bargaining power as they can decide to keep their in-house pharmacy teams already familiarised with their protocols and systems. Furthermore, healthcare institutions are under pressure to reduce costs, as such they will only consider Lusíadas' RMRS if it proves more cost-efficient than maintaining or expanding internal services. Additionally, buyers will require strict legal regulations and well-defined contractual terms to guarantee compliance, data security and accountability, further influencing the negotiation process and terms of RMRS offerings.

5.2.5. **Intensity of Competition:** Low

Competition in Portugal is currently low, as there is no comparable service in the market, giving Lusíadas a first-mover advantage. This allows the group to establish itself in the industry with minimal rivalry. However, competition is expected to increase as technology, AI and telemedicine services become advance. To maintain its competitive advantage in the long-term, Lusíadas should focus on differentiating its services through strong customer support, expertise in different systems and protocols, and effective promotional strategies.

5.3. Internal Analysis

To get a deeper understanding of this projects' challenges and capabilities, it is essential to analyse the different internal factors that may impact it. Using the SWOT framework allows a more comprehensive assessment of this project's key advantages, therefore assisting in strategic decision-making.

5.3.1. Strengths

Lusíadas Saúde's RMRS offers numerous strengths that significantly improve patient care and operational efficiency. This service increases patient safety and quality of care by reducing medication errors, aligning with the Joint Commission standards, which is crucial for example for high-risk patients such as those with chronic conditions. By reviewing a larger number of prescriptions, it ensures complete validation, which leads to better health outcomes.

Cost efficiency and optimal resource utilization are other significant benefits, fostering a more sustainable healthcare system while providing economic advantages. The service also contributes to high pharmacist satisfaction by offering development opportunities flexible remote work options, improved work-life balance and potential for increased income.

5.3.2. Weaknesses

This service also faces some challenges that could impact its scalability. The system's high dependency on technology introduces vulnerabilities, as system malfunctions could delay pharmacists from accessing crucial records. This may require consistent technical support, which increases operational expenses. Additionally, the high costs associated with setting up the system, marketing, and ensuring reproducibility across different environments can pose obstacles to the expansion of this service.

Moreover, some physicians may resist to adopt new technologies due to reluctance to change, which could further interfere with successful implementation and collaboration. In addition, the ambiguity surrounding accountability for medication errors presents another challenge, particularly in a remote setting where responsibility can be difficult to assign.

Communication challenges may also arise, particularly during emergencies, and the lack of direct integration of remote pharmacists within hospital teams may lead to mistrust or a lack of credibility for the service. Differences in pharmacists' opinions, educational qualifications, and areas of expertise may also result in discrepancies in the medication review process. Furthermore, variability in hospital IT systems complicates information gathering, hindering seamless integration.

5.3.3. Opportunities

The RMRS presents several opportunities for growth and market leadership. The service has strong scalability potential and opportunities for externalization, as it is currently unique in the national market. This positions it as a pioneer, capable of providing a differentiated service that could establish a benchmark for similar initiatives.

The dissatisfaction among hospital pharmacists regarding their working conditions and compensations also creates an opening, as many may be interested in transitioning to remote work, which aligns with the model of this service. The growth of telehealth and digital

healthcare services, especially post-COVID-19, has heightened the demand for remote work solutions, aligning this service within current market trends.

Furthermore, expanding the service might even result in it becoming a mandatory requirement for certified hospital units, opening doors to strategic partnerships and broader market penetration. Additionally, there is a significant market need for improved medication safety practices due to the prevalence of medication errors, highlighting an opportunity to address a significant gap in healthcare quality.

5.3.4. Threats

The service also faces some threats that could hinder its successful implementation and growth. Strict regulations, legal requirements, and compliance challenges could impede the expansion of the service. Additionally, cybersecurity and privacy risks are critical concerns, especially given the sensitive nature of patient information involved in remote medication reviews.

Emerging competition from similar services could threaten the market position of the remote medication review service, while differences in how the public sector operates may limit its applicability and advantage in those settings. Securing specialized professionals for on-demand validation might also be challenging, which could limit the availability of expert support and impact the quality of service provided.

Moreover, efforts for integration and standardisation could be complicated by the variability in cultures, practices, and logistical processes across healthcare institutions, impacting the overall effectiveness of the service. Disparities in access to technology, particularly in more rural areas, present an additional barrier to the scalability and reach of the service. Lastly, intense competition among major healthcare provider groups and the limited number of competitors in this niche could constrain growth opportunities and limit expansion of market share.

5.4. Moving Forward

From the contextual framework of the market carried out and after having detailed the reality of current pharmaceutical care within hospital settings, we conclude that RMRS presents a viable opportunity for externalisation in Portugal, and we will know proceed to outline how it can be better operationalised. By understanding those involved in its operations, including clients and external benefiters, we shall develop a business model which will enhance the advantages derived from externalisation of this service..

6. Results

Following the contextual analysis carried out, the results will aim to illustrate the best possible way to place into motion a remote medication review service, highlighting risks, costs, strategies, and operational resource management.

6.1. Assumptions

To externalize the Remote Medication Review Service, the following key assumptions must be considered:

a) Pharmacists working on the RMRS require continuous specialized training to remain updated on the latest pharmacology, as well as on each hospital's protocols and work policy. This guarantees adequate and accurate validation of the prescriptions. Strict onboarding procedures will take place.
b) Pharmacists performing remote validation must have access to patients' complete clinical information to make informed decisions and perform an efficient medication review.
c) Pharmacists working on the RMRS must have flexible schedules to be able to meet certain hospitals' requirements and protocols. This guarantees continuous service across different hospitals and in accordance with their needs.

d) Matching types of patients to a pharmacist with more relevant clinical expertise in certain pathologies. This ensures that more complex and delicate cases are handled by the most appropriate pharmacist that possesses specialized knowledge on the matter.

e) Pharmacists will strictly adhere to industry's best practices and will commit to informing clinicians of any concerns raised. Pharmacists will advise but never disobey the orders of the clinician.

f) Matching pharmacists to specific onboarded institution, allowing each pharmacist to become fully proficient in a particular facility's systems, software, protocols and regulations, as well as acquainted with relevant staff members. This optimises training and improves the efficiency and effectiveness of the RMRS. By developing an in-depth knowledge of one institution instead of becoming familiarised with the practices and workflow of each one, pharmacists will be able to provide a more comprehensive and tailored support.

6.2. Resource Allocation Plan

6.2.1. Human Resources

Pharmacists – The pharmacists are the main pillar of the service, as they are the ones responsible for the validation of the medication prescription, preventing errors and increasing patient safety. They require extensive and ongoing training to familiarize themselves with the various client systems, protocols, and workflows. This team will comprise of more novice pharmacists, as well as more specialised and experienced pharmacists.

IT Team – The IT team plays a critical role in ensuring a secure remote access and system integration. They are responsible not only for implementing robust cybersecurity measures to prevent data breaches, but also for solving technical and software issues.

HR Team – The HR team oversees the hiring and onboarding of pharmacists, as well as the development of their shift scheduling. Moreover, they are also in charge of planning and coordinating training programs, as well as monitor pharmacists' progress and performance.

Legal and Compliance Team – This team ensures compliance with crucial data protection laws, including GDPR, and draft contractual agreements. They address liability and malpractice concerns, and guarantee transparency across all stages of the service.

Marketing Team – The Marketing team is responsible for the promotion of the service to potential clients through the development of marketing campaigns.

6.2.2. Technological Resources

Medication Validation Software – Although GLINTT is the principal platform for the validation and management of prescriptions, there are several other systems that perform similar functions and that may be used by possible clients. As such, it is crucial that Lusíadas acquires these software's so that the pharmacists can, not only use them when validating medications for clients, but also so that the pharmacists can get training in these systems.

Communication Platform – A dedicated platform for real-time communication among pharmacists in order to clarify doubts and request specific information, allowing for a better and more effective treatment. This platform will facilitate the collaboration between remote pharmacists.

Clinical Decision Support Systems (CDSS) – Improving the CDSS in order to provide real-time alerts for complex and high-risk cases. Additionally, it should have further functionalities, such as the ability to identify potential medication incompatibilities, thus improving the efficiency and safety of the process.

6.2.3. Financial Resources

Initial Investment – These initial costs include not only the development and functioning/creation and operation of training programs and marketing campaigns, but also the

acquisition of technological equipment, software and systems needed for well-functioning of the service.

Employee-Related Expenses – It is necessary to consider the costs related to the salaries of the pharmacists, as well as of any employee that was needed to hire for the functioning an operation of the service. Here it's also included Meal Allowance, as well as the Holiday and Christmas, and the Occupational Accident Insurance Fee.

6.3. Occupational Design Overview

A series of observations and interviews were conducted, such that the proposed process flow for prescription validation was designed (Appendix). Dr Rui Rodrigues, Director of Pharmaceutical Services of Lusíadas Saúde, provided a detailed tour of the hospital pharmacy, guiding us through the normal daily operations of the department.

Besides understanding the pharmacy flow, we observed its interconnection with wider hospital operations, particularly its impact on hospitalised patients within the different floors. We accompanied the preparation of the unitary dose procedure, its transition into the different hospital floors, and the subsequent reception and administration process to patients. All steps were tracked using the PDA system, since medication is part of a closed loop management system. On the various hospitalisation floors, we were able to observe and document how pharmaceutical interaction were received and processed by nurses and clinicians on site. This interconnection between nuclear pharmacy operations and its contextual environment is paramount when designing the operationalisation of the RMRS. The service must align with wider operational timelines and be designed in a way that improves the hospital's broader functioning.

Typically, the morning period is reserved for the review of every unitary dose prescription that needs to be processed daily for its preparation, which is done per prescription, and administration. Pharmacists responsible for validating prescriptions focus primarily on routine

unitary dose reviews, while also validating any urgent requests that emerge. It should be understood and noted that in a hospital pharmacy without staff solely hired to assess clinical reviews, the reviewing pharmacist may also be responsible for other hospital pharmacy tasks, such as medication preparation, receptions, inventory, storage and other related duties.

The RMRS will concern its operations after a prescription is submitted, which can affect the unitary dose, or could be under the form of an urgent request. It should be mentioned that the service will still respect and support compliance with general hospital operational timings, aiming to optimize the timing in which clinical reviews are carried out, and facilitate the time of daily unitary dose dispensing. By having a fully dedicated team focused on prescription validation, the proposed service will ensure that pharmacists do not have to divide its time with other hospital pharmacy responsibilities. Hence, the utilisation of each pharmacist for the number of concluded reviews performed per hour will be substantially higher.

6.3.1. Details of the Remote Medication Review Service Operations

The service will be running continuously for 24 hours per day, all days of the year. Each daily period will be divided into 3 shifts ensuring that optimal rest times are given to professionals guaranteeing that errors are kept to a minimum.

Each shift will ensure the coverage of one hundred percent of medication prescription reviews for all clients based on an assigned scheduled which will contemplate and account for the average number of prescriptions at any given time which ultimately is deducted from the number of beds together with the natural influx of prescriptions deriving from operational timings of an inpatient hospital ward. The calculation of optimal staff numbers will be detailed below.

An optimal number of scheduled pharmacists also means that it shall be guaranteed that at each shift there is at least one onboarded pharmacist for every client institution. This will ensure that the service can be provided effectively, contractual obligations fulfilled and that communication

and integration within the client's institution is well established. This will minimise risks of miscommunication, misunderstandings and especially reduce scepticism over the clinical opinion provided. Each pharmacist will, during its shift, have the responsibility of remotely entering onboarded client's informatic systems and verify if there are any pending validations. Urgent or routinely. Once entering the system, the normal process flow should be respected as per that shown on Appendix .

The definition of contact streams with clients is paramount for the effectiveness of the service. An email report should be sent accompanying the validation, in case there is an intervention, to each client for accurate record keeping and responsibility traceability. A copy of the recommendation email should be kept. At the end of each shift pharmacists are to provide Lusíadas with a report over how many validations were carried out as well as to which institutions. If there was any exceptional occurrence this should also be communicated. Such will ensure higher safeguarding for the service provider as well as for the employee.

It is recommended that pharmacists hired for the service share an internal communication channel, where second opinions can be shared, and doubts clarified. It must be clearly understood by each pharmacist, under written agreements, that at any point personal identification information can be exchanged within the group, neither can the professional responsible for the medical review be excused from responsibility in case of wrong judgement prompted by exchanges within the forum.

6.4. Operational Team Design and Staff Allocation

The success of the service model, under all scopes, financial and operational, is dependent on how effectively teams are built, maintained, and organised. The service´s management should coordinate with the current in-house human resources responsible the best possible rotational shift schedule in such a way that legal requirements are complied with, whilst at the same time ensuring the service's optimal delivery.

When designing shifts, it is important that set criteria and parameters are complied with and strictly followed. Besides general guidelines detailed in Appendix , particular requirements include the need to have at least one onboarded pharmacist per client institution per shift. Also, each shift must have enough professionals to guarantee full coverage of the expected number of prescriptions per hour. Considering that during the different phases of the day, prescription inflow is dramatically different, team numbers should be adapted to account for this. It is also ideal to have within each shift a mix of more senior professionals together with more junior staff. Such is especially important during high stress periods and the daytime; a proportionally higher number of highly qualified professionals should be allocated in these times.

All in all, the service's success if dependent on two factors. First, hiring the correct number of pharmacists, to the right proportion where all validations are covered in time with the least possible number of professionals. Secondly, the correct shifts need to be designed in such a way which the service can deliver maximum quality at all times. If management cannot ensure the correct distribution of its staff, promised quality gains for client institutions will not be visible. Considering the cost burden of the service on clients, any failures in service delivery may be detrimental, resulting in contract resolution. This also reinforces the need for a precise staff backup plan.

Furthermore, to ensure a healthy cost structure and profitability, management needs to ensure that gross profit margins are respected (recommended a minimum at 10%, ideally up to 20% given it is the service providing sector), aiming to increase the latter as time goes by. The more sophisticated client portfolio Lusíadas ensures, the easier it will be to have on average a greater profit margin.

6.5. Pharmacists Required and Associated Costs

6.5.1. Calculating Costs per Pharmacist

To estimate the service's financial requirements for employing pharmacists, a comprehensive analysis of salaries, allowances, and supplementary expenses was performed. To accomplish this, various assumptions and key details were considered:

a) **Staff Composition:** According to Lusíadas Saúde, the monthly salary for a junior pharmacist is €1,250 and for a senior one is €2,000. We assume that 80% of the workforce are junior pharmacists and 20% are senior pharmacists.

b) **Shift Allowance:** 15% increase in the monthly salary. This is also included in the Christmas and Holiday Allowance.

c) **Yearly Salary:** Pharmacists receive the total monthly salary 14 times, as it includes 12 months of regular salary, as well as the Christmas and Holiday Allowance.

d) **Meal Allowance:** Daily value of €9.60 (maximum amount that is tax-exempt). With 20 working days per month, the monthly meal allowance is €192. The yearly meal allowance is calculated for 11 months, as it excludes the days of holiday.

e) **Single Social Tax:** Lusíadas must pay 23.75% of the yearly salary (including shift allowance) to Social Security, per pharmacist.

f) **Occupational Accident Insurance:** This costs 1% of the total yearly payment to the employee, which includes not only salary but also allowances.

The following table describes the needed calculations:

Table 1. Breakdown of the Pharmacist-Associated Costs

Expense	Calculation	Value
Base Monthly Salary	80% of €1,250, 20% of €2,000	€1,400
Monthly Shift Allowance	15% of Base Monthly Salary	€210
Total Monthly Salary	Base + Shift Allowance	€1,610
Total Yearly Salary	Total Monthly Salary × 14 Months	€22,540
Yearly Meal Allowance	€192 × 11 months	€2,112

Yearly Payment	Yearly Salary + Yearly Meal Allowance	€24,652
Single Social Tax	€22,540 × 23.75%	€5,353.25
Occupational Accident Insurance	1% of yearly payment	€246.52
Total Cost per Pharmacist	**Yearly Payment + TSU + Insurance**	**€30,251.77**

This total cost per pharmacist includes the direct and some indirect costs that Lusíadas is anticipated to encounter. However, it excludes costs associated with yearly pharmacists' training needs, assuming current internal resources will be used to cover this requirement as well as client company through onboarding initiatives.

6.5.2. Determining the Number of Pharmacists Needed for the Service

To determine the number of pharmacists required for the RMRS to operate, it's necessary to conduct an analysis that accounts for various metrics, such as prescription data, pharmacist review rates and client hospital bed capacity. The main objective is to guarantee that the number of pharmacists aligns with the review demand across the 3 shifts, while maintaining a 24/7 coverage and 100% prescription review.

1) Data Analysis and Prescription Rates

Lusíadas provided a 2023 document detailing the sum of prescriptions written per hour across four hospitals with 346 beds (Appendix). To calculate the average number of prescriptions per bed for each hour, we divided each hourly total by 365 days and then by the number of beds (346). This prescription-to-bed ratio is the basis for calculating the prescription demand of potential clients based on number of beds they manage.

2) Pharmacists' Workload Estimation

According to Lusíadas Saúde, pharmacists can review approximately 5 high-complexity prescriptions per hour and 50 low-complexity prescriptions per hour. Assuming that 75% of prescriptions are low complexity and 25% are high complexity, we calculated an average review

time of 3.9 minutes per prescription. Therefore, a pharmacist can review approximately 15 prescriptions per hour.

3) Prescription Demand by Shift

Using the calculated prescription-to-bed ratio and the total number of beds (sum of each client's number of beds), we can estimate the total hourly prescription workload. These values are then aggregated into three 8-hour shifts: Morning (08:00–16:00), Afternoon (16:00–00:00), and Night (00:00–08:00), allowing the estimation of the medium prescription demand for each shift.

4) Workforce Estimation

a) Each pharmacist works 7 hours in an 8-hour shift and can review 15 prescriptions per hour. Therefore, the maximum workload per pharmacist per shift is 105 prescriptions.

b) The number of pharmacists required for each shift is determined by dividing the total prescription demand per shift by the maximum workload per shift (105).

c) To determine the weekly staffing needs for each shift, we multiply the number of prescriptions of each shift by 7 (days of the week) and then divide it by 5 (number of weekly shifts per pharmacist).

d) The total weekly requirement corresponds to the sum of the weekly staffing needs of each shift. This value should be rounded up to ensure full prescription review coverage.

6.5.3. Current Client Context

To understand the financial implications and contextualise the Remote Medication Review Service pricing strategy, we must estimate each client's likely in-house pharmacist costs. The goal is to provide a basis of comparing the RMRS pricing with the clients' current costs.

Using the same rationale as the one used for Lusíadas Saúde, we are able to estimate the clients' average annual pharmacist-related expenditure. However, unlike Lusíadas' remote pharmacists who receive a shift allowance, the clients likely operate with a traditional 8-hour workday,

Monday to Friday. As such, we calculated that the average cost per pharmacist for the clients is approximately 26,584.12€ per year. This process is detailed in Appendix .

Moreover, when examining each client, we can find two different circumstances: single-unit hospitals and hospital groups with more than one unit.

a) Single-Unit Hospitals

1) Estimate the total number of daily prescriptions using the prescription-to-bed ratio determined in Section 9.5.2.
2) Calculate the total daily prescription workload by dividing the number of weekly prescriptions (daily prescriptions × 7) by 5 (working days per week).
3) Divide the previous result by 105 (pharmacist's maximum daily workload capacity) to estimate the required number of pharmacists.
4) Round up the previous number to ensure full prescription review coverage.

b) Hospital Groups

1) Estimate the total number of daily prescriptions and divide this value by the number of units in the group to estimate the number of prescriptions per unit. This process assumes equal bed distribution among the various units in the group.
2) Apply the same approach as for single-unit hospitals to calculate the rounded-up number of pharmacists required per unit.
3) Multiply the number of pharmacists estimated by the number of units to obtain the total number of pharmacists that the group must employ.

To estimate the client's total yearly pharmacist-related costs, we must multiply the client's number of pharmacists by the estimated annual cost (€26,584.12).

6.5.4. Pricing Strategy

To establish a fair and flexible pricing model for the Remote Medication Review Service, we adopted a methodology based on operational efficiency, cost coverage, and equitable

distribution of expenses across clients.

This pricing model ensures Lusíadas' cost recovery for pharmacist-related expenses while allowing for adaptability based not only on the particular needs and circumstances of each client, but also on the service's specific situation and customers.

1) Lusíadas' Pharmacists Allocation to Each Client

The model begins by estimating the number of pharmacists that Lusíadas has to allocate to each individual client. This calculation follows a similar method to the one described in Section 9.5.2 1). However, unlike that section, which aggregates all the clients to determine the total prescription volume and corresponding pharmacist requirements, this approach focuses on each client's specific number of beds. This allows for an individual estimation of the prescription workload and the number of pharmacists needed.

These calculations provide the unrounded number of pharmacists required for each client.

This value represents the minimum number of pharmacists needed to ensure full prescription review coverage, which consequently allows us to estimate the individual pharmacist-related cost that Lusíadas has with each client.

2) Financial Gain Comparison

Once the Lusíadas' individual client-related costs are calculated, we compare it to the estimated costs that the client currently incurs. This allows for the understanding of client savings vs Lusíadas's profit margin per client. Such is especially important given that the service is highly specialised, and that the terms of the service are always individually negotiated.

3) Pricing Model

The pricing model of the service has been developed to guarantee that each client fairly contributes to Lusíadas' operational costs, while accommodating different client sizes and ensuring profitability for Lusíadas. This model is composed of two main elements: pharmacist costs and a bed-based additional fee.

Table 2. Breakdown of the RMRS Pricing Model

Pharmacist Costs	The exact number of pharmacists that each client requires, which was estimated in Section 9.5.4. 1), is multiplied by Lusíadas estimated annual cost per pharmacist (€30,251.77). This element covers the specific pharmacist-related costs that Lusíadas has with the client.
Additional Fees	This fee consists of two components: a base value and the client's number of beds. By factoring in the client's bed count, we ensure fairness and flexibility – clients with more beds also have larger operations that likely require more infrastructure and support. The base value per bed must into account different factors: the client's specific circumstances, and Lusíadas' current client environment and the service's overall conditions. This guarantees flexibility for Lusíadas to adapt to client-specific circumstances while also ensuring profitability for Lusíadas with each client.

The additional fee is added to cover expenses not included in the "Pharmacist Cost" and to ensure profitability for Lusíadas.

4) Pricing Formulas and Constraints

The pricing model recommended, and constraints necessary to considered, as are follows:

Table 3. Pricing Formula and Associated Constraints

Total Price	$(€30{,}251.77 \times \text{Number of Pharmacists Required for the Client}) + (\text{Client's Number of Beds} \times \text{Established Value})$ *(Equation 1)*
Client-Level Constraint	$\text{Total Price} < \text{Client's Current Costs}$ *(Equation 2)*
Lusíadas-Level Constraint	$\sum(\text{Each Client's Total Price}) > €30{,}251.77 \times \text{Lusíadas' Total Number of Pharmacists}$ *(Equation 3)*

This pricing model ensures fairness for clients, scalability based on their size and circumstances and profitability for Lusíadas while still being competitive in the market.

6.6. Financial Analysis Through a Feasibility Study

To assess the viability of implementing the Remote Medication Review Service (RMRS), we selected six prospective clients representing a diverse range of sizes and operational contexts. These included both individual hospitals and healthcare groups with multiple units, providing a comprehensive spectrum for analysis.

6.6.1. Client Overview and Prescription Estimates

The six clients studied were:

- **Trofa Saúde Group**: A Portuguese healthcare group with 1,274 beds across 9 units (Trofa Saúde n.d.) (Trofa Saúde 2022).
- **Hospital Particular de Paredes**: A single-unit hospital with 74 beds (Hospital Particular de Paredes n.d.).
- **HPA Group**: A group with 300 beds across 4 units (HPA Saúde Group - Private Health n.d.) (HPA Saúde Group - Private Health n.d.).
- **Hospital de Santa Maria**: A single-unit hospital with 152 beds (Hospital de Santa Maria Porto n.d.).
- **Hospital da Prelada**: A single-unit hospital with 70 beds. (Misericórdia do Porto 2020)
- **Hospital Particular – Health Group**: A healthcare group with 34 beds across 2 units. (Hospital Particular - Health Group n.d.) (Hospital Particular - Health Group n.d.)

This variety allows us to test our model's scalability and efficiency in different operational scenarios.

6.6.2. Weekly Staff Requirements and Cost Estimation

Using the methodology detailed in Section 9.5.2. “Determining the Number of Pharmacists Needed for the Service” applied to the context of each individual client, we were able to

calculate the total number of pharmacists required to set up the service for the 6 proposed institutions. 30.74 pharmacists would be needed to operate the service within this context, which rounded up would mean hiring 31 professionals. Consequently, with 31 employees, this would represent a €937,804.87 yearly cost for the group.

6.6.3. Client's Current Context

As part of our analysis, we estimated the current number of pharmacists and the associated costs at each of the six clients under consideration. These estimations were based on their bed counts and the rationale previously outlined, as well as the cost of €26,584.12 per pharmacist.

Table 4. Client Hospitals' Current Pharmacist Requirements and Costs

Institution	Trofa Saúde Group	Hospital Particular de Paredes	HPA Group	Hospital de Santa Maria	Hospital da Prelada	Hospital Particular Group
Number of Pharmacists	Rounded up to 3 Total of 27	Rounded up to 2	Rounded up to 2 Total of 8	Rounded up to 3	Rounded up to 2	Rounded up to 1 Total of 2
Current Annual Expenditure	€717,771.24	€53,168.24	€212,672.96	€79,752.36	€53,168.24	€53,168.24

6.6.4. Estimation of Client's Pharmacists Requirements

To estimate the number of pharmacists that Lusíadas must have to handle each client, we applied the same methodology previously outlined in Section 9.5.4. 1) "Lusíadas' Pharmacists Allocation to Each Client". Consequently, the calculated pharmacist requirements per client are the following**:**

Table 5. Clients' RMRS Pharmacist Requirements

Institution	Trofa Saúde Group	Hospital Particular de Paredes	HPA Group	Hospital de Santa Maria	Hospital da Prelada	Hospital Particular Group
Number of Pharmacists	20.58	1.19	4.85	2.45	1.13	0.54

The sum of these values represents the total unrounded number of pharmacists that Lusíadas would need to hire in total – 30.74, rounded up to 31. This difference results in additional staffing costs, which must be distributed fairly among the clients to cover all expenses of pharmacist-related services.

6.6.5. Client Pricing and Constraints

To finalize the feasibility study for Lusíadas, we analysed the client prices in this case. Additionally, before deciding on the "Value per Bed," we analysed various scenarios to ensure the model adheres to both client-specific constraints and overall profitability for Lusíadas.

To do so, we utilised the previous developed Price Formula and Constraints, represented by Equation 1 and Equation 2, respectively,

As such, for each of these 6 clients, we have the following conditions:

Table 6. Client's Pricing Formula and Associated Constraints

Institution	Number Beds & RMRS Pharmacists	Price	Constraint
Trofa Saúde Group	1,274 beds & 20.58 pharmacists	622,581.43 + (1,274 × Established Value)	Price < 717,771.24
Hospital Particular de Paredes	74 beds & 1.19 pharmacists	35,999.61 + (74 × Established Value)	Price < 53,168.24
HPA Group	300 beds & 4.85 pharmacists	146,721.08 + (300 × Established Value)	Price < 212,672.96
Hospital de Santa Maria	152 beds & 2.45 pharmacists	74,116.84 + (152 × Established Value)	Price < 79,752.36
Hospital da Prelada	70 beds & 1.13 pharmacists	34,184.50 + (70 × Established Value)	Price < 53,168.24
Hospital Particular Group	34 beds & 0.54 pharmacists	16,335.96 + (34 × Established Value)	Price < 53,168.24

6.6.6. Lusíadas-Level Constraints

At the organizational level, Lusíadas must ensure that the revenue generated covers at least the full pharmacist-related costs across all clients. By tailoring Lusíadas' previously developed constraint (Equation 3) to this particular scenario involving 31 pharmacists, we obtain the following restriction:

$$929{,}939.42 + (1{,}274 \times \text{Established Value}) + (74 \times \text{Established Value}) + (300 \times \text{Established Value}) + (152 \times \text{Established Value}) + (70 \times \text{Established Value}) + (34 \times \text{Established Value}) > 937{,}804.87$$

(Equation 4)

6.6.7. Testing Hypotheses for the "Established Value"

To identify a feasible and uniform "Established Value" across all clients, we tested various values to meet both the client-level and Lusíadas-level constraints.

Results: The maximum common value for the "Established Value" that follows all constraints was approximately €36. If the value was higher, Hospital Santa Maria, the most restrictive client, would exceed its current spending by adopting this service. However, with this value, Lusíadas would drop its overall profit below 7% and other clients, such as Grupo Hospital Particular Norte, would get an almost 70% cost savings.

Therefore, in this scenario, a common "Established Value" does not optimize profitability for Lusíadas and ensure cost savings and fairness for clients. As such, we recommend tailoring the "Established Value" to each client, reflecting their specific cost-saving potential and operational needs, as well as Lusíadas' RMRS overall circumstances. Below is a possible customised approach:

Table 7. Proposed Values per Bed and Associated Impact

Institution	Trofa Saúde Group	Hospital Particular de Paredes	HPA Group	Hospital de Santa Maria	Hospital da Prelada	Hospital Particular Group
Proposed Value	€37 per bed	€100 per bed	€100 per bed	€20 per bed	€100 per bed	€250 per bed
Client's Cost Savings	≈ 7%	≈ 20%	≈ 17%	≈ 3%	≈ 20%	≈ 50%
Lusíadas' Profit Margin	≈ 7%	≈ 20%	≈ 20%	≈ 3%	≈ 20%	≈ 50%

It is important to highlight the <u>following two situations</u>:

Hospital Particular Group allows for an increased “Established Value” as it has a higher cost-savings, due to having the largest proportional difference between the number of pharmacists that it’s estimated to employ, and the number required by Lusíadas to provide the service. This client allows for an impressive gain, helping to sustain extra expenses related to the service. Secondly, Hospital de Santa Maria currently employs an estimated 3 in-house pharmacists, making the proposed decrease to 2.45, and its costs under the of the RMRS, lack appeal. As the difference in pharmacist-associated costs is minimal, in order for the bed-associated fee to allow for cost savings, the “Established Value” would have to be exceptionally low. Even at a rate as low as €20, the hospital would have less than 4% cost savings, while Lusíadas would also achieve a client-associated profit of less than 4%. Given these limitations, it is recommended that Lusíadas reevaluate the sustainability of offering this service to Hospital de Santa Maria.

By considering the structure outlined, Lusíadas would have a profit of € 96,452.92, which corresponds to a 10% profit margin.

This analysis highlights the importance of a flexible pricing strategy tailored to each client's operational realities. While some clients have the potential to achieve higher cost savings, others, such as Trofa and Hospital de Santa Maria, present challenges in aligning costs with profitability. The prioritization of customised agreements is essential to balance the needs of all stakeholders.

6.7. Business Strategy

As part of the business and marketing plan for the externalization of the service, we conducted the marketing mix analysis and the business model Canva framework.

6.7.1. Marketing Mix

a) Product

Lusíadas Saúde provides a Remote Medication Review Service that ensures 24/7 medication review coverage, guaranteeing the timely and complete validation of all prescriptions to minimise medication errors and medication-related harm. This service seeks to improve patient safety and help healthcare institutions achieve necessary safety and accreditation standards from key entities such as the World Health Organization (WHO) and Joint Commission International (JCI).

Additionally, the RMRS guarantees services performed only by specialized pharmacists with various clinical expertise who receive continuous training to remain updated on the latest pharmacology and protocols, ensuring that each case is handled by the most qualified professional. These pharmacists strictly adhere to industry best practices and are prepared to work with any technological system and program, certificating an equitable and optimal quality service regardless of the healthcare institution.

Adopting Lusíadas' RMRS offers significant economic benefits. This service reduces hospitals' need of on-site pharmacist by up to 70%, resulting in lower costs associated with the managing and functioning of the pharmacy team. It also gives hospitals the opportunity to scale their service demands without the costs of expanding in-house pharmacy teams, providing flexibility to match pharmacy services to their evolving needs.

Lusíadas' RMRS not only improves patient safety and quality of care by reducing medication errors but also increases financial and operational efficiency. This service allows hospitals to allocate resources to other key services and address critical challenges.

b) <u>Price</u>

The pricing of the service depends on each client and has been previously detailed in *Equation 1*.

c) <u>Place</u>

Given the specificity of the service provided, there shall not be the need for broad distribution channels. In fact, the targeting of customers should be done mainly via direct contact streams or through specialized professional settings. Targeting business to business platforms is pivotal, with an emphasis on medical and hospital care settings. For example, establishing presence at major medical and technological fairs, participating in articles in specialised medical review magazines and journals, participating in healthcare conferences, and engaging with innovation centres is key.

In general terms, physical presence is advised given the peculiarity and novelty of the service. Furthermore, given the complexity of the latter, direct contact, and use of platforms where extensive explanations can be given for immediate client reassurance is advisable. Since several hesitations are likely to immediately surge, it is necessary that the chosen platforms immediately tackle these initial concerns.

It should be noted that there shall not be, at any stage, instant sales points, such as brick and mortar stores or online sales platforms. The service requires careful contractual arrangements, tailored to each client. Hence, a dedicated sales representative should always be assigned once Lusíadas Saúde is contacted by an interested client.

d) <u>Promotion</u>

To effectively promote the Remote Medication Review Service to hospitals across Portugal, a thorough approach should be implemented. Lusíadas could start by organizing events with potential clients to introduce the service and offer temporary free trials or pilot programs, allowing hospitals to experience the service first hand without any commitment. Personalized demonstrations adapted to each potential client could also help address concerns regarding implementation, illustrating how the service can integrate with existing systems. Additionally, hosting educational webinars, workshops, and participating in industry conferences could boost

visibility and credibility by demonstrating how the service can reduce costs, support requirements, and ease staffing burdens.

A sales team could be an effective way to reach hospital pharmacy administrators directly, sharing success stories and evidence of operational improvements. By utilizing social media platforms, Lusíadas Saúde could also create engaging content such as posts and case studies that address topics such as the benefits of remote medication validation or the importance of reducing medication errors. Furthermore, collecting testimonials from early adopters, pharmacists and other participants could emphasize efficiency, cost savings, and quality care.

Finally, the company should obtain relevant certifications or accreditations that reflect the service's compliance with industry standards, thereby building trust and reliability. In the long term, regularly publishing statistics and reports showcasing the service's impact – such as satisfaction rates among pharmacist and clients or percentage reductions in medication errors, and overall cost savings – could further reinforce its value offer.

6.7.2. Business Model Canva

a) <u>Customer Segments</u>

Lusíadas Saúde should initially target private hospitals in Portugal that offer hospitalisation services, segmenting them into two groups: small and large clients. Smaller hospitals often struggle to maintain adequate pharmacy staff, while larger institutions may seek to optimize operational efficiency and reduce expenses. Focusing on private hospitals allows for a more effective implementation of the service. In the long term, once the service proves its value and effectiveness, there could be potential to also expand its offerings to public hospitals in Portugal.

b) <u>Value Propositions</u>

An ideal RMRS client will face a variety of operational and labour market challenges which pose threats to their quality standards and cost structure integrity. Due to high employment

costs, low qualified labour supply and a changing labour force, many institutions find it ever more complicated to hire enough pharmacists to meet their highest quality standards. Reallocation of resources within departments is often necessary and the prioritisation of tasks an eminent reality, leaving behind other necessary duties which may seem at a glance less urgent.

Nonetheless, hospitals in a competitive environment strive for the achievement of the highest quality standards, and increased patient safety. As a result, any mechanisms which increase safety, reduce costs and aid with compliance will be welcomed. The coverage of 100% of prescriptions being validated on time will ensure not only the benefits described above but will also reduce costs per patient (less hospitalisation time, less corrective/reversal procedures and medication, higher utilisation per professional) and reduce significantly the costs associated with medical errors (through fewer compensation payments and in the long run reduced insurance costs).

The proposed service will have comparatively significantly smaller validation costs per prescription/patient if we consider the higher utilisations per professional. By specialising and focusing solely on validating prescriptions for an array of clients, costs will be spread and divided between the several client entities. This ensures the financial viability of the service, providing a cost-effective solution for the client.

Moreover, due to the nuances of the service, by being fully remote, allowing pharmacists to specialize and be away from the sometimes frenetic environment of hospital pharmacies, there is an advantage when hiring these professionals, proving to be a more attractive job opportunity. Highly qualified professionals can be attracted to provide the service, wishing to decrease their workload and work-day intensity. These professionals will be fully integrated and onboarded to the client institution, ensuring tailored care and solutions are provided.

c) <u>Channels</u>

Lusíadas Saúde aims to reach other hospitals in Portugal to offer its Remote Medication Review Service, by leveraging multiple channels. Firstly, awareness should be raised through participation in conferences and direct communication efforts, as already detailed. The purchasing process must involve negotiation meetings, contract options, and structured guidance to potential clients while the delivery of the service need to be ensured via remote systems, with a good integration with clients' IT infrastructure. Ongoing customer support must be provided to ensure client satisfaction and continuous improvement.

d) <u>Customer Relationships</u>

Establishing strong customer relationships is essential for the successful externalization of Lusíadas Saúde's RMRS. The objective is to build long-term partnerships with hospitals and focus on personalized support and continuous communication, which is crucial for retaining existing clients and attracting new ones. Lusíadas' customer relationship approach should begin with personalised assistance and support by assigning each client a designated point of contact to address their specific needs or concerns effectively. This will strengthen client satisfaction, loyalty, and retention.

A thorough service agreement is also crucial as it formalises the partnership and clarifies expectations regarding service scope, roles, responsibilities, and performance metrics, fostering a sense of commitment and reliability between Lusíadas and its clients. Additionally, regular communication and feedback are essential. Scheduled meetings should be held to evaluate service performance, discuss insights, and address any emerging issues. Lusíadas should also provide detailed reports on the medication validation processes to keep clients informed, while structured feedback mechanisms can be implemented to collect valuable input for continuous service improvement.

Trust and reliability are equally important, and by demonstrating a commitment to data protection and adherence to regulations, Lusíadas can assure clients of the confidentiality and

integrity of patient data. Furthermore, having strong customer support and efficient problem resolutions is crucial. Lusíadas should provide support services, clear procedures for addressing technical or procedural issues, and an emergency contact available 24/7 to guarantee prompt assistance.

e) Revenue Streams

The revenue model for Lusíadas' RMRS is based on a service subscription, which serves as the main revenue stream. As detailed before, this is structured as an annual contract fee, calculated based on two different factors: the number of pharmacists required to validate the client's prescriptions and the number of hospitalisation beds at the hospital. These components reflect the intensity and operational scale of each client, ensuring that the price charged for the service is fair and aligned. This model is flexible and must be adapted and negotiated with each client to address their needs and operational context.

f) Key Resources

Lusíadas Saúde needs to rely on crucial resources to create value for its clients, maintain its operations efficiently and ensure the sustainability of the business model. These include qualified and licensed pharmacists to perform the service, advanced and secure IT infrastructure, regulatory compliance knowledge, sufficient financial capital to stable the business, human resources management for recruiting and retaining professionals and customer support systems.

g) Key Activities

i. **Recruiting qualified pharmacists** is crucial for Lusíadas Saúde's RMRS, as hiring employees capable of performing remote medication reviews proficiently ensures the delivery of high-quality service. Effective recruitment strategies, including detailed job descriptions, interviews, and assessments are key to attract and evaluate the candidates'

expertise and suitability for this type of work. Once selected, providing thorough monitoring and standardized procedures is essential.

ii. **Performing RMRS** involves conducting rigorous evaluations and validations of hospitalised patient's medication regime, aiming to minimise medical errors and improve patient safety across partner hospitals. This includes analysing medication orders alongside patient medical histories to understand the patient's health status and medication plan. Pharmacists must identify potential drug interactions, contraindications or dosing errors that could adversely affect the patient. If no issues are identified, the medication is validated: otherwise, recommendations and findings are communicated to the healthcare teams at partner hospitals to ensure the appropriate medication is administered and thus optimise patient outcomes.

iii. **Developing and sustaining a secure IT infrastructure** is essential for facilitating seamless and secure interactions between pharmacists and partner hospitals while ensuring data security. This requires setting up secure databases, implementing cybersecurity measures and regularly updating software to protect against security risks and ensure optimal system performance.

iv. **Ensuring regulatory compliance** requires staying up-do-date with healthcare regulations and guarantee that all RMRS operations comply with legal standards, thereby avoiding penalties and building client trust. Key tasks include monitoring changes in healthcare legislation, implementing compliance protocols, and training staff on regulatory requirements to maintain adherence to legal and ethical requirements.

v. **Managing partnerships and client relationships** aims to expand Lusíadas' client base and maintain long-term collaborations. This involves negotiating contracts and service agreements, maintaining regular communication with hospital administrations to ensure

alignment and address concerns, and gathering feedback to continuously improve the service and meet clients' needs.

vi. **Quality assurance and continuous improvement** of the service involves monitoring the quality of medication reviews and making improvements to boost service effectiveness, minimise medical errors and maintain competitiveness. This includes conducting regular audits, performance evaluations, implementing feedback mechanisms and revising protocols in line with best practices.

vii. **Marketing and business development** aim to promote the service, expand its market presence, and drive revenue growth. This includes creating targeted marketing campaigns that highlight the service's value and benefits, implementing advertising strategies, keeping current with industry trends, and participating in industry conferences and networking events to engage directly with potential clients. Leveraging professional networks for referrals is also essential for establishing new partnerships and expanding the client base.

viii. **Administrative and financial management** involves super visioning tasks that guarantee effective service delivery and financial sustainability. This includes billing and invoicing partner hospitals to manage revenue streams, budgeting, financial reporting to track performance, and handling legal and contractual documentation to ensure that all agreements are properly formalized and comply with legal requirements.

h) Key Partners

The successful externalization of the RMRS rely heavily on collaborations with key partners. Portuguese hospitals are the primary partners, serving as clients who provide the patient data and access necessary for performing remote validations. Establishing strong relationships with these hospitals is essential for the continuous expansion and development of the service. Furthermore, technology providers are also crucial, supplying the necessary IT infrastructure,

including hardware such as computers and servers, and software platforms. These partners ensure that Lusíadas has secure and efficient technology for effective remote medication validations. In the future, these companies can serve as partners for product development aiming at improving interfaces and communication channels for pharmacists.

Educational institutions, such as universities, could also be partners by serving as sources for recruiting qualified pharmacists, offering internships, or supporting professional development programs. Their involvement could help Lusíadas maintain high service standards and contribute to its reputation as an employer of choice by providing pharmacists trained in the latest practices and technologies. Telecommunication companies are essential partners as well, as they offer reliable internet and communication services that ensures secure and stable connectivity, crucial for real-time transmission and communication between pharmacists and client hospitals. Additionally, there is an opportunity to collaborate with insurance companies, as they directly benefit from improving patient safety and reducing medica error associated costs –factors that directly impact their financial performance and customer overall satisfaction. Insurance companies could work with hospitals to minimise medication errors, prevent adverse medication events, and so reduce hospital readmissions. This collaboration would be mutually beneficial, improving patient outcomes while providing value for both partners.

i) Cost Structure

The main costs for Lusíadas' RMRS are associated with human resources, especially the pharmacists hired to perform the service. Annual running costs, in a typical operating year, are mostly fixed costs, which includes pharmacists' salaries, encompassing allowances, taxes and accident insurance, amounting to €30,251.77 per employee. Additionally, there are also predicted expenses for software licenses, estimated at €200 per year, and mobile communication plans, costing around 180€ annually. Variable costs, associated with marketing,

communication, administration, and technical support, also need to be considered, as these are essential for promoting and maintaining the service.

Beyond the recurring expenses, initial investments such as admission costs, also need to be accounted for. These require equipping each employee with the necessary tools, including a computer with the necessary functionalities and software, with the total price of approximately €1270, and a cell phone, costing €600.

A summary of the cost structure is presented in Appendix . It is important to note that these values are merely assumptions, based on market prices, and must be adapted. These estimates may vary, as the company could benefit from discounts or partnerships, so these figures should be revised and aligned with the company's terms and conditions in case of progress.

7. Conclusion

From the research and study conducted, it must be brought to attention that in terms of communication, the success of this service is highly dependent on targeted marketing approaches, and through the building of personal connections with client institutions. This is important especially now as the market grows and is setting new power dynamics. Financially, the service must be conservative, and management must take cost structure very seriously, otherwise viability shall be compromised due to the naturally short margins existent in the sector. Operationally, it was verified that pharmacists must be given more sophisticated technological platforms and tools so that capacity may increase, improving service quality and profit margins. These professionals must be organised in such a way that they mimic the natural operational flows of wider hospital operations, otherwise the dissonance of flows will not generate the highest global benefits.

All in all, this study has shown that the creation of a remote medication review system can become a financially sustainable business, especially if integrated directly within existing hospital management structures. With the setup of personalised contracts, the service will be

able to provide the market with specialised solutions for clinical medication reviews. It was demonstrated that there is an opportunity to be developed within the expanding private healthcare market, where stricter quality requirements and increased competition drive the need for differentiated services and quality guarantees to patients. The proposed service will allow institutions to accomplish these metrics at a comparatively reduced cost. Moreover, this analysis has opened discussion about the need to develop a more sophisticated and interconnected healthcare system in the country, leveraging integrated technologies and quality tools. To ensure success, Lusíadas must remain adaptable to market changes and carefully assess potential risks, positioning the RMRS to overcome foreseeable challenges and strengthen its competitive edge in this emerging sector.

8. Limitations

Several limitations were encountered during the development of this project. Time Constraints were a significant challenge, as this project was conducted over a limited and short period. This restricted the depth of data collection and analysis and inhibited the possibility of establishing direct contact with potential clients, which would have allowed for a better assessment of their needs. Additionally, limited access to important information from the partner company required assumptions to be made based on market benchmarks. Although this approach allowed the development of the project, it introduced a degree of uncertainty in the analyses and may limit the accuracy of the work. The Lack of Comparison was another limitation, as the externalization of this service is innovative and unique in the Portuguese market, and so there were no direct competitors or similar services available in the market to serve as benchmarks. This required this project to rely heavily on assumptions and predictions to estimate potential clients, pricing strategies and operational feasibility. As a result, the recommendations may require further validation through pilot testing or adaptations.

The Variability of gains given client portfolio also presents a challenge, as profit margins and gains are highly dependent on the overall portfolio of clients. Furthermore, Clients' resistance to the price may arise, especially if their cost savings seem to be negligible. This could result in negotiations and additional price adjustments, which may reduce Lusíadas' profitability.

It is important to note that this analysis depends heavily on the accuracy of the assumptions, such as the prescription-to-bed ratio and the pharmacists' rate of prescription review. Therefore, any variations in these expectations could affect the financial results and sustainability of the service. Similarly, the variability in client number and sizes influences the pricing model, as the additional costs that incurs from rounding up the total number of pharmacists that Lusíadas requires must be fairly distributed among all clients, which can be more challenging depending on various circumstances. To maintain financial sustainability and fairness, Lusíadas may need to adjust its pricing according to changes in its client portfolio.

Regarding gross profit margins**,** only labour costs were included in the feasibility study, while software licenses and mobile communications costs were disregarded when conducting the analysis. Finally, the working hours assumption restricted labor utilization calculations to 7-hours shifts with 1 hour rest per day. If a different shift model is adopted, the calculations need to be adapted accordingly.

9. Recommendations

Lusíadas should focus on targeting high-savings clients that, by adopting the service, would have high levels of cost savings. This will leverage Lusíadas's negotiating power, more successfully signing higher profit margin contracts. A strategy to attain this would be to prioritise clients with multiple facilities, since the latter are more likely to employ more pharmacists compared to if they had a centralised unit. When there are multiple units, to ensure full coverage in all facilities, a proportionally higher number of pharmacists is necessary. This results in relatively higher cost savings when adopting the RMRS. Conversely, low profit

margin clients must be reassessed, especially if these disrespect pre-established constraints. It is recommended that the gross profit margin should not fall below 10% whilst aiming to increase to at least 20%. During the launch phase, margins may be more conservative for client attraction until the skepticism barrier is broken. Additionally, to allow for reassessments, contracts must be revised yearly.

On Luisadas's side, cost savings can also be achieved through the use of existing group resources. Business support activities should be carried out by the already existing resources within the group, including administrative work, human resources and financial control.

Moreover, a flexible pricing model should be adopted to ensure profitability and client satisfaction. Prices should be tailored to align with the client's cost structure while also considering the overall impact on the client portfolio composition and the implications for Lusíadas' global profitability once the client is added to the portfolio. Furthermore, as a sturdy client portfolio is needed, it is recommended to establish a significant and diverse client base at launch. This starting base must be wide and diverse to ensure the best possible outcome for all parties, allowing for the spreading of costs between institutions resulting in better value for all clients.

Additionally, increased efficiency must be sought by improving support technologies like the Clinical Decision Support System. This maximises prescription review capacity and decreases the number of pharmacists required, increasing the profit margins. This highlights the need for a direct communication channel (chat) between all pharmacists employed by the service to share insights and medical knowledge, reduce errors and increase expertise.

Finally, to ensure service's legal protection, carefully developed service contracts must be devised detailing the responsibilities of each party, deliverables, information sharing requirements and means, confidentiality, IT security system responsibilities, yearly price revision, and just termination clauses.

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11. Appendix

Appendix 1: Overview of Interviews' Participants (see page 12)

Date	Age	Sex	Occupation
20/09/24	56	Male	Pharmaceutical Technical Director, Hospital Pharmacy
29/09/24	42	Female	Specialist Nurse in the Quality and Patient Safety Directorate
30/09/24	47	Female	Pharmacist Director
23/10/24	47	Female	Lawyer, Compliance Department
23/10/24	42	Female	Laywer, Legal Department
23/10/24	47	Male	Chief Information Security Officer, Technological Risk Department
22/11/24	48	Female	Laywer, Legal Department

Source: Author's illustration

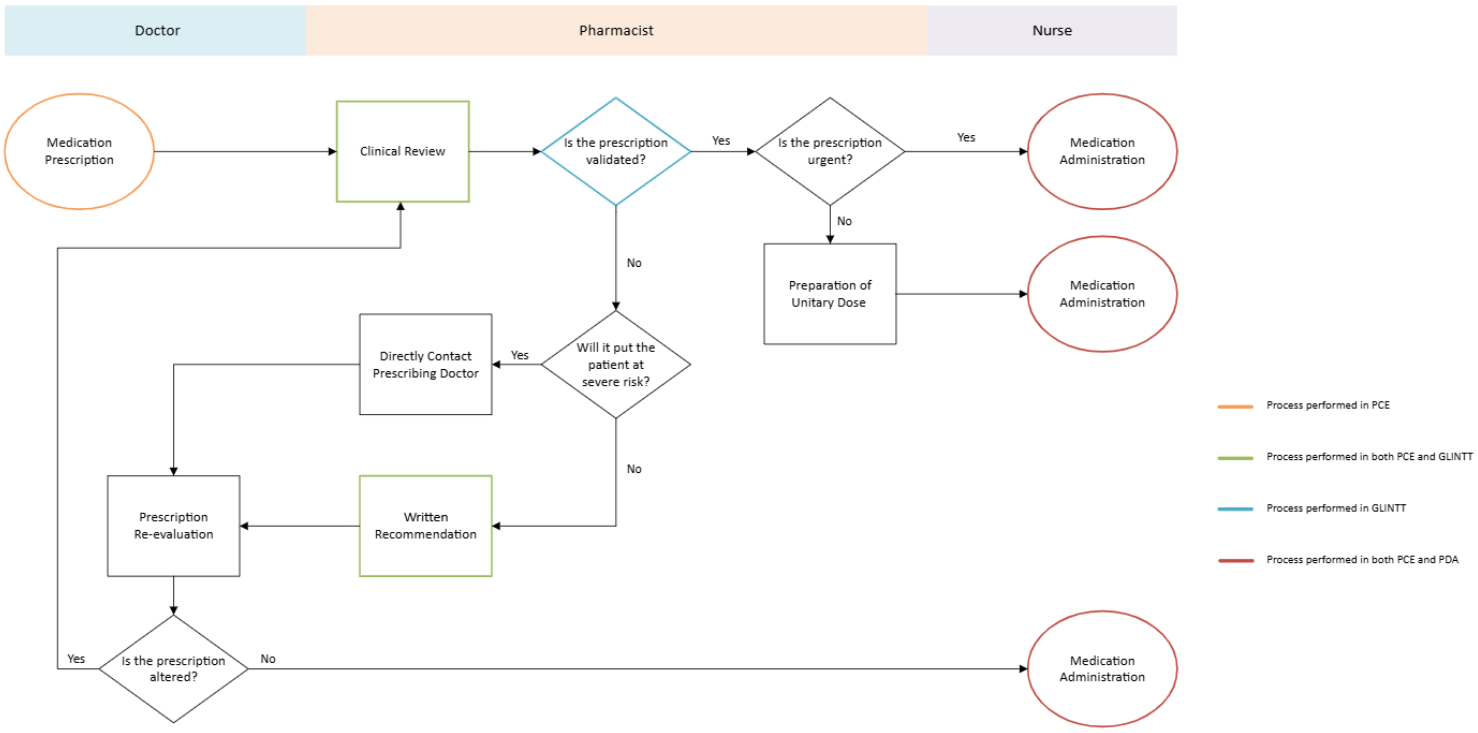
Appendix 2: Potential Initial Clients (see page 17)

Size	Name
Big	Grupo Trofa Saúde
Medium	Hospital de Loulé
Medium	Grupo Hospital Particular do Algarve
Medium	Hospital Cruz Vermelha Portuguesa
Medium	Hospital SAMS
Medium	Hospital de Santa Maria Porto
Medium	Hospital Nossa Senhora da Arrábida
Small	Clínica Particular de Barcelos
Small	Hospital da Mesericórida de Paredes
Small	Hospital da Prelada
Small	Hospital Particular de Almada
Small	Grupo Saúde Hospital Particular

Small: Less than 100 beds
Medium: Between 100 and 500 beds
Big: More than 500 beds

Source: Author's illustration

Appendix 3: Process Mapping (see page 29 and page 31)



Source: Author's illustration

Appendix 4: General Guidelines for RMRS' Pharmacists (see page 32)

Scope	Rule	Clause	Recommendation
Normal Weekly Work Duration	40 hours per week or 8 hours per day	**(Clause 17, No. 1)**	35 hours per week, or 7 hours per day
Work Week	5 days per week, with one mandatory rest day and one additional rest day (if the schedule allows).	**(Clause 23)**	-
Maximum Daily Work Hours	During a 6-month reference period: The daily work period cannot exceed 10 hours. Weekly work hours cannot exceed 48 hours.	**(Clause 17, No. 2)**	-
Daily Rest Period	There must be a minimum of 11 consecutive hours of rest between two consecutive work periods	**(Clause 18, No. 7)**	-
Shift Handover Time	-	-	Specific guidelines for handovers must need to be defined based on operational and personnel requirements.
Schedule Adjustments	-	-	Schedules should be based on a 4-week framework.
Public Holidays	Work performed during public holidays entitles employees to two compensatory rest days or a 100% increase on their pay for the work carried out on that day.	**(Clause 40, No. 1)**	-
Shift Pay Scope	Work performed between 11:00 PM and 8:00 AM is considered Nigh Work	**(Clause 21, No. 1)**	-
Shift Pay Allowance	Employees that perform shift work are entitled to a shift allowance: For rotating shifts with night work: 15% monthly pay increase.	**(Clause 39, No. 1)**	-
Overtime Work Scope	Overtime is any work performed outside the agreed work hours. & Overtime is limited to 200 hours per year.	**(Clause 24, No. 1) & (Clause 25, No. 1)**	-
Overtime Work Pay	Overtime pay is calculated as follows: 50% for the first hour or part thereof, and 75% for each subsequent hour on regular workdays.100% for each hour or part thereof worked on weekly rest	**(Clause 41)**	-

	days, supplementary rest days, or public holidays.		
Employee Benefits	A Meal Allowance for each working day and its value cannot be inferior to 6.10€. & A Holiday and Christmas allowance, both with the same monetary value as the worker's monthly salary + shift allowance. & An Occupational Accident Insurance	**(Clause 36, No. 3)**	-
Based on the provisions of the "Collective Labour Agreement between the Portuguese Private Hospitality Association - APHP and FESAHT - Federation of Agricultural, Food, Beverage, Hotel and Tourism Unions of Portugal" and some recommendations.			

Source: Author's illustration

Appendix 5: Lusíadas Saúde's annual number of prescriptions (See page 34)

Source: Grupo Lusíadas Saúde

Appendix 6: Cost Calculation per pharmacist (see page 36)

Category	Monthly	Anually
Base Salary	€ 1,400.00	
Sub-Total	**€ 1,400.00**	**€ 19,600.00**
Meal Allowance	€ 192.00	€ 2,112.00
Sub-Total with Meal Allowance	**€ 1,592.00**	**€ 21,712.00**
Single Social Tax	€ 332.50	€ 4,655.00
Accident Insurance	€ 15.92	€ 217.12
Total		**€ 26,584.12**

Source: Author's illustration

Appendix 7: Cost Structure of the RMRS (see page 53)

Category	Item	Cost (per employee)	Frequency
Fixed Costs	Salaries	30,251.77€	Annual
	Software Licenses	200 €	Annual
	Mobile Communication Plans	180 €	Annual
Variable Costs	Marketing and Communication	Variable	As needed
	Administration and technical support	Variable	As needed
Admission Costs	Computer and extras	1 270 €	One-time
	Cell phone	600 €	One-time

Source: Author's illustration