Assessing the Voucher Strategy's Impact on Surgery Waiting Lists

A network/regional context

Francisca de Magalhães Ramalho Arnaud Farinha

Thesis to obtain the Master of Science Degree in

Biomedical Engineering

Supervisor: Dr. Daniel Rebelo dos Santos

Examination Committee

Chairperson: Prof. Mónica Duarte Correia de Oliveira

Supervisor: Dr. Daniel Rebelo dos Santos

Member of the Committee: Prof. Teresa Sofia Cipriano Gonçalves Rodrigues

July 2021

Declaration

I declare that this document is an original work of my own authorship and that it fulfils all the requirements of the Code of Conduct and Good Practices of the Universidade de Lisboa.

Abstract

The Portuguese National Health Service has suffered from long waiting lists and times for elective surgery in the past decades. Being a universal access system, the demand for these services is extremely high and hospitals' supply is not sufficient to meet the demand, resulting in growing waiting lists. In 2004, a system of vouchers for inter-hospital patient transfers was created to improve the management of waiting lists. This system envisages the possibility for patients who are close to reaching a stipulated maximum waiting time to choose an alternative hospital with a lower waiting time. This choice is made from a list of hospitals attached to the voucher, which may include public or private hospitals.

The problem of long waiting lists is present in several publicly funded health systems. As such, different strategies or policies have been developed internationally to tackle this problem. The objectives of this dissertation are to develop a robust understanding of the types of waiting list management strategies existent, their effects and implications, and of the strategies used in the Portuguese health service and their points for improvement. For that, a systematic literature review of international evidence and a detailed national case study are developed.

The conclusions suggest a need to understand current reasons for patients' high rate of transfer refusals, such as possible socioeconomical inequities or lacking information to support their decision. Increasing capacity in public hospitals, incentives to comply with waiting time guarantees and better studying the validation of prioritisation guidelines used are also necessary.

Keywords: Waiting list management, Elective surgery, Health policy, Voucher system, Maximum waiting time guarantees.

Resumo

O Serviço Nacional de Saúde tem registado longas listas e tempos de espera para cirurgia electiva nas últimas décadas. Sendo um sistema de acesso universal, a procura destes serviços é extremamente elevada e a oferta não é suficiente para a satisfazer, resultando em crescentes listas de espera. Em 2004, foi criado um sistema de vales para transferências inter-hospitalares de pacientes para melhorar a gestão das listas de espera. Este sistema prevê a possibilidade de os pacientes quase a atingir um tempo de espera máximo estipulado, escolherem um hospital com um menor tempo de espera. Esta escolha é feita a partir de uma lista de hospitais que pode incluir hospitais públicos ou privados.

O problema das listas de espera está presente em vários sistemas de saúde públicos. Desta forma, várias estratégias foram desenvolvidas internacionalmente para este problema. Assim, os objectivos desta dissertação são compreender melhor os tipos de estratégias de gestão de listas de espera existentes, os seus efeitos e implicações, e as estratégias utilizadas no serviço de saúde português e os seus pontos de melhoria. Para tal, é desenvolvida uma revisão sistemática da literatura a nível internacional e um estudo detalhado do caso nacional.

As conclusões sugerem a necessidade de melhor entender as razões para recusas de transferência pelos pacientes, como possíveis desigualdades socioeconómicas e fornecer melhor informação para apoiar a sua decisão. Aumentar a capacidade nos hospitais públicos, os incentivos para cumprimento dos tempos máximos garantidos, e estudar melhor a validação do sistema de prioridade utilizado são também necessárias.

Palavras-chave: Gestão de listas de espera, Cirurgia programada, Políticas de saúde, Sistema de vales, Tempos máximos de resposta garantidos

Acknowledgements

I would like to deeply thank Dr. Daniel Santos and Dr. Mariana Oliveira, who have made this dissertation possible, and have helped me define this long, sometimes uncertain, path, discussing ideas and helping me overcome obstacles and difficulties.

I would also like to thank Professor Angel Ruiz and Professor Valérie Bélanger for sharing their knowledge and insights with me in the first steps of this journey.

To my family, a warm thank you for their support and patience throughout this long journey. To my mom and dad, Catarina and Henrique, for giving me the opportunities in life that have made it possible for me to carry this journey and achieve this important milestone; to my sisters, Marta and Sofia, to João, and to my grandmothers, Maria João and Ana, for always supporting me and understanding my absence during the last months; and to Benji, Maui, Fix and Shiraz, for always making me smile and helping me keep a perspective in life.

To my friends who have shared this path with me, and who have been there for the also needed more relaxed moments.

Finally, to Miguel, who has listened to my long discussions of this work so many times and has been with me in the happier and in the tougher times, and in all my big achievements.

To everyone involved in this path, a deep thank you.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

CAHS – Central Administration of the Health System

DRG – Diagnostic Related Group

EPE – *Entidade Pública Empresarial* (Public Enterprise Entity)

HD – Hospital of Destination

HO – Hospital of Origin

ICD – International Classification of Diseases

INE – *Instituto Nacional de Estatística* (National Statistics Institute)

LIC – *Lista de Inscritos para cirurgia* (Surgery Waiting List)

LVT – Lisboa e Vale do Tejo

MH – Ministry of Health

NHS – National Health Service

OECD - Organisation for Economic Co-operation and Development

OR – Operating Room

PHI – Private Health Insurance

PPP – Public-Private Partnership

RHA – Regional Health Administration

SIGA SNS – *Sistema Integrado de Gestão do Acesso no SNS* (NHS Access to Healthcare Integrated System)

SIGIC – *Sistema Integrado de Gestão de Inscritos para Cirurgia* (Integrated Management System for the Surgery Waiting List)

SIGLIC – *Sistema Informático de Gestão da Lista de Inscritos para Cirurgia* (Computer System for the Management of the Surgery Waiting List)

SPA – *Setor Público Administrativo* (Public Administrative Sector)

SV – Surgery Voucher

TMRG – *Tempo Máximo de Resposta Garantido* (Maximum Guaranteed Response Time)

TN – Transfer Note

UGA – *Unidade de Gestão do Acesso* (Access Management Unit)

ULGA – *Unidade Local de Gestão do Acesso* (Local Access Management Unit)

URGA – *Unidade Regional de Gestão do Acesso* (Regional Access Management Unit)

1 Introduction

The focus of this work is the management system of elective surgery waiting lists in the Portuguese National Health service (NHS), and the current strategies used to reduce waiting times. In this chapter the contextualisation and motivation to study this problem is described in section 1.1, whereas the goals of the dissertation are defined in section 1.2. In turn, section 1.3 gives an overview of the methodological approach followed to achieve those goals and finally, section 1.4 describes the structure followed by the dissertation.

1.1 Problem Background and Motivation

The Portuguese health system is composed by the Portuguese NHS and a network of private for-profit and social sector hospitals, which provide secondary and primary care. The NHS was set on the basis of a Beveridge model, being mostly tax funded and providing public universal health care to all Portuguese citizens, mostly free at the point of care.

Like in most publicly funded healthcare systems [1], the NHS suffers from a problem of long waiting lists and waiting times for elective surgery services. Long waiting times can lead to possible deterioration of patients' health condition and have received significant media attention since they are perceived as a consequence of poor management of the system. The *Sistema Integrado de Gestão de Inscritos para Cirurgia* (SIGIC) system was implemented in 2004 to improve the management of surgery waiting lists after a series of other projects consistently proved not to be sustainable options for long term management of waiting lists. Contrary to these programmes, SIGIC was able to significantly reduce waiting times and waiting lists, as well as significantly increase production in the first few years of activity [2]. The main concepts introduced by SIGIC are the use of additional extra-paid activity to increase production, the possibility of patient choice of being transferred to an alternative NHS or privately contracted hospital through a system of vouchers, and the establishment of maximum waiting time guarantees (*Tempos Máximos de Resposta Garantidos*, TMRGs) [3]. Hence, the possibility of patient choice is only given when it is plausible that the hospital will not be able to comply with the established TMRG (that is, at a certain percentage of the TMRG). Furthermore, prioritisation guidelines were also implemented, being patients ordered in the waiting lists according to four urgency categories.

Nonetheless, some issues are also identified in the operation of the NHS regarding surgical activity. First, despite the initial reduction in waiting times prompted by the implementation of SIGIC, waiting times have later stopped decreasing, showing a slightly increasing trend in recent years, and waiting lists are longer each year. Additionally, there are relevant waiting times variabilities between NHS hospitals, and a significant percentage of patients in waiting lists - 32,1% in 2019 - are breaching the TMRG [4]. The expected objectives of the transfer system include the reduction of both of these factors, being important to understand why this is occurring. One of the reasons that may contribute to this is the low proportion of patients actually accepting transfers, which in 2019 was only 18,8%. Other reasons may also exist for the lack of improvements in the past years, which need to be better studied. Additionally, other substantial discrepancies exist, such as the large unbalance between the number of

patients transferred to NHS and to private contracted hospitals, being the later significantly higher. Additionally, this unbalance is especially large in some regions, which may not be sustainable for the NHS. Approximately 5% of NHS patients are operated in private hospitals. However, this number increases to 22,1% in the Algarve region, whereas in Norte and Alentejo, for instance, it is close to, or below 2% [4].

As such, a deeper understanding of these issues is necessary so that they can be improved and the changes sustained. The following sections describe the main goals of the dissertation, the research methodology followed to attain these goals, and the structure of the dissertation.

1.2 Dissertation Goals

Given the motivations mentioned above for the study of this problem, it becomes important to better understand the implications of the strategies implemented by SIGIC to manage waiting lists. As such, one of the objectives of this dissertation is the identification of issues affecting the efficacy of SIGIC. Similarly, basing the discussion of these implications on evidence-based findings of relevant health systems research literature that addresses the same problem can generate valuable and robust conclusions and possible solutions for the issues identified. As such, the second main objective of this work is to identify other strategies used internationally for the management or reduction of waiting lists or waiting times, as well as their possible positive and negative effects and implications. For that, it is necessary to provide a robust systematic literature review of health systems empirical research that focuses on the implementation and use of system-wide strategies to improve the management of elective surgery waiting lists or reduction of respective waiting times.

Hence, the findings of both the Portuguese case study and the international evidence can then be linked to reach relevant and robust conclusions. As such, the main contributions of this dissertation are the following:

1. Providing an updated and structured systematic literature review on the topic of elective surgery waiting list management strategies.
2. Identifying possible approaches or solutions to the improvement of problems identified in the case study.
3. Identifying topics related to the SIGIC strategies that require and would benefit from further and extended research.

Despite the fact that this work focuses on the Portuguese case of SIGIC, it is important to note that its contributions, namely the systematic literature review, can also be used and adapted to study waiting list policy questions in any other healthcare system that is faced with the same problem, since all types of system level strategies and all types of effects are included.

1.3 Research Methodology

As mentioned in the previous section, this dissertation focuses on an assessment of the strategies used in the NHS to improve waiting list management and waiting time reductions. The methodological

approach followed by this dissertation is in line with this and with the goals described in the previous section. As such, the methodology followed in this work is based on a qualitative analysis that consists of the development of a systematic literature review with the objective of summarizing and synthesizing the international literature regarding elective surgery waiting lists, and of the report of a detailed case study regarding the institutional setting of the NHS and the operation and processes that encompass SIGIC.

First, the systematic literature review is developed using the databases PubMed and Web of Science Core Collection and the remaining research protocol described thoroughly in chapter 3. The respective findings are then reported in a comprehensive and structured way. The development of a systematic literature review is essential to understand and provide evidence-based conclusions regarding waiting list management strategies.

Second, the case study is based on robust data collection and document analysis, from various sources. This step is intended to provide a complete understanding of the institutional setting of the Portuguese health system and the NHS, as well as of the strategies used by SIGIC to manage elective surgery waiting lists in the NHS, and their possible issues and implications.

The last step consists of a qualitative discussion that links the evidence-based findings of the two previous steps to provide valuable conclusions. Nonetheless, these steps are detailed in chapter 3.

1.4 Structure of the Dissertation

The remaining of this dissertation is structured in six chapters:

Chapter 2, Problem Definition, provides the description of the waiting list problem, including its causes and characterisation.

Chapter 3, Methodology, details the research methodology followed in this work. This includes a thorough description of the research protocol used to perform the systematic literature review, including the databases used, search terms, inclusion and exclusion criteria, among others. Additionally, the documentation used to report the case study is also enlisted and described.

Chapter 4, Systematic Literature Review, presents the results obtained with the previously described research protocol. As such, the characteristics of the articles included in the review are first reported, followed by the report of the literature review findings, that is, the waiting list management strategies identified and their possible effects and implications. Furthermore, these strategies are organised according to whether they act mainly on the supply or on the demand of elective surgery, or, alternatively, directly on waiting times.

Chapter 5, Case Study, provides an overview and organisation of the NHS and its hospitals, as well as the levels of surgical production and demand in total and per region. Additionally, currently practiced NHS waiting times are depicted, and the funding model of NHS hospitals is described. Afterwards, the operating model of SIGIC is described, and the normal surgical patient flow from referral to secondary care until closure of the episode after surgery is detailed, including the definition of TMRGs and

thresholds for surgery booking. The processing of patient transfers in the context of SIGIC is then described, also specifying the billing process of transfers.

Chapter 6, Discussion, links the findings of the literature review with the issues identified in the case study, in order to discuss possible improvement approaches and novel research topics for certain SIGIC and NHS components that could benefit from additional assessments.

Chapter 7, Conclusions, concludes the dissertation by presenting the main findings, additional considerations, and prospects for future research.

2 Problem Definition

The demand for healthcare services has been rising in the past decades in Portugal as well as throughout the world, including surgical, consultation, diagnostic exams, among other services [4], [5]. Factors related to this widespread rising tendency include population growth, the ageing of populations due to higher life expectancy, changing socioeconomic contexts, the development of new health technologies and thus new treatment possibilities, or decreased thresholds for treatment eligibility [6]. On the other hand, the supply for healthcare services is not always sufficient to meet demand. Insufficient supply is strongly related to shortage of resources, such as beds, operating rooms (ORs), surgeons, nurses, anaesthetists, among others. However, it is also the result of inadequate strategical planning and system inefficiencies. This is discussed in further detail in chapter 4.

When the supply for healthcare services does not adapt to the demand, a mismatch between supply and demand arises and waiting lists are formed [5]. Additionally, the uncertainty and randomness of patient arrivals in waiting lists further hinders the demand-supply balance management process. Long waiting lists have been a rising concern in health systems throughout the world, especially in those with universal publicly funded healthcare, where demand is especially high and waiting lists have a rationing role [1]. Moreover, these systems are also frequently under cost and resource restrictions, which results in lower supply levels. Long waiting lists generally result in long waiting times for patients, which lead to patient dissatisfaction and possible deterioration of patients' health [6]. This represents one of the greatest concerns related to the presence of waiting lists to society and thus to policy makers, since patients are primary stakeholders in the treatment process and in health systems, being their perspective and satisfaction one of the most valued aspects in healthcare. In addition to health-related costs for patients, longer waiting times can also result in additional costs for the health system or facility due to additional consumption of resources during the waiting period or to the possibility of patients balking [6].

As mentioned, the presence of waiting lists is shared by several countries and healthcare areas. This thesis focuses on the case of the surgical services in the Portuguese NHS, where the unbalance between demand and supply and the presence of long surgery waiting lists have been constant and marked in the past years [4]. The evolution of demand and supply for surgeries in the NHS in the last decade can be seen in Figure 1. The figure shows a growth both in demand, number of entries in waiting list, and supply, number of NHS patients operated. However, there is also a clear gap between demand and supply volumes. This translates into long surgical waiting lists for NHS patients that have been growing each year, as seen in Figure 2, and waiting times that reach several months. To hone the management of surgery waiting lists in the NHS, the integrated system SIGIC was created, and maximum waiting time guarantees are currently established [3]. To better enforce these guarantees, a system of vouchers that allow transfers of patients between hospitals, including to private hospitals, and the use of extra, additionally funded, OR time are in practice [3]. A detailed description of the operating model of this system and of the current surgery waiting list situation in the NHS is given in chapter 5.

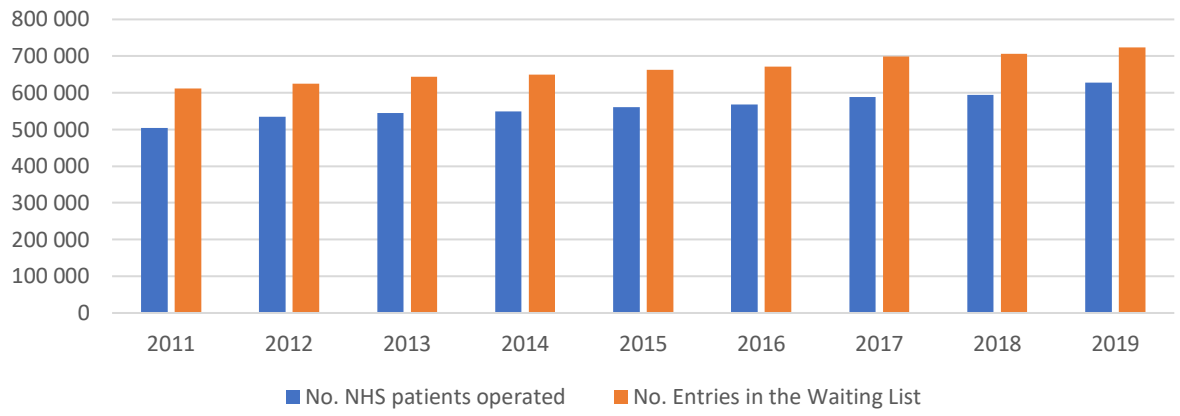

Figure 1 - Evolution of the number of patients operated and number of entries in the waiting list. Adapted from [4].

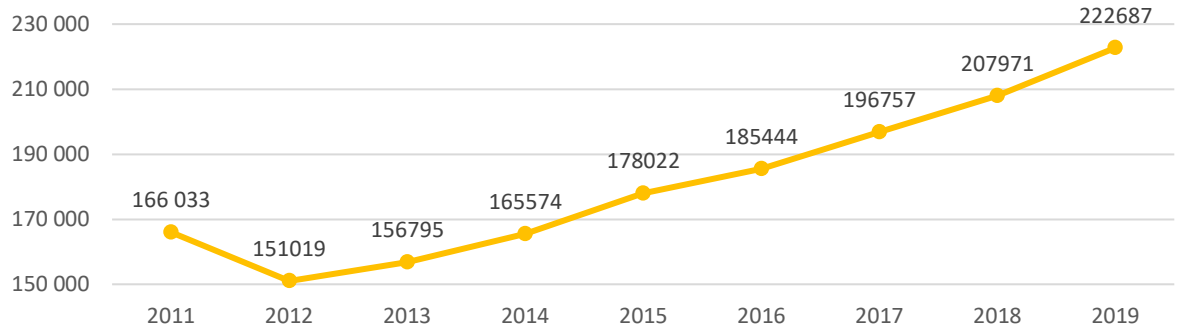

Figure 2 - Evolution of the number of patients in NHS hospitals waiting lists. Adapted from [4].

Internationally, several different strategies and policies are used by health systems to tackle the waiting list problem [5]. On the supply side, the strategies used generally act on healthcare providers and aim at increasing capacity through various ways and improving the efficiency of waiting list related processes [1]. These include increasing fixed public capacity, increasing capacity using private or international capacity, increasing productivity through incentives, among others. On the contrary, demand side policies have the objective of rationing demand through increased thresholds for treatment eligibility, prioritisation strategies, or providing subsidies to the population for private health insurance uptake [1]. In practice, governments often combine different strategies, both on supply and demand side, to obtain more effective outcomes. Additionally, the establishment of maximum waiting time guarantees are also extremely common in several health systems, impacting both supply and demand [1]. Nonetheless, various approaches are possible, and several different strategies can be used to enforce the guarantees.

With this plethora of possible strategies to improve the management of waiting lists, it becomes of extreme relevance to analyse in detail the Portuguese strategy and to study the characteristics and effectiveness of other strategies implemented internationally through a thorough literature review. The final objective of this work is to understand how the Portuguese strategy differs from those implemented internationally and identify possible areas of improvement, so that evidence-based recommendations for policy makers in the NHS can be achieved. In order to attain the proposed objectives, the following chapter provides the methodology followed in this work, namely the framework to be used to perform the literature review.

3 Methodology

This chapter presents the methodology followed in this work to reach the objectives previously proposed. In section 3.1, an overview of the methodological approach is presented. Section 3.2 details the search strategy and the selection of studies to be included in the literature review, while section 3.3 describes the methodology for the data collection for the development of the case study. Finally, section 3.4 concludes the chapter.

3.1 Methodological Approach

The main objective of this work is to study and assess the impact of SIGIC strategies on the surgical activity of the Portuguese NHS by collecting data and analysing it to obtain valuable conclusions, ultimately providing insights and suggestions for the improvement of the efficacy of SIGIC.

Due to the lack of quantitative data to perform a robust quantitative analysis, to attain this objective, a qualitative research based on published information regarding surgical activity in the NHS, as well as on international literature on the topic of surgical waiting list management is performed. The objective of a qualitative research is to obtain a more in-depth level of information rather than numerical representations to understand the many aspects of the studied problem [7]. It is thus considered by many researchers an added value when dealing with complex systems, being a valuable method for the generation of hypotheses and moving towards explanations for the research questions [8]. Additionally, qualitative research can, in many cases, lead to a quantitative research for a question raised in the qualitative study. In the healthcare field, due to the stronger emphasis given on the patient perspective, it has become more common and qualitative methods are now often used to approach policy or programme evaluations, and studies of complex healthcare systems [9]. The potential for qualitative research to identify relevant questions that are only possible to identify when a detailed description and understanding of the problem are present can be very beneficial in this field. However, qualitative research methods also have some limitations that should be kept in mind when performing one so that they can be minimized. One of the issues pointed out in the literature is their higher level of dependency on the author's perspective compared to quantitative methods, which is a reason why a strong knowledge basis achieved through rigour and systematic analysis of the information is essential [8]. Additionally, one of the main disadvantages reported is the difficult generalization of the research findings to a wider population compared to quantitative approaches [10].

As such, the methodology followed in this work is divided in three steps: (1) a systematic literature review of the subject under study, (2) the case study, and (3) an analysis of the information retrieved. Figure 3 summarizes these steps and the main components of each one.

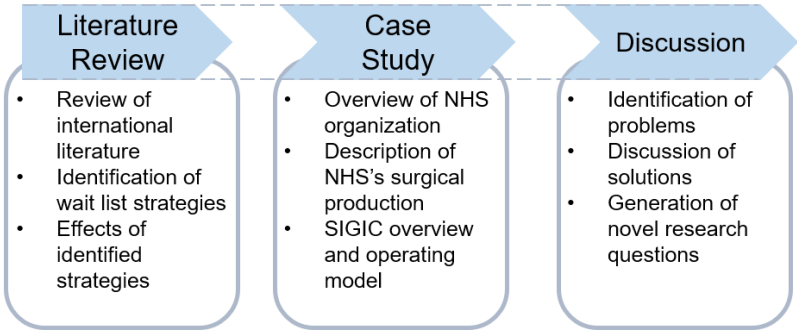

Figure 3 – Schematic representation of methodological approach

The first step consists of a literature review of the topic under study. A literature review is a crucial feature of the research process, providing information of the existing work on the topic and identification of knowledge gaps. International literature is reviewed concerning health policy strategies for the management of waiting lists and reduction of waiting times for elective surgery and their successfulness. This is presented in chapter 4.

The second step, the case study, provides an overview of the Portuguese NHS, its surgical activity, the operation model of SIGIC and its voucher system. The case study represents a critical step in a qualitative study due to the numerous sources of information and flexibility, which enable the generation of hypotheses and the reformulation of the problem. The case study is presented in chapter 5.

The last step, presented in chapter 6, consists of the analysis and discussion of the information retrieved, with the insights gained from the case study and the literature review as working basis. The objective of this discussion is to depict the problems identified in the case study and discuss possible solutions acknowledged during the literature review, as well as possible strengths identified in the Portuguese system. After this extensive analysis, suggestions and guidelines are provided based on the evidence-based observations made, aimed at improving the effectiveness and efficiency of the SIGIC programme.

The following section describes the methods used to conduct the systematic review of literature as mentioned above.

3.2 Literature Review Methodology

A literature review is an essential step in an academic research. It provides knowledge and findings of previous work, exposes knowledge gaps on the topic under study, and enables testing of hypotheses or developing new theories [11]. In this work, a systematic literature review is conducted with the aim of synthesizing the existing evidence on the subject of surgical waiting time reduction or waiting list management. Due to the growing importance given to evidence-based practices not only in medicine but also in public policy, systematic reviews have gained great relevance in this field [12], [13]. Systematic literature reviews have the advantages of being less propense to misleading evidence than individual studies, and being rigorous and transparent [12].

According to Xiao and Watson [11], a literature review conventionally consists of eight steps: (1) formulate the research problem or question, (2) develop the review protocol, (3) search the literature,

(4) screening the literature retrieved for the inclusion criteria, (5) assess the quality of the selected literature, (6) extract data, (7) analyse and synthesize the data, and (8) report the findings.

The literature review developed in this work concerns international literature regarding governments' strategies or initiatives to tackle long waiting times or waiting list management. Therefore, in accordance with the first step stated above, two research questions to be considered in this review were formulated: (1) "*What strategies are used internationally by governments or other regional authorities to improve the management of elective surgery waiting lists or reduce waiting times?*" and (2) "*What are the effects of employing those strategies?*". With the research questions in mind, it was then possible to design the review protocol, which is developed throughout this section.

To search the literature, the databases PubMed and Web of Science Core Collections were accessed. These databases are considered valuable principal search systems for systematic reviews and have a large coverage of healthcare related literature [14], hence being appropriate for the objectives of this review and for the current research questions. After the choice of databases to consult, it is necessary to define the search terms to be used to retrieve the most relevant literature. The search terms used in this review consist of a combination of free text terms and controlled vocabulary using MeSH terms (in PubMed), identified in accordance with the research questions. On the one hand, controlled vocabulary is a powerful tool since these terms allow for more efficient searches through the identification of literature that may not use the exact terms searched in free text. On the other hand, free text terms allow for more flexibility in the search, and the identification of literature that may not be indexed yet or that may be under discontinued indexing.

The definition of search terms was done iteratively, making adjustments and identifying new terms based on the results different searches retrieved. Free text terms were first identified using terms related to waiting lists and waiting times, elective surgery and respective variations using wildcards and truncation. Additionally, terms related to health policy, strategies, reforms, health systems, among others were also identified and combined with the former using Boolean operators, namely AND, OR and NEAR, to form the search queries as presented in Appendix A. MeSH terms were then identified by searching the MeSH database, as well as by identifying terms that commonly index relevant papers on the topic [15]. In the case of Web of Science, since MeSH vocabulary cannot be used, the terms identified were also used to identify new free text terms. Furthermore, due to the large quantity of manuscripts retrieved initially, other terms that related to literature that was not relevant for the study, as detailed below, were later added to the queries using the NOT operator to exclude them. All terms identified were searched in abstracts, titles, and keywords.

After retrieving the literature, the next step consisted of screening the citations retrieved. The inclusion criteria considered were the following:

- Articles regarding the use of at least one wait time or wait list management strategy
- The strategy or strategies analysed must be directed at elective surgery
- The strategy or strategies must be designed for national or regional contexts
- Articles from the databases PubMed or Web of Science Core Collection

- Articles published between 1st January 2000 and 31st May 2021
- Articles published in English or Portuguese

Despite the definition of explicit inclusion criteria, after overviewing the range of literature obtained, it was also necessary to define some exclusion criteria. As such, the exclusion criteria considered were the following:

- Articles that do not report effects of the strategy studied
- Articles that are not directly related to the improvement of waiting time or waiting list management
- Simulation models or other type of study design that does not analyse empirical data
- Articles focusing on elective transplantation, oncology, gynaecological or dental surgery
- Studies regarding the Portuguese system
- Letters, News or Conference proceedings articles

Simulation models were excluded because the objective of this review is to report outcomes of strategies employed in real settings. Similarly, articles that study features of the Portuguese surgical waiting list management system were excluded to avoid duplication of information because another objective of this review is to focus on international strategies, since the Portuguese setting is explored in this dissertation's case study (see chapter 5). Regarding elective transplantation, oncology, gynaecological or dental surgery, this literature was excluded because the management of these surgical specialities is often done separately from other specialities, namely having specific hospitals or isolated departments or management, or being performed in urgency contexts.

Therefore, the screening of all citations retrieved with the search strategy stated was performed in three main stages: first, all duplicate manuscripts were excluded; second, abstracts were screened to eliminate clearly irrelevant articles; third, full-text screening was undertaken for the more specific inclusion and exclusion criteria. Additionally, forward and backward citations of the final manuscripts included were also used to obtain an additional set of articles. A flow chart representing these stages of screening and the final number of articles obtained is presented in section 4.1.

The next step in a literature review is quality assessment of the studies retrieved. In this case, since the databases searched are peer reviewed, it was assumed that the studies included had sufficient quality. As such, the information was then analysed and synthesized, being the findings of this literature review reported in chapter 4.

The following section describes the methodology used for the collection of data for this work's case study taking into consideration the methodological approach chosen and the analysis to be done, as described previously.

3.3 Case Study Data Collection and Selection

Since the case study is an important feature of this work, the methodology used to develop it, which consists of an extensive document analysis, is described in this section. An adequate data collection

and examination methodology is essential for any analytical method. As pointed out by Bowen [16], qualitative research especially requires robust data collection methods so that the researcher can develop a deep understanding of the studied problem. In this work, data is collected through the analysis of documents from several sources that allowed the generation of theoretical and empirical knowledge about the SIGIC programme and its operation, in particular the voucher system.

The use of document analysis as a research technique is common in qualitative studies and is often used in combination with other techniques or as a single technique [9]. In fact, documents are considered a valuable tool for the development of understanding and insights regarding the problem under study, often also providing quantitative data. The information retrieved can suggest new research questions or subjects that need to be analysed, provide a background, and produce knowledge. The collection of data through documents can provide, for instance, the regulation of a system's operation even though in practice the system may not be behaving in respect to that regulation, or it can provide insights of what practices/activities of the system are being studied or if their analysis is being neglected when there is a gap of information about them.

Nonetheless, it is also important to take into consideration that documents may not always provide precise and complete information, meaning that the researcher needs to analyse them from a critical viewpoint [16]. Additionally, during the process of data collection and selection, it is important to use different sources of information so that the findings of the research can be corroborated across the different sources and the risk of bias can be reduced [16]. As such, the documents here analysed were retrieved from several different sources and included several types of documents, such as regulatory information, audits, quantitative data documents and interviews:

- SIGIC Operation Manual [3] – provides the main regulations of SIGIC, including the processing of transfers, the billing process, the administrative and clinical actions in each of the surgical patient's flow stages.
- Portuguese legislation and regulatory documents [17]–[21] – including all *Portarias* (Portuguese legislative documents) that regulate TMRGs, prioritisation categories, and payment models.
- NHS Programme-contract specifications for 2020 [22] – provide information on the calculation of yearly NHS hospital budgets (in this case for 2020) and respective incentives and penalisations.
- NHS 2019 Access Report [4] – provide quantitative data regarding the surgical production of NHS hospitals and regions, waiting times, and other elective surgery related indicators.
- National Statistics Institute (*Instituto Nacional de Estatística*, INE) data [23] – provides regional level data regarding capacity and resources in the NHS and private sector.
- Audit from *Tribunal de Contas* (Portuguese Court of Audits) [24] – provides an assessment of access to healthcare in the NHS between the years 2014 and 2016.
- Health Regulatory Entity study of SIGIC [25] – provides an assessment of access to surgical services in the NHS in the context of SIGIC.
- SIGIC patient interviews study [26] – provides a study of patients' reasons for refusals of transfers based on interviews to refusing patients in the context of SIGIC in 2008.

3.4 Chapter Conclusions

The choice of a methodology for a research can determine its quality, results, and conclusions, being essential for any work to identify an appropriate methodology. The objective of this work is to perform a qualitative assessment and discussion of the impact and adequacy of the voucher system in the NHS surgical activity, in light of current international evidence of successfulness of wait list management strategies. It intends to provide a deeper understanding of the system's operation and behaviour, thus providing suggestions for policy makers to improve the efficacy and efficiency of SIGIC and raising novel questions for future research. The methodological approach taken is in line with this objective, using qualitative research techniques to establish a robust theoretical and empirical knowledge basis.

The use of a systematic review of literature is a powerful method to draw evidence-based conclusions on a particular topic due to its rigour, transparency and reproducibility. In this work, it provides a comprehensive synthesis of existing evidence regarding international elective surgery waiting time or waiting list management strategies so that these findings can afterwards be discussed and combined with those of the case study. The development of a sound research protocol is essential to achieve these objectives, selecting adequate databases and search terms for an effective and efficient search strategy, as well as defining objective inclusion and exclusion criteria.

The basis for the collection of data to develop the case study in this work is document analysis which is an extremely important tool in a qualitative study, being able to provide large quantities of information, both qualitative and quantitative. By using different types of documents, different types of information can be retrieved. As such, the documents analysed in this work include objective qualitative information such as the SIGIC manual or legislation documents, as well as quantitative documents (access reports and NHS website), and critical documents (audits and other studies). The document analysis must be done keeping in mind that data is not always precise or complete, which is why it is necessary to maintain a critical point of view when analysing the documents, and to use multiple sources of information.

The following two chapters present the results and findings obtained in this work through the methodology defined, making analyses using the data collected. First, chapter 4 reports the findings of the systematic literature review conducted, and last, chapter 5 presents the case study developed.

4 Results of the Systematic Literature Review on Waiting List Management Strategies

As the previous chapter outlined, one of the main components of this work is a systematic review of literature concerning waiting list management strategies for elective surgery. The present chapter reports the findings of the literature review performed following the protocol presented in section 3.2. First, section 4.1 details the results obtained with the selected search strategy, including number of articles included in the review as well as their characteristics. Next, sections 4.2, 4.3 and 4.4 describe the types of strategies used to manage elective surgery waiting lists, acting on the demand-side, supply-side and directly on waiting times, respectively. Finally, section 4.5 presents the conclusions with a summary of the findings of the systematic literature review undertaken.

4.1 Article Characteristics

As mentioned, study selection was performed in three stages: deduplication, abstract screening and full-text screening. This process and the number of records obtained in each stage is represented graphically in a flow diagram in Figure 4. Database searches yielded 911 records and an additional 10 manuscripts were retrieved through forward and backward citation searches, using Google Scholar. After deduplication, 722 unique records were screened through abstract and title. Of these, 513 citations were eliminated, and 209 full-text records were assessed for inclusion and exclusion criteria. Based on full texts, a further 125 citations were eliminated, and 64 manuscripts were eventually included in the review.

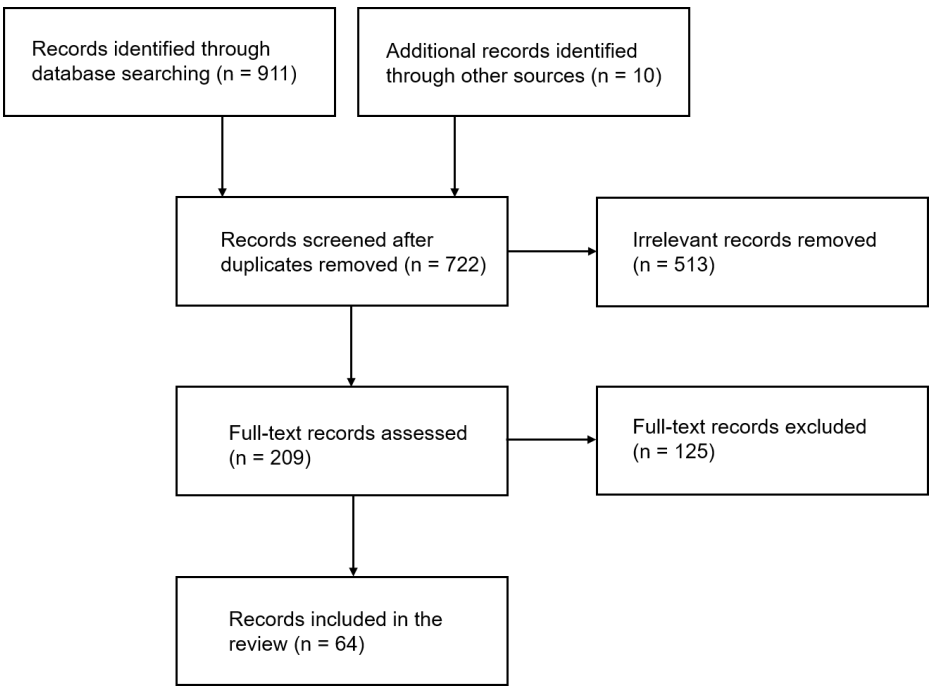

Figure 4 - Flow chart of the systematic literature review results.

Data extraction of the included studies was then carried out using standardized categories to be extracted from all studies. These categories were defined in accordance with the review's objective and included strategy studied, outcomes measured, country, and speciality. Since studies on this subject vary significantly in terms interventions, populations and design, findings are reported qualitatively and in a descriptive way instead of a formal statistical analysis. As such, after analysing and synthesizing the data extracted, findings were reported under a realist approach, being the theory behind each strategy and its intended objectives defined before reporting the experienced outcomes identified [27].

The 64 studies included used both quantitative and qualitative as well as mixed-methods methodologies and were mainly observational studies. The most frequently studied waiting list or waiting time management strategies were waiting time guarantees (n=12), increasing patient choice (n=9), increasing thresholds for surgery eligibility (n=9), and prioritisation tools (n=8). Other strategies were also identified, as further described in the following sections. The specialities and procedures studied were commonly those associated with high patient volumes, such as hip and knee replacement or cataract surgery, although there was also high variability. Regarding country, most studies were from Organisation for Economic Co-operation and Development (OECD) countries and with publicly funded health care, even though there were no criteria for exclusion regarding country. Of the 64 studies, 12 were from New Zealand, 10 from England, 7 from Canada, 6 from Norway, and the remaining were from Australia, Sweden, Italy, Scotland, Denmark, and the Netherlands.

The following section presents the findings and information retrieved from the selected studies regarding the objectives of the waiting list management strategies identified and their outcomes, dividing the types of strategies according to whether they act mainly on the supply, demand or waiting times for elective surgery.

4.2 Waiting List Management Strategies

Waiting lists and waiting times for elective care have been a significant concern for many countries, especially those with publicly funded universal health systems, such as Portugal [1], [28], [29]. This is due to these systems' characteristic universal access which leads to extremely high levels of demand, combined with the fact that governments try to holdback health expenditure which is often linked to capacity deficits. The demand for healthcare has been rising in the past decades, which can be attributed to several factors such as ageing population, changing socioeconomic factors, increased health needs, new health technologies or decreased thresholds for treatment eligibility [6]. This increasing tendency in demand is widespread and aggravates the problems in the management of waiting lists. As a consequence, an imbalance between demand and supply arises, in which the supply is insufficient to meet demand due to lack of capacity and system inefficiencies. This leads to the rise of waiting lists and longer waiting times. Although the existence of waiting lists is generally considered necessary to ration the demand for health services (when patients do not need to pay for care), it can also result in dissatisfaction and possibly deterioration of the patients' health.

To tackle this problem, several types of waiting list management strategies exist and the literature on the subject is diverse, addressing different strategies and using different approaches. Several authors

distinguish waiting list reduction strategies between supply or demand side strategies. This differentiation is based on whether the policy used acts mainly on the demand for the health services, which corresponds to the patients seeking care, or on the supply of the services, that is, the healthcare providers. Additionally, waiting time guarantees act directly on waiting times, affecting both demand and supply [6]. In practice, governments often combine different strategies, both on the supply and demand side, in order to obtain more effective outcomes. In this chapter, each of these strategy groupings is addressed in each of the following subsections.

4.2.1 Supply Side Strategies

Strategies that act on the supply of health services are generally applied when it is considered that the volume of public surgical production is insufficient [1], [6]. Thus, they consist of increasing the supply through various ways, including increases in capacity or in activity. According to Kreindler [28], countries that do not have significant waiting time issues usually pay providers according to the volume of treatments and avoid large cost restrictions, showing the relevance of applying effective supply management strategies. Some of the most common policies used by governments are increasing funding to public health providers (hospitals) and increasing hospital productivity [6], however, other supply side strategies are used, as described below.

Increasing hospital productivity by funding extra activity

Increasing activity through additional funding is one of the most direct ways of increasing supply of treatment. The additional funds can be used for instance to increase hospital capacity or staff with the ultimate objective of increasing the number of surgeries provided and thus, reduce waiting times.

Many early policies to reduce waiting times consisted on short-term funding of extra activity to increase capacity of public systems, under the assumption that resolving the backlog is sufficient to resolve long waiting list problems [6], [28]. However, these short-term bursts of funding consistently decreased waits initially but returned to the same or higher levels shortly after [6]. Nonetheless, when extra activity funds are provided long-term, which has now been implemented in several countries, it has been shown that they can effectively reduce waiting times [30], [31]. A specific model of extra activity funding that has been especially successful consists of conditional funding of both extra activity and reduced waits [1], [28], [31]. This has been used in several countries, such as Canada, England, or Spain. However, it is important to note that one of the requirements for these strategies to succeed is that the providers who receive and manage the funds have sufficient capacity to increase their activity and use the additional funding efficiently [28], [31]. In order to guarantee this, governments can require that providers show they have sufficient capacity before providing funds [32].

Increasing productivity by using activity-based financing

Activity-based payment is a strategy that surged to replace retrospective cost-based payments or block budgets to hospitals. It consists of paying providers by case treated, usually based on pre-established Diagnostic Related Groups (DRGs) pricing. When hospitals are paid retrospectively based on actual costs, there are little or no incentives to efficiency, especially if there is debt rebate, as the revenue is

the same independently of the volume produced [33]. On the contrary, under activity-based budgets, higher productivity leads to higher revenue. Hence, providers are incentivised to increase their productivity which in turn should result in shorter waiting times and lists. In fact, activity-based financing is now used in most developed countries [34].

Several studies have analysed the impact of activity-based payments in providers' activity [33]–[36]. In general, there seems to be strong evidence that this strategy in fact leads to higher activity levels [1], [28], [33]. One Italian study found that an increase in the DRG pricing of a subset of DRGs lead to increased surgery volumes of the affected DRGs [33]. However, there is no strong evidence of possible effects on reduced wait times. According to Siciliani et al. [6], who review strategies in OECD countries, activity related payment has been successful in increasing productivity, but does not necessarily reduce waiting times, even though it is frequently combined with other strategies, such as provider choice, producing successful results. Nonetheless, in the Netherlands, the replacement of fixed budgets by activity related hospital budgets led to a remarkable reduction of waiting times of close to 50% in the first years of the reform, however there was also a large increase in hospital care expenditure in the country [37]. One of the main issues with DRG related payments is that they may create unintended incentives in attracting patients of more profitable DRGs. A Norwegian study analysed the effect of activity-based payments in DRG cream skimming, that is, selectively treating more profitable patients [35]. The authors verified the presence of this effect in most of the DRGs analysed. Additionally, the presence of DRG-creep, the effect of providers deliberately shifting patients' reported DRGs to more profitable DRGs, has also been identified [1].

Reforming contracts of specialists

Being specialist physicians one of the main stakeholders in elective surgery provision, their impact on the length of waiting times and lists is crucial. Thus, making changes to their contracts linked to wait time reductions can have important impacts. However, only one article was found to mention this strategy, showing a need for further research. Nonetheless, according to Siciliani and Hurst [1], this strategy has been implemented through either 1) providing specific incentives to physicians who reduce wait times, or 2) by restricting the practice of working both in public and private hospitals. The first approach was implemented in Spain by giving a bonus to physicians who reduced their waiting times, having possibly achieved steady reductions. On the other hand, in The Netherlands the opposite policy was implemented (applying fixed budgets instead of fee for service payments to physicians) resulting in decreases in admissions and increases in waiting times. The second approach was introduced due to concerns that specialists may keep long waiting times so that patients resort to the private sector, where clinicians generally receive higher payments per patient. As such, this policy was implemented, for instance in Ireland, where a large extent of activity performed in public hospitals was in fact provided to private sector patients.

Improving management of waiting lists to increase efficiency

Specific strategies to improve the management of waiting lists by making processes more efficient are used to decrease wait times in several countries. Unlike other strategies that aim at directly or indirectly

increasing capacity, these strategies have been implemented in some countries to reduce inefficiencies that can lead to longer waiting lists even if capacity is sufficient. They can include booking systems, pooling of waiting lists, new information systems, streamlining patients' pathway, ring fencing, or contracting physician assistants.

For instance, direct booking systems, where patients are directly booked for a surgery date without going through a waiting list, have been widely employed [38]. These systems have the advantage of decreasing uncertainty for patients and possibly decreasing cancellation rates, however, their implementation may be hindered by the difficulties of long-term planning of elective surgery especially if there are capacity deficits. The use of pooled waiting lists or single-entry models as opposed to lists for individual surgeons is also a commonly studied strategy [39], being associated with improving efficiency, promoting equity and reducing waiting times. Under this strategy, patient referrals are centralised and are directed to the next available clinician from a pool of available surgeons even if that implies changing surgeon. The main objective is the reallocation of patients with longer waiting times to surgeons with shorter waiting times, thus decreasing variability between different surgeons' waiting lists and possibly decreasing overall waiting times. When implemented for spinal surgery referrals in Manchester, England, waiting times decreased markedly [40]. In Winnipeg, Canada, preliminary results of the implementation of pooling for joint replacement surgery showed a reduction in waiting time variability among surgeons by close to 4 weeks and a significant decrease in patients' mean wait times as well as an increase in proportion of patients treated within benchmark waiting times [41]. Nonetheless, one of the largest difficulties with pooling methods is the participation and agreement of surgeons [42]. Several surgeons may be reluctant to interrupt the continuity of care of their patients or to operate on patients for whom they may have different clinical opinions, however patient acceptability is generally high [39], [40]. Additionally, it is also agreed that only patients requiring non-complex surgery should be included in pooled lists [40]. As mentioned, other strategies to increase efficiency, decrease waste and improve cost-effectiveness include redesigning patient pathway [43], ring fencing, that is, segregating a unit or department of a hospital (generally elective surgery) [36], contracting physician assistants to undertake tasks otherwise performed by surgeons [44], or introducing improved information systems [45].

Most of these initiatives aim to reduce inefficiencies, being their effect on waiting times often unclear, however, as stated by Kreindler [28], they have promising effects and should be further studied. Additionally, often these strategies may be recommended by governments but are rarely strictly imposed.

Increasing fixed capacity in the public sector

Capacity increases are also one of the most direct ways of increasing supply and reducing waiting times. Waiting times have been found to be strongly negatively associated with several capacity measures such as the number of acute care beds, specialist physicians and the country's health expenditure [46].

Some studies have shown the positive impact of increasing capacity on wait times. For instance, Bellan [47] concludes that, after a resource increase reflected in an increase in the daily surgery cap in

Manitoba, Canada, wait times were decreased. Other studies have also suggested that public capacity increases are effective long-term strategies to reduce wait [28]. Siciliani and Hurst [1] point out the example of Denmark which invested in additional ORs and staff to face the rising demand of coronary procedures resulting in a steep increase in the volume of procedures and decrease in wait times. On the other hand, England, faced with the same demand increase, only provided an investment in capacity years later, having had a significant rise in wait times. Nonetheless, some authors also believe that the issue of capacity deficits stands on its efficient planning rather than on its quantity. In a later study, Siciliani et al. [5] state that many countries with long waiting times do not necessarily have significant capacity constraints. In this study concerning 13 OECD countries, when considering capacity proxied by the number of physicians this does not seem to have a significant effect on waiting times. Furthermore, the same authors also note that several countries with higher than the OECD average health expenditure (e.g., Canada and Denmark) and number of physicians (e.g., Portugal and Sweden) also face long waiting lists and times. As such, it is noticeable that even though capacity is an important factor, its efficient use is also extremely impacting on waiting lists.

Contracting with the private sector

Contracting with non-public providers is another method of increasing total capacity of the healthcare system. Buying a volume of activity from the private sector is in theory a quicker and more affordable way, at least in the short-term, of acquiring additional capacity than, for instance, building new hospitals or ORs. As such, contracting out elective surgery services from the private sector is intended to deliver more efficient and timely care [48]. Additionally, the pressure on the public sector can be reduced and this strategy can also introduce competition for the public sector. This is used in countries such as England, Scotland or New Zealand [48]–[51].

Most evidence on the effects of this strategy is unclear regarding its successfulness, with some studies suggesting it has not provided the desirable outcomes, especially when implemented alone [28]. For instance, in 2005 England introduced a plan to purchase a large volume of activity from the private sector to attain a quick increase in the public system's capacity. However, while Willcox et al. [30] stated that wait times would in theory decrease, according to Harrison and Appleby [49], the volume of activity by the contracted providers was low (less than 1% of the total public activity) producing only minor effects. The implementation of this plan in Scotland also did not resulted in any major increase in capacity and actually led to a decrease in overall public provision especially in regions with greater use of the private sector [51]. Additionally, in both cases, since the payment to private providers was based on referrals rather than treatments, the strategy resulted in a significant overpayment relative to the activity actually done by the private providers [51].

Another issue with contracting out elective surgery services from the private sector is that it is not uncommon that private providers are not prepared to admit more complex cases which can lead to private hospitals only taking on simpler cases while public hospitals are left with more complex and costly cases [48]. This effect has been, in fact, verified in a recent English study [52]. This may not be a problem if the payment to private providers corresponds to those cases and not to an agreed average case, as often occurs, and if the payment to public providers is compensated for the increase in case-

mix [28], [48], [52]. Another option is to negotiate prices per patient or DRG, although this can have increased transaction costs. A more recently reported alternative is to use public tendering, which has shown to decrease significantly private providers prices in a Norwegian study [53]. The fact that private providers generally only accept simpler cases can also represent equity issues as it means that low risk patients can be treated earlier than high risk patients. In fact, there is evidence that the Scottish plan led to increased age inequalities [51]. Another risk of these policies is that it can diverge supply of medical staff to private providers. Additionally, it also raises concerns that dual practice (physicians working on both sectors) may create perverse incentives to maintain higher wait times [48].

Despite these risks, contracting services from the private sector is often combined with other waiting list management strategies such as increasing patient choice, which can be successful in decreasing waiting times when under careful planning and monitoring of the contracted providers' activity [28]. Additionally, in a study by Cooper et al. [52], the English private contracting policy did show to have a positive effect on increased competition, which has resulted in increased efficiency (measured by pre-operative length of stay) for public hospitals geographically closer to privately contracted providers. However, it is important to note that in the long-term it may be cheaper to increase public capacity directly.

Cooperation with international hospitals

Similar to contracts with private sector providers, in some cases, these agreements are made with hospitals from foreign countries. One reason for this is to avoid competition between private and public providers for a limited supply of medical staff [1]. In Norway, a policy to send waiting list patients to neighbouring countries was implemented in 2001 and although most physicians were against the policy, patients were willing to participate to have shorter wait times. However, as reported by [54], the costs were excessively high due to both transportation and treatment costs as DRG pricing was more expensive in several of the receiving hospitals abroad. Additionally, no evidence of an overall decrease of waiting times is present, which is in accordance with other literature [28]. Another important concern is that in some studies patients who underwent surgery outside the country had worst clinical outcomes, likely due to the difficulty of follow-up.

Increasing choice

Initiatives that aim at increasing patient choice can be based on the achievement of various objectives. From a more individual patient perspective, increasing patients' decision-making powers and increasing equity by improving their access to healthcare services are expected effects frequently reported. From a system-level perspective, the increase of patient choice is expected to better distribute demand, under the assumption that patients will choose providers with shorter waiting times, which in turn improves the system's efficiency. As such, this has the advantage of shifting demand from providers with longer wait to those with shorter wait, thus improving resource utilisation. Additionally, since choice policies are often combined with activity related payments, it has also been hypothesized that increased patient mobility can lead to increased provider quality and efficiency due to a fear of losing market share and increased competition [1]. Several countries have implemented reforms or schemes that increase

patient choice, such as England, Norway, Sweden, or Denmark [55]–[58]. However, it is important to note that choice can be implemented at different points in the surgical patient's pathway, namely, upon referral to secondary care or after inclusion in the waiting list, which is generally a more restricted choice.

Despite the intended objective of increasing equity of access between patients, several studies have pointed in the opposite direction. Consistent inequities have been identified between patients who opt for choice of alternative providers and those who do not. A Norwegian study found that women, older, higher educated and higher income patients were more likely to use choice, being education the clearest inequality effect [56]. On the other hand, a Swedish study found that movers were tendentially younger and were less severely ill, although this was possibly because more ill patients were prioritized and already had shorter wait times [57]. A recent review of choice policies identified older age, lower socioeconomic groups and non-white ethnicity as the most common factors of patients who bypass their right to choose provider [59].

One of the main issues identified with choice policies, which hinders their effects, is the low proportion of patients that use their right to choose alternative providers [57], [58], [60]. However, in one case, the London Patient Choice Project, where patients in surgery waiting lists were offered a choice of receiving treatment in alternative hospitals with a guaranteed shorter wait, acceptance rate and patient mobility was significantly higher [61]. Additionally, no evidence of the presence of inequities between choosers and non-choosers was identified. Reasons for patients not to use the opportunity of opting for a different provider can include higher distance or travel times and lack of information about the policy and waiting times both for patients and physicians [57], [58]. Additionally, uncertainty may also play an important role as suggested by a Danish study where many patients who already had a booked surgery declined changing hospital even if the alternative hospital could have offered a shorter wait [58]. This may explain the high acceptance rate in the London project, as most referrals were done within the same region and patients' choice process was supported by providers [61]. This evidence also suggests that despite the unfavourable factors of changing providers, if patients are guaranteed a shorter enough wait, for instance by directly booking them after acceptance of transfer, and by giving options that are not too far from the home hospital, a high proportion of patients may be willing to accept these transfers.

Regarding the objective of better distributing demand and improving resource use, as well as increased competition, there hasn't been considerable evidence suggesting the presence of these effects in practice. The London project led to reduced waiting times in both sending and receiving hospitals and for all patients (whether using choice or not), having the main effect of the policy been the convergence of mean waiting times within London [62]. Although the effect on wait times is not clear due to the decrease already taking place in English hospitals, the project is seen as successful. The main reasons pointed out for this were the existence of a centralised purchaser and the additional fund to increase capacity employed in the beginning of the project. However, as suggested by [59], without careful planning, choice policies can lead to uneven distributions of demand due to patients preferentially seeking providers with better quality, which results in some providers keeping long waiting lists and others being underutilized. This leads to less efficient use of resources and decreased overall provider

capacity. However, when patients' choice is implemented under central coordination and is limited to patients with long wait times it has proved to be successful in reducing wait [28], [60].

4.2.2 Demand Side Strategies

Demand side initiatives are introduced to better manage and contain demand, being often combined with supply side initiatives. Strategies to reduce demand do not usually reduce the number of patients requiring treatment as this is difficult to achieve (prevention through primary care can be done but its effect on surgery waiting times is difficult to study). Instead, this is done by reducing the number of eligible patients for treatment, assigning explicit priorities to define the treatment order, or by encouraging patients to substitute public for private treatment, as described below.

Subsidies to private health insurance uptake

Incentivizing adherence to private health insurance (PHI), for instance through tax incentives provided by the government, as a means to reduce public wait times is a demand-side policy currently used, for instance in Australia. In these cases, PHI works as a supplement to publicly funded healthcare, with the objective of decreasing weight and pressure on public services. The assumption behind this policy initiative is that the increase in the proportion of privately insured patients increases access to private care, which in turn leads to reductions in public demand and consequently, in public wait times [63]. Additionally, increased proportion of PHI can also act as an incentive to the private sector to increase its activity due to the higher demand for private services, which is translated into an overall supply increase [28]. This means that one possible determinant of success of this strategy is the ability of private hospitals to increase their activity to respond to demand increases.

Australia has one of the most well-known PHI subsidization strategies. In the 1990s the government started providing a rebate of 30% for voluntary PHI which was accompanied by strong advertisement campaigns concerning the benefits of private insurance. This was followed by sharp increases in PHI coverage in the country, as well as increased share of private treatments attributed to both increase in private and decrease in public activity [1]. Early studies suggested that PHI coverage led to reduced public demand for surgical waiting lists, mainly caused by a substitution effect of public by private treatment, resulting also in reductions in public waiting lists and times [46], [64]. However, as later suggested, these reductions were more likely in accordance with previous trends, since a positive correlation has been found between reduced waiting times and higher public activity as opposed to private activity [63]. As discussed in the cited article, this is also corroborated by studies in other countries. Additionally, the costs of this initiative were extremely high, while there is no actual evidence that waiting times decreased due to it.

There are also other risks associated with this strategy, namely that PHIs may mostly attract young and low-risk patients that are likely not the source of the high pressure on the public system [28]. These patients also often require more profitable procedures that end up being performed by private hospitals, leaving the more complex and costly cases for the public system. On the other hand, higher economic status patients are more likely to pay for PHI or any possible co-payments. As pointed out by [28], since

there isn't evidence indicating that higher PHI coverage benefits both public and private patients, this means that treatment is provided on the basis of ability to pay and not clinical factors, raising important equity concerns. Another factor that can lead to the failure of voluntary PHI policies is that it may create incentives for surgeons to keep public wait times high to encourage patients to resort to the private sector. This concern identified by many authors arises since frequently physicians act on both sectors and fee-for-service remuneration in the private sector is frequently higher than public payments [28], [63]. Finally, depending on the PHI coverage, patients may still have to pay significant co-payments, which is especially likely for surgical procedures, and opt to wait for public treatment [1].

Prioritisation strategies

Despite any other potential strategies in use, achieving low waiting times for all patients may still be very difficult in a public system. As such, in some countries, prioritisation of different groups of patients is used to ensure shorter waiting times for patients with higher need or that benefit more from expedite surgery. The use of a prioritisation policy defines the order in which patients on a waiting list should be treated, as opposed to a first come first serve system, and have been widely studied. When no national prioritisation regulations exist, there is an increased risk of inequities between similar patients since different surgeons may use different criteria to prioritise their patients. In England, where surgeons are generally free to use their own criteria, effects of severity on wait times have been reported to be only small or modest in the case of joint replacement [65]. Furthermore, the degree of this effect varies across hospitals and the weight given to the different criteria seem to differ for different procedures. Establishing national regulations also aims at reducing the risk of these inequities. Hence, prioritisation practices generally focus on ethical, or equity concerns rather than overall wait time reductions or efficiency issues. Prioritisation regulations can differ regarding the criteria considered and the tools used to integrate those criteria, being the definition of optimal sets of criteria and tools controversial.

The criteria established to prioritise waiting lists depends on each government's ethical basis behind the implementation of the policy. Since often the objective is to increase equity and fairness in the system, the most widely used criteria are clinical based, including factors such as disease severity, pain, disease progression, expected benefit, quality of life decay rate, need, or time waited. In some cases, for instance in New Zealand and Canada, social non-clinical criteria are also considered such as ability to work or limitations on activities [66], [67]. In Norway, an explicit scheme to prioritise patients on sick leave was implemented on the basis that these patients' absence from work and productivity loss should be reduced [68]. This scheme led to significant reductions in waiting times and sick leave days for surgical patients under the scheme, however the estimated costs were larger than benefits and ethical and equity issues were raised.

There are two ways in which most countries use these criteria to prioritise patients. The first is through more general prioritisation guidelines, where patients are grouped (usually in 2 to 4 urgency groups) according to their general urgency level. The second is through more specific scoring systems, implemented in New Zealand and Canada, where each patient receives an individual score calculated by summation or weighting of different quantitative criteria [66], [67]. Guidelines are more commonly implemented, for instance in Italy, Australia or Sweden [45], [69], [70], and are generally able to reduce

wait for more prioritised patients despite not impacting overall waiting times. In the case of Italy, one study has reported achievement of both vertical and horizontal prioritisation, that is, more urgent patients waited less time, and within the same urgency group patients included in the list first were treated first [45]. However, guidelines also have a high degree of subjectivity, and have been characterized as insensitive and lacking transparency [69]. Additionally, if criteria are not well defined, this can lead to different assessments by different clinicians which can result in inequities. On the other hand, scoring systems were developed to be more explicit, objective, and transparent. The largest example of a scoring system is in New Zealand, where quantitative criteria and scores are defined for individual specialities to prioritise, as well as ration (see following point), patients. This system faced many difficulties. First, in early years different tools were developed throughout the country for the same procedures which led to large inequities in assessment of patients' scores [67]. Furthermore, even when using the same tool, different physicians might score the same patients differently. Second, criteria were established based on consensus between clinicians rather than evidence-based and were not properly validated before implementation [71]. This has led to surgeons disagreeing with the criteria used which often was inconsistent with their own clinical judgement, lacked discrimination between cases, and did not correctly prioritise some conditions such as malignancy and paediatric procedures. Additionally, surgeons felt the tools decreased their autonomy. These issues contributed to surgeons often not using the system correctly or giving higher scores to their patients when they believed the tool would not give them appropriate clinical priority.

Demand rationing

Another way to reduce demand is by having physicians raise the criteria for patients to be eligible for treatment. This can also be a form of prioritisation, however instead of receiving surgery later, patients in less need are excluded from the waiting list, being demand directly reduced.

One of the most explicit demand rationing systems was implemented in New Zealand in 1999 [72]. This consisted of replacing waiting lists by directly booking patients based on a prioritisation scoring system, mentioned above, that determined access to elective treatment. Priority assessment criteria were developed for individual specialities, along with clinical thresholds, the score above which surgery was considered clinically beneficial. Additionally, financial thresholds were established as the score above which hospitals could provide treatment given the available funding. Under the policy, patients were placed in one of three categories determining whether they are 1) directly booked for surgery which should occur within 6 months (currently reduced to 4 months) if the score was above the financial threshold, 2) put under active review if booking within 6 months was not possible or the score was close to the threshold, or 3) referred back to their general practitioner. One of the main objectives was to provide an aid in clinical decision making, improve equity in terms of prioritisation and possibly geographical equity. The policy aimed at being transparent and to clarify patients' expectations on whether they would receive publicly funded surgery. However, this system faced several issues and criticism. Despite being nationally implemented, different tools were used for the same specialities and financial thresholds were set at different scores across the country according to the resources available. Additionally, financial thresholds were also frequently above the clinical threshold, which contributed to

surgeons' lack of compliance with the scoring system [32], [71], [72]. This is because clinicians often acted as advocates for their patients individually and not from a population view of health, and many felt it was unethical to deny patients access to surgery when they needed it. Furthermore, as mentioned above, the scoring tools did not correctly prioritise some conditions according to physicians' opinions. Another problem is that while waiting times of patients who receive guarantee of surgery usually are within the guaranteed time, patients who are below the financial threshold but would benefit from surgery are 'invisible' to the system since they are removed from hospital records [67], [73]. Additionally, many of these patients eventually undergo surgery, however with much higher waiting times [73], possible effects on quality of life and having used non-operative resources in the meanwhile which possibly had already been ineffective for those patients [74]. Some studies have analysed the extent of unmet demand, and have reported large degrees of rationing taking place (in one study only 43% of the total patients in need were offered surgery) [73]–[75]. These large proportions of patients denied surgery despite recognized need may also have led to more patients undergoing surgery in the private sector, which raises concerns that care may be provided based on ability to pay instead of need [67], [71], [72], [75]. One of the biggest problems identified in New Zealand's policy is the shortage of resources. While some degree of rationing may be accepted by patients and physicians, it is acknowledged that many patients who would benefit from surgery are being denied access for falling below the financial threshold. In [76] the authors report, for joint replacement, an increasing unmet demand (patients denied surgery) with higher severity in the past years which is attributed to the lack of a matching increase in supply. In addition, the lack of resources also resulted in many hospitals removing patients from waiting lists even after being given certainty of treatment due to being unable to book the surgery within the maximum time [32].

4.2.3 Maximum Waiting Time Guarantees

The previously described strategies either acted on the supply or on the demand of elective surgery services, however, a third approach to tackle rising wait times consists of directly targeting reductions in waiting times. By directly acting on wait times, these policies impact both supply and demand [1]. This has been done in the form of waiting time guarantees or targets in several countries such as England, Scotland, Norway, New Zealand, or Sweden, and have been one of the most successful strategies to reduce waiting times [77].

These policies consist of establishing a maximum waiting time within which patients must be treated, with various consequences when the target is breached. The objective is generally to reduce the proportion of long waiting patients and equalising wait times across hospitals [78], [79]. However, depending on the way in which the policy is formulated, the main objective may differ. For instance, if the guarantee is provided only to more urgent patients the expected effect is to reduce wait for patients whose condition might worsen over time and might benefit more from earlier treatment. On the other hand, a universal guarantee, in which all patients receive the same waiting time target, has the objective of preventing cases of patients who wait long periods of time, not affecting prioritisation practices directly. In summary, the enforcement of waiting time guarantees can differ regarding the length and portion of wait guaranteed (for instance, referral to admission or inclusion in list to admission), the

sanctions or consequences when breaching the guarantee, and the type of patients covered (and whether the guarantee is the same for all patients covered or differs according to specific prioritisation guidelines).

Some countries, such as England and Scotland, formulated guarantees where all patients are covered independently of clinical or other factors. In 2001, the English NHS implemented a waiting time policy for elective inpatient admission in which performance of hospitals was public and poor performing managers would be sanctioned [79]. Sanctions included dismissal of key managers of poor performing hospitals and rewards consisted of, for instance, granting greater autonomy (including keeping certain surpluses and having less central control). English hospitals were set a maximum wait for inpatient treatment of 18 months by the end of March 2001, which was subsequently decreased until a target of 6 months in 2005. This was also accompanied by additional funding [30]. When the guarantee, known as 'targets and terror', was first implemented in England, the neighbouring Scotland did not have a waiting time guarantee policy yet. Propper et al. [79] took the advantage of this natural experiment to compare waiting times in the two countries and study the impact of the guarantee, verifying significant decreases in wait times in England relative to Scotland. It was also noticeable that this decrease was larger in long waiting patients, i.e., those that were subject to the targets. However, reducing the proportion of long waiting patients does not necessarily reduce mean or median waiting times, and reduced waiting times may be due to prioritising less needy patients or by reducing other activities [1], [79]. Since the policy only targeted long waiting patients, and without any formal prioritisation tools, one central concern regarding this type of guarantee is that it may shift surgeons' prioritisation practices leading to distortions in wait time distributions [80], [81]. Complying with a universal guarantee (that covers all patients equally), can be achieved by increasing the total number of surgeries, which would not impact clinical priorities, or by prioritising patients that are close to breaching the guarantee, which may be at the expense of shorter waiting patients possibly with higher need. Peaks in admissions of patients with wait times close to the guarantee after the policy implementation suggest that the later may have occurred, although there was likely a combination of the two leading to the successful results [80], [81]. The same effect was also observed in Scotland after implementation of a similar waiting time guarantee policy, with waiting times decreasing overall but long waiters being the main benefiters [82]. Additionally, the lack of formal prioritisation guidelines in a universal guarantee can lead to different hospitals and even surgeons' teams achieving the guarantee through different practices leading to large variations of wait time distributions between hospitals, specialities and procedures [81]. Clinical prioritisation shifts occur especially if the target waiting time is too long. When targets started decreasing and approaching practiced wait times becoming more challenging, more patients started benefiting from the policy [28]. Despite the several studies suggesting that some form of prioritisation shift occurs with universal guarantees, others have also shown the opposite, i.e., that they do not result in high priority patients waiting longer if enough resources are made available [83]. In summary, the overall success of these policies was attributed to the strict monitoring and penalisations defined for non-compliance with the guarantee and the provision of extra funding which is essential for hospitals to increase their activity [30].

Due to the clinical prioritisation critiques concerning universal guarantees, some countries, such as Sweden, New Zealand or Norway, implemented conditional guarantees, where higher need patients are prioritised with wait time targets. In Sweden, for 12 different procedures that had been suffering from especially long waiting times, patients were provided a guarantee of 3 months from decision to treat until treatment, after which they had the right to choose another provider (public or private) at the expense of the home provider [84]. For some of the procedures, such as cataract surgery, only higher priority patients (lower visual acuity) had the right to the guarantee [85]. This initiative effectively decreased waiting times, with the percentage of patients covered treated in time increasing from 26% to 66% in the case of cataract surgery, however this increase was only of 23% to 36% for non-covered patients [1]. After the first year, waiting times started to increase again. As shown by Hanning and Lundstrom [85], since only the more urgent groups of patients were covered by the guarantee, providers responded mainly by increasing their thresholds for providing the guarantee and surgery eligibility rather than increasing activity. In fact, after the policy was terminated, activity levels were higher and more patients with lower clinical need were operated. However, in later years, an increasing demand, which hospitals no longer had the sufficient resources to manage, led to the short-lived effects of the policy [78]. Additionally, since patients rarely took the possibility to change providers, there were no specific penalties or incentives to physicians that did not comply with the guarantee. In Norway, a conditional guarantee policy, based on severity of condition, availability of treatment and cost-effectiveness of the treatment, was also implemented [83]. Patients would be given individual guarantees based on these criteria, and if hospitals cannot comply with the guarantee, patients have the right to be treated at another public or private provider at the expense of the original hospital. However, after the policy implementation, waiting times for highest priority patients did not change, but declined for lowest priority patients. Two reasons have been pointed out for these results: first, the economical penalisation for non-complying hospitals was proportional to the cost of the treatment and lowest priority treatments' prices were on average significantly higher than highest priority treatments; second, the high complexity of the prioritisation regime hindered efficient implementation by hospitals. Additionally, there was no external monitorisation of fulfilment of guarantees by the hospitals, which meant that penalisations only occurred if patients filed a complaint. Another critique for conditional guarantees was that the guarantee only covered a small portion of patients, raising ethical concerns.

Finally, other criticisms are common to guarantee policies independently of the type of patients covered or the sanctions established. First, the establishment of target waiting times for specific portions of the patient's pathway or specific types of activity has led to criticism since it can lead to focusing wait time reduction efforts on the targeted portion and not necessarily reduce total waiting time [49], [86]. Second, there is the possibility that providers game the system by only providing official guarantees to patients they know they can treat in time, or even by manipulating waiting time data [78], [79], [83].

4.3 Chapter Conclusions

This chapter provided a review on the literature that addresses elective surgery waiting list management strategies, which is vast in its approaches and findings.

As seen, strategies to reduce waiting lists or times vary widely and can produce very different effects. However, it is broadly acknowledged that most need to be combined with other strategies to produce effective outcomes. Supply side initiatives are generally more common than demand side initiatives. However, increases in supply also tend to further increase demand, being most of these types of policies not viable in the long-term when implemented alone [6].

Some conclusions can be taken from the review of the different strategies based on the effects they had in the countries in which they were implemented. For instance, short bursts of additional funding are generally unsuccessful in the long-term. However, long-term funding of additional activity as well as activity-related payments can have a very important role in combination with other strategies, such as patient choice, in the reduction of waiting times. Increasing fixed capacity is also a factor with great importance on the length of waiting times however, it may not be sufficient, being its efficient planning critical on the effects produced by these increases. Some strategies are more commonly agreed to carry too many risks, namely subsidizing PHI uptake and raising thresholds for treatment eligibility. Contracting with the private sector can also have very different outcomes depending on how it is implemented, as it may not raise production to the level expected if it is not well planned and under constant monitoring. Similarly, free choice for patients also needs careful planning, as free choice without limits can lead to a further unbalanced distribution of demand and to equity issues. Nonetheless, if patient choice and use of private sector are under specific regulation and combined with other strategies, they can be central factors in reducing waiting times. Finally, the introduction of waiting time guarantees is currently one of the most used strategies, although the context and the way in which the guarantees are enforced can lead to very different results. Nonetheless, if adequately enforced, namely through patient choice, maximum waiting time guarantees have shown to be very effective. It is also important to note that publishing wait time data is one of the requirements for these strategies to succeed. While waiting time data reporting alone cannot be considered a waiting list management strategy and does not produce meaningful waiting time effects, it does play an important role in accompanying strategies that rely on these data, and effective and consistent wait time reporting systems should therefore be in place [87], [88].

In fact, these conclusions are in accordance with other literature regarding the relevant factors for the successful implementation of waiting list and waiting time management strategies at regional or national contexts. A review performed by Pomey et al. [89] identifies the need for central coordination, monitoring and reporting as one of the main factors, along with providing public awareness of the strategy, incentivizing efficiency and effectiveness, providing adequate funds (including capacity increases and financial incentives), developing tools to allow standardization of data and processes, the involvement of stakeholders and stakeholders' accountability.

Table 1 - Overview of literature review findings.

Strategy	Definition/Objectives	Effects	Observations
Funding extra activity [1], [6], [28], [30], [31]	Funds dedicated to increasing activity through additional hospital or staff capacity.	If in short-term decreases waiting times only temporarily. If in long-term can achieve sustained waiting time reductions.	Hospitals need to have sufficient capacity to increase activity.
Activity-based financing [1], [6], [28], [33]–[37]	Paying providers per case treated, which creates incentives to increase productivity.	Generally, leads to significant productivity increase. Effects on waiting times are unclear.	Can create incentives to cream skimming or DRG creep.
Reforming contracts of specialists [1]	Establishing incentives in specialists' contracts to decrease waiting times or restrict dual practice	Contract incentives can lead to steady waiting time reductions.	Requires further study.
Improving management of waiting lists [28], [36], [38]–[45]	Improving processes' efficiency and designing streamlined processes locally.	Generally achieves efficiency gains but effects on waiting times are usually unclear. Waiting list pooling can lead to significant waiting time reductions.	Requires implementation efforts at the local level, besides top level. Requires involvement and cooperation of surgeons.
Increasing public fixed capacity [1], [5], [28], [46], [47]	Increasing capacity (physical or human resources) which allows higher activity levels.	Can increase production and reduce wait times in the long term	Any additional capacity should be efficiently managed to produce the desired outcomes.
Contracting with the private sector [30], [48]–[53]	Fast increase in capacity through contracting out services from the private sector.	Usually has a small effect on capacity. Can lead to increased competition which results in increased public hospital efficiency. Can be costly. Can increase inequities.	Should be done under strict monitoring. Public tendering can help reduce costs. Adequate funding should be provided to public providers to compensate the case-mix increase.

Strategy	Definition/Objectives	Effects	Observations
Cooperation with international hospitals [1], [28], [54]	Similar to private contracting but with hospitals abroad	No effect on overall wait times reported. Can be costly. Can lead to poorer clinical outcomes.	Contracting with countries with similar DRG pricing might prevent high costs.
Increasing Choice [55]–[62]	Increasing patient choice of provider aiming at better distributing demand, improving resource utilisation, and possibly introducing competition between providers	Since there is a difference in groups of patients who use choice, equity issues are one of the main problems. Low proportion of patients who use choice hinders the effects intended by the policy.	Appropriate information is necessary so that patients and clinicians can support decisions. Central coordination and planning are necessary.
Subsidising PHI uptake [1], [28], [46], [63], [64]	Encouraging PHI uptake so that private sector becomes more accessible thus reducing public demand, wait lists and wait times.	Likely does not impact wait times. Creates equity concerns due to higher economic status groups benefiting more. Can lead to perverse incentives Costly.	Private sector needs to be able to expand. May attract primarily low risk patients. Covered patients may choose to wait for public treatment if co-payments are still high.

Strategy	Definition/Objectives	Effects	Observations
Prioritisation strategies [45], [65]–[71]	Prioritising patients with the aim of improving equity by providing faster treatment for patients in higher need or that may benefit more through guidelines or scoring systems.	Generally able to decrease wait for prioritised patients but not overall waiting times.	Clinical criteria are generally accepted but social criteria are more controversial, so it is important to define the ethical basis. Guidelines are generally subjective which still leads to inequities. Criteria should be well defined. Scoring is very difficult to implement and takes away a lot of clinical freedom by surgeons which leads to gaming the system. Criteria need to be evidence-based and validated before implementation.
Demand rationing [32], [67], [71]–[76]	Increasing thresholds for treatment eligibility so that demand is directly reduced.	Waiting times of eligible patients decreased significantly. Several patients who might benefit from surgery are excluded. Many equity concerns can arise if thresholds are at different levels across the country.	Tools and thresholds should be centrally defined and well defined to decrease equity risks. Resources available must be sufficient so that the degree of rationing is not too large and inappropriate.
Maximum Waiting Time Guarantees [1], [28], [83]–[86], [30], [49], [77]–[82]	Reducing proportion of long waiting patients.	Strong evidence that it reduces long wait times and overall wait times. Possible increase in wait or decrease in quality of untargeted areas.	Should be challenging enough to change overall wait times. Should be accompanied by enough resources to increase activity. Should have clear incentives to guarantee compliance. If it is a conditional guarantee, prioritisation guidelines must be very clear and adequate.

5 Case Study

This chapter provides a characterization and contextualization of the problem under study, giving an overview of the surgery planning process in the Portuguese NHS and the use of patient transfers to make the process more effective. The first section, 5.1, presents the organisation of the Portuguese health system and, in particular, of the NHS, focusing on the surgical activity and providing some relevant data regarding surgical production. In section 5.2, an overview of the SIGIC programme is given, and the patient flow in the context of SIGIC is described. Section 5.3 details patient transfers, the main mechanism used by SIGIC for assuring timely surgery. To finalize, the conclusions of the chapter are given in section 5.5.

5.1 The Portuguese Health System and the NHS

The Portuguese health system including, in particular, the NHS, is the network responsible for the provision of healthcare in Portugal. As such, the understanding of its functioning model and of its activity, especially in the surgical sector, is essential for the development of this thesis. This section gives an overview of the organisation and operation of this complex network, starting more generally, with a bird's eye view of the Portuguese health system and the NHS in section 5.1.1, and giving then a description of the two managing bodies of the NHS, the Central Administration of the Health System (CAHS) and the Regional Health Administrations (RHAs) in sections 5.1.2 and 5.1.3, respectively. Following, information regarding the hospitals operating in the Portuguese health system is given in section 5.1.4, as well as some data concerning surgical production in the NHS, in section 5.1.5. Finally, section 5.1.6 details the current model used for funding the NHS hospitals.

5.1.1 Overview and Organisation

Before the Portuguese NHS was created, the health system in Portugal was mainly based in small and individual health subsystems, having the State only a secondary role in the provision of care [90]. In 1979 the NHS was established with the objective of guaranteeing equity by providing universal access to healthcare for all Portuguese citizens independent of their social and economic situation. Since then, it has undergone several evolutionary changes, including the addition of user charges, and the inclusion of interaction of the public with the private sector to better integrate the different levels of care [90].

The NHS's foundation was based on the Beveridge model, being, thus, essentially free at the point of care, except for, as mentioned, user charges applied in some cases. Furthermore, the source of most of its funding is tax based. Nonetheless, there is also an important out-of-pocket portion of payment (close to 28% of the total expenditure in 2015) done to the Portuguese health system, mostly in NHS co-payments for pharmaceutical products, outpatient centres and hospital care, such as medical exams [91]. Besides the universal coverage provided by the NHS, a significant fraction of the Portuguese population (approximately 25% in 2017) is also covered by health subsystems (public or private insurances with occupational-based membership) or voluntary PHI, which coexist [91], [92].

Related to the high percentage of population covered by other health systems, is the fact that, besides the public institutions of care provision integrated in the NHS, the presence of the private sector in the provision of healthcare remains significant in the country. This marked presence partially results from the tradition of the population to go directly to private doctors and religious charities (*Misericórdias*) for healthcare, before the existence of the NHS, and which has been maintained after its creation. Furthermore, we have been witnessing, in the last years, an increase in the investment in more differentiated and specialised care from the private sector, making the sector now able to compete with public hospital care to some extent [91]. One of the contributing factors for this growth is, as mentioned above, the incentive to contracting out services from the private sector for public provision, which was due to the NHS's insufficient production capacity to satisfy the demand for health services in the country. These contracts started in the 1980s mostly for diagnostic and therapeutic services, and have more recently evolved to more specialised care with the creation of waiting list reduction programmes, the case of SIGIC [93], which is detailed in section 5.2.

Hence, in Portugal, the delivery of healthcare is performed by a network of private (primary and hospital care) and public health institutions. Public facilities are part of the NHS, which organises the provision of care in different levels through primary care centres, hospitals, and a network of long-term care. The Ministry of Health (MH) is the entity responsible for creating health policies and performing the planning and regulation of the NHS through its various units. Regarding private institutions, these have their own private management, nonetheless, they are also monitored by the MH through the Health Regulatory Entity. Figure 5 shows the organisational structure of the MH.

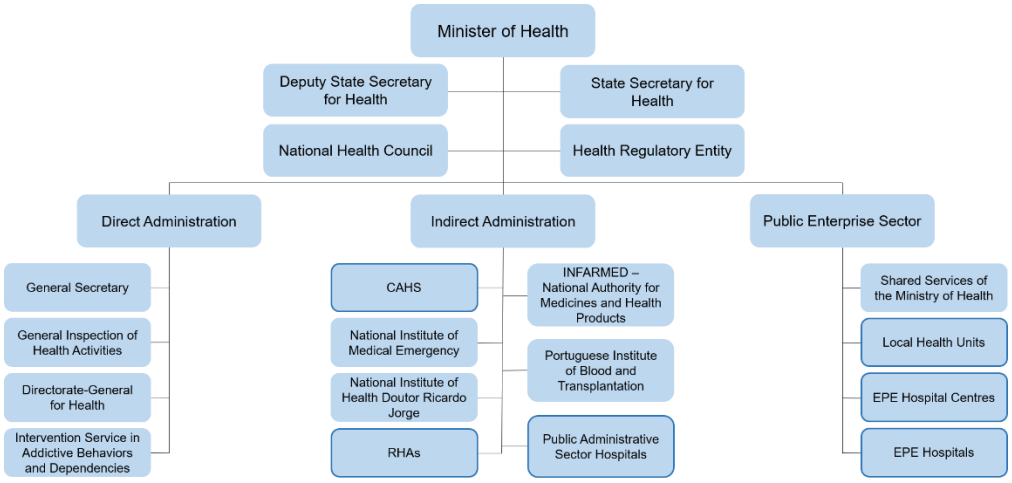

Figure 5 - Organisational structure of the Ministry of Health. Adapted from [94].

As can be seen in Figure 5, the MH includes several organisations, some with enterprise status, including most of NHS hospitals (see section 5.1.4), some under its direct administration, and some under indirect administration, which include some NHS hospitals, the CAHS and the RHAs. These two institutions, highlighted in Figure 5, are the ones responsible for the managing activities of the NHS, namely, playing the main role in regulating the process of management of surgery waiting lists, and are thus further detailed in sections 5.1.2 and 5.1.3, respectively, which provide a better understanding of how the management of healthcare provision is done in the NHS at the central and local levels.

5.1.2 The Central Administration of the Health System

The CAHS (*Administração Central do Sistema de Saúde*), created in 2007 with administrative, financial and patrimonial autonomy is the institution in the MH responsible for centralising most of the regulation, management and planning activities of the NHS [95].

The CAHS is in charge of coordinating and managing the financial and human resources of the NHS and the MH, and the facilities, equipment and information systems of the NHS, as well as centralising the information about production and financial resources of the NHS [95]. It is also responsible for defining financial models for contracting out health services and accompanying the execution of contracts with the NHS hospitals (programme contracts), for which it closely articulates with the RHAs. Finally, the CAHS is the institution responsible for the NHS Access to Healthcare Integrated System (SIGA SNS, see section 5.2.1), which includes SIGIC. In order to manage this system, CAHS developed a unit specialised in healthcare access management, the Unit for Management of Access (*Unidade de Gestão do Acesso*, UGA). This unit is responsible for integrating, centralising and managing information about the surgery waiting list (*Lista de Inscritos para Cirurgia*, LIC), surgery production, patients awaiting surgery, among others, within the CAHS at the national level [96].

5.1.3 The Regional Health Administrations

The RHAs (*Administrações Regionais de Saúde*) were created in 1993. Like CAHS, these are institutions with administrative, financial and patrimonial autonomy. Their creation was aimed at performing a more decentralised and efficient management of the NHS. In fact, the law that established the NHS in 1979 set up the basis of the NHS as having a centralised control (mostly done by the CAHS, as seen in the previous section) and a decentralised management [91]. As such, while planning and resource allocation are highly centralised, the management of the NHS is done in a decentralised way at the regional and local level, being the RHAs the bodies in charge of the regional level management of the NHS.

As mentioned in section 5.1.2, the RHAs cooperate with the CAHS in contracting health services under the NHS, including the execution of programme contracts with the NHS hospitals, as well as contracting private sector providers, such as hospitals or clinics, for the provision of health services to NHS users. Contracts with private sector institutions often occur within waiting lists reduction programmes, including SIGIC for surgery waiting lists. Additionally, RHAs are also responsible for the implementation of health policies regionally, monitorisation of human resources needs in each region, signing of public-private partnership (PPP) contracts, monitorisation of hospitals and their production, and management and funding of the NHS primary care centres in their respective regions.

Considering the country's geography, there are five RHAs in continental Portugal: Norte RHA, Centro RHA, Lisboa e Vale do Tejo (LVT) RHA, Alentejo RHA and Algarve RHA. Their geographical distribution, as well as the respective population that inhabits each of the regions, is shown in Figure 6.

As can be seen in Figure 6**,** Norte and LVT RHAs (both with approximately 3,7 million inhabitants) are the largest regions in terms of allocated population, followed by Centro RHA (with 1,7 million) and Alentejo and Algarve RHAs (both with close to half a million people). The delivery of health services in the country follows this demographical distribution, with Alentejo and Algarve RHAs having fewer specialised medical and surgical services, especially in the most interior regions. This can be perceived in the number of ORs per region in the NHS, which is presented in Table 2 in absolute and relative number per 100 000 inhabitants. Another relevant indicator for an overview of the distribution of resources in the NHS and between RHAs is the number of beds in public hospitals for each region. This number is also shown in Table 2 both in absolute and relative number, for the same year. Looking at the data, it is possible to see that the number of ORs and beds is moderately proportional to the population size of each region, with higher discrepancies in the number of ORs per 100 000 inhabitants.

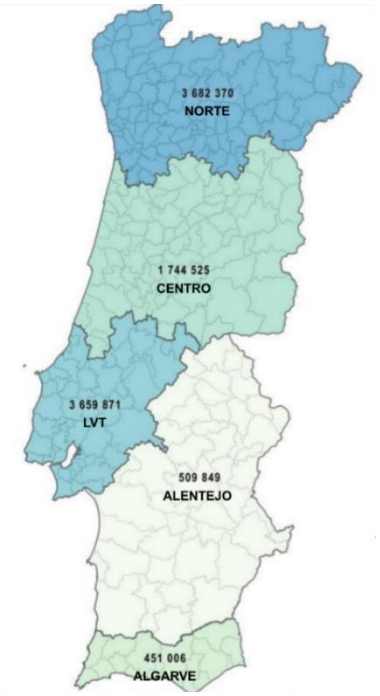

Figure 6 - Geographical distribution of RHAs and respective population. Adapted from [111].

While Norte, Centro and LVT have a relative number of ORs close to or above the national average, Alentejo and Algarve have significantly lower proportions. Regarding the relative number of beds, this is higher than the national average in Centro, LVT and Algarve but lower in Norte and Alentejo. One should also note that the number of beds includes all types of hospital beds, which may not be directly correlated with the number of surgical beds. Nonetheless, inequities regarding the geographical distribution of resources arise especially in the most interior regions, in which the population is more dispersed, leaving remoter areas with a more difficult access to health services. Another important indicator commonly regarded as one of the main bottlenecks in surgery services provision is the number of anaesthesiologists. According to a 2017 report by *Ordem dos Médicos*, there are in average 12,4 anaesthesiologists per 100 000 inhabitants in Portugal [97]. However, while Norte, Centro and LVT have a relatively close proportion (14,6, 10,0 and 15,3 respectively), Alentejo and Algarve have a significant lower number, at 3,9 and 4,5, respectively.

Table 2 - Number of ORs and beds in absolute and relative number per 100 000 inhabitants in public hospitals (including PPP hospitals) and per region [23].

Region	No. ORs	No. ORs per 100 000 inhabitants[(i)]	No. beds	No. beds per 100 000 inhabitants
Norte	201	5,63	7 267	188,2
Centro	146	6,59	5 608	253,1
LVT	184	6,46	6 962	220,0
Alentejo	26	3,69	1 296	182,9
Algarve	16	3,65	956	217,6
Total	573	5,86	22 089	213,1

(i) calculated using data from INE [23]

Each RHA has the responsibility of guaranteeing access to healthcare to the respective population, carrying out an effective integration of the different levels of care. Together with the CAHS, RHAs are in charge of monitoring and supervising hospitals and assessing their results, however, NHS hospitals have a high degree of independence, being their management largely done internally and locally, as seen in the following section.

5.1.4 Portuguese Hospitals

Hospitals play an essential role in the health system, being currently under an increasing pressure, with high expectations not only from the patients for a better quality of care but also from their supervising authorities and financing parties for a more efficient management of resources and expenses.

NHS hospitals are divided into the Public Administrative Sector (*Setor Público Administrativo*, SPA) and Public Enterprises (*Entidades Públicas Empresariais*, EPE), with the vast majority of them currently being EPEs. The granting of the EPE status to the NHS hospitals, which was initiated in 2002, had the objective of implementing an enterprise management in hospitals aiming to improve efficiency and hold back costs. This is because this status gave these hospitals a higher level of accountability, with the State maintaining ownership but assigning more management autonomy to the institutions. Some NHS hospitals are also organised in EPE hospital centres, which group hospitals in the same geographical area in order to allow better coordination and cooperation between them. In addition to hospitals, the NHS also relies on Local Health Units (*Unidades Locais de Saúde*) to provide hospital care, including medical and surgical services. These units were created in 1999 with the intent of increasing vertical integration between primary care and hospital care by facilitating communication between them. Even though they have not shown to be effective in attaining this objective, Local Health Units also play a relevant role in contributing for the NHS's surgical production [91].

Regarding the geographical distribution of these institutions, this follows the trend of the population distribution, as mentioned previously. For instance, Alentejo has only one specialised care hospital, and three Local Health Units for more general services. On the contrary, Norte and LVT regions are the ones with the highest number of public hospital institutions with 16 each. Nonetheless, according to the Health Regulatory Entity [25], 99,3% of the population is covered by NHS and protocolled (see following section) hospital institutions at most 60 minutes away from their municipality, being Alentejo the region with the least coverage (95,3%). When NHS privately contracted hospitals are also considered, the national coverage increases to 99,5%, remaining Alentejo the region with the least coverage (97,7%). Table 3 shows the number of public and private hospital institutions per region, and the number of beds to better compare size. Note that the second column of the table presents the number of hospital institutions, including hospital centres and local health units which may include more than one hospital, but are managed as one whole institution. The third column presents the total number of hospitals to facilitate the comparison with the number of private hospitals, present in the fourth column.

Table 3 - Number of public hospital institutions, public, private, contracted, and protocolled hospitals per region.

Region	No. public hospital institutions[(i)]	No. public hospitals (no. beds)[(ii)]	No. private hospitals[(ii)] (no. beds)[(iv)]	Total no. hospitals[(ii)]	No. contracted hospitals[(iii)]	No. protocolled hospitals[(iii)]
Norte	16	33 (7 420)	47 (4 521)	74	24	10
Centro	12	34 (5 607)	26 (1 432)	59	18	2
LVT	16	28 (7 128)	31 (3 875)	59	21	3
Alentejo	4	6 (1 266)	4 (246)	10	7	0
Algarve	1	4 (937)	7 (280)	11	8	0
Total	49	105 (22 358)	115 (10 354)	213	55	15

(i) [94] (ii) [23] (iii) [98] (iv) calculated using data from INE [23]

In the context of this work, it is important to consider that not all private hospitals have contracts with the NHS that enable the reception of patient transfers for the execution of surgeries. This means that the number of private hospitals available to the NHS is lower than the number of private hospitals presented. As such, column six of Table 3 shows the number of contracted hospitals in 2015, the last year with available information. Similarly, the last column shows the number of protocolled hospitals, which are generally social sector hospitals that also perform surgeries for the NHS, as explained in the following section. It is important to note that some contracted hospitals have agreements with more than one RHA, being represented in more than one row in the table. Additionally, in the same context, it is also important to know the number of ORs in public and private hospitals per region, which is shown in Table 4. It would also be interesting to know the number of ORs in contracted hospitals, however this information is not available.

Table 4 - Number of operating rooms in public and private hospitals and in total per region [23].

Region	No. public ORs	No. private ORs	Total no. ORs
Norte	201	121	322
Centro	146	45	191
LVT	184	103	287
Alentejo	26	5	31
Algarve	16	12	28
Total	573	286	859

Finally, regarding both private and public hospitals, it is also relevant to note that the different hospitals have different capacities and productivities, being important to consider them and to be acquainted with the level of production of the NHS. For this reason, the following section is dedicated to giving more insights on the surgical production in the NHS hospitals.

5.1.5 Surgical Production and Waiting Times in the NHS

An overlook of the surgical production in the Portuguese NHS is given in this section. Surgical care accounts for close to 50% of health services provided in hospitals. Being this sector one of the most complex and one of the main sources of expenditure and income for hospitals, it is essential that its management is efficient while always maintaining quality care.

One of the measures to increase efficiency and improve resource allocation in the sector is the increase in the proportion of surgeries performed in ambulatory (outpatient) circumstances when compared to inpatient surgery. Ambulatory surgery only requires the patient to stay hospitalized for at most 24 hours, consequently spending less resources. Additionally, there is a decreased risk of hospital infections, being also more comfortable for the patient to recover at home. For these reasons, lately, ambulatory surgery has been promoted in the NHS, namely through incentives to hospitals to perform more surgeries of this type. In fact, as can be seen in Figure 7, the percentage of ambulatory surgeries as a proportion of the total number of elective surgeries (ambulatory and inpatient) has been consistently rising in the last decade, growing from 49,5% in 2010 to 66,1% in 2019.

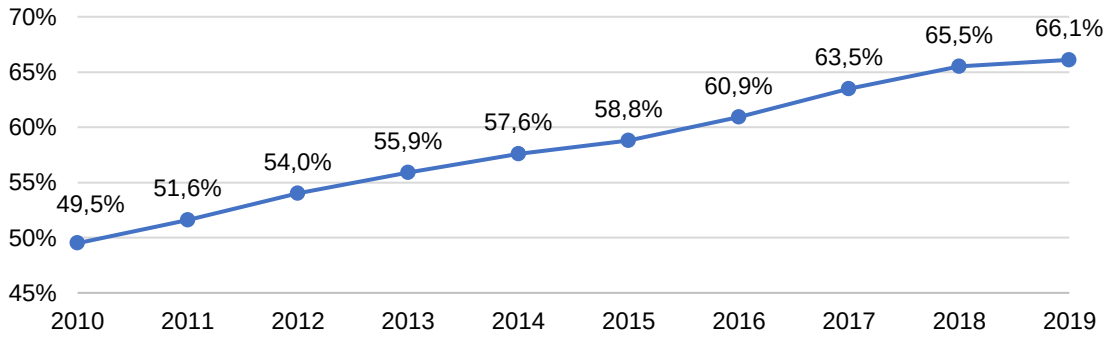

Figure 7 - Percentage of ambulatory surgeries in the NHS hospitals between 2010 and 2019. Adapted from [4].

Moreover, Figure 8 shows the evolution of the total number of elective NHS patients operated, i.e. surgical supply, and the number of LIC entries, which corresponds to new LIC referrals, i.e. surgical demand. Elective, or programmed, surgeries can be scheduled in advance as opposed to emergency surgeries which do not go through the normal scheduling process. It is possible to see in Figure 8 that between 2010 and 2019, both elective surgical supply and demand have been consistently increasing at approximately the same rate. In fact, the supply increased by 29,8% and the demand by 26,3% in this timespan. However, it is important to note that the number of entries in LIC is higher than the number of patients operated each year, which leads to an increasing number of patients awaiting surgery.

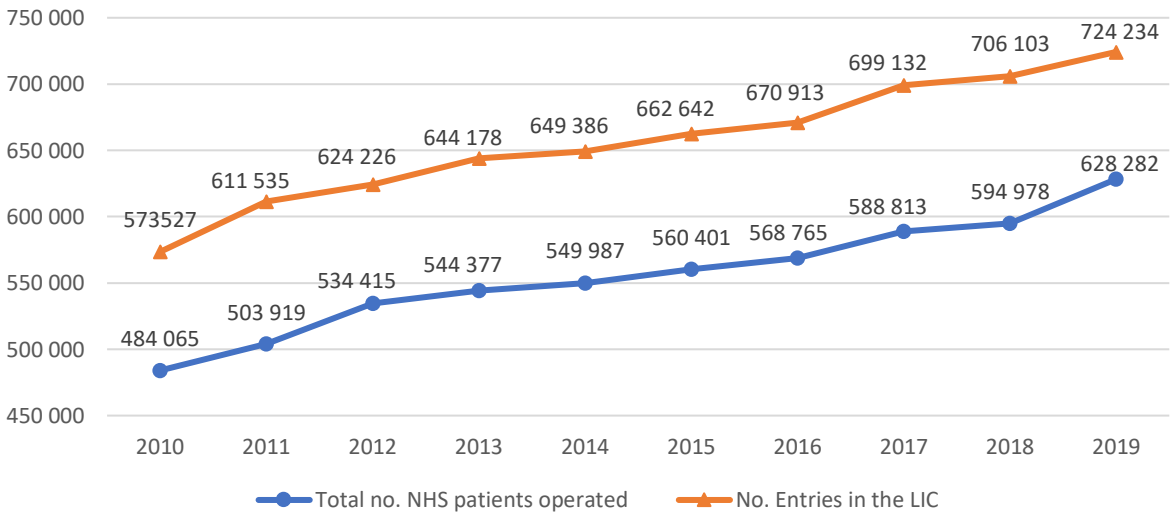

Figure 8 - Evolution of the number of entries in the LIC and number of NHS patients operated between 2010 and 2019. Adapted from [4].

Table 5 shows the number of entries in the LIC, the total number of NHS patients operated and the number of patients awaiting surgery, i.e. patients in LIC, at the end of 2019 per region. However, it is important to note that the total number of NHS patients operated (column 3) includes not only surgeries performed in NHS hospitals (column 4), but also in contracted and protocolled hospitals (columns 5 and 6, respectively). Both protocolled and contracted hospitals consist of private and social sector hospitals that perform surgical services for the NHS. However, while protocolled hospitals only act as hospitals of origin (HOs) for NHS patients, contracted hospitals are hospitals of destination (HDs) for patients transferred within the SIGIC programme. Therefore, the number of patients operated in NHS hospitals represents only 89,4% of all NHS patients operated in 2019, with 6,1% being in protocolled hospitals and 4,5% in contracted hospitals [4].

Table 5 - Number of entries in LIC, total NHS patients operated, patients operated in NHS (including PPPs), contracted and protocolled hospitals and patients in LIC in 2019 [4].

Region	No. entries in the LIC	Total no. NHS patients operated	No. operated in NHS hospitals	No. operated in contracted hospitals	No. operated in protocolled hospitals	No. patients in LIC at the end of 2019
Norte	291 433	287 679	247 417	5 890	34 372	84 874
Centro	125 080	109 382	98 697	8 429	2 256	48 503
LVT	226 978	194 496	182 848	10 252	1 396	87 961
Alentejo	25 740	21 790	21 394	335	61	7 645
Algarve	19 452	14 935	11 587	3 298	50	8 653
Total	724 234	628 282	561 943	28 204	38 135	237 636

To better visualise this information per region, Figure 9 shows the percentage of patients operated in NHS, contracted and protocolled hospitals in 2019. The variability in the contribution of private providers for NHS production is clear. In Algarve, more than 22% of surgeries are performed in the private sector, while all other regions have at most 8% of surgeries performed in contracted hospitals, even though the number of contracted hospitals in Algarve is one of the lowest. Also noticeable is the high proportion of patients operated in protocolled hospitals in the Norte region, however this is related to the high number of *Misericórdias* in this region, which act as protocolled hospitals for the NHS.

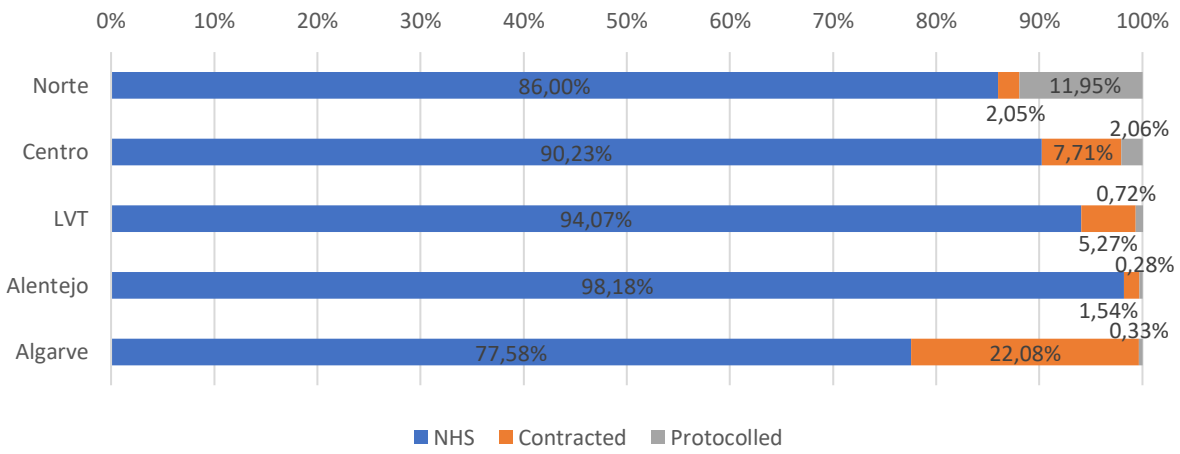

Figure 9 - Percentage of patients operated in NHS, contracted and protocolled hospitals per region in 2019. Data source: [4].

To analyse the performance of the NHS regarding response times, Figure 10 shows the evolution of four indicators between 2011 and 2019. First, the mean waiting time for surgery, which has been slightly increasing in the past years, being 3,3 months in 2019. Second, the median waiting time of patients in the LIC, which has been oscillating between its lowest of 2,8 months and highest of 3,6 months in the period considered. Third, the 90th percentile of the waiting time of patients in the LIC, which, at the end of 2019, was 13,3 months, the highest since 2011. Four, the percentage of tardy patients in LIC, that is, patients awaiting surgery who have already exceeded the NHS maximum waiting time guarantee (TMRG) which is 32,1% at the end of 2019. Additionally, the percentage of tardy patients operated, that is, patients operated after the TMRG, is not systematically published but was approximately 16,5% in 2019 [99].

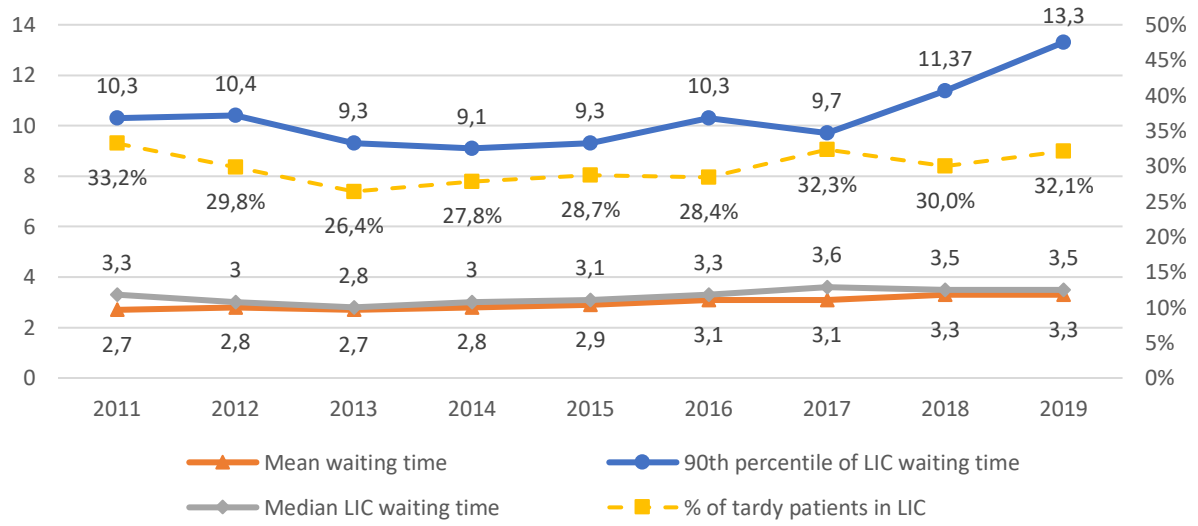

Figure 10 - Evolution of response time indicators in months between 2011 and 2019. Data source: [4].

Moreover, it is relevant to analyse the differences between specialities regarding volume of surgeries and response times. Of the total number of LIC entries in 2019 (Table 5), 31,2% correspond to ophthalmology, 17,3% to general surgery and 15,8% to orthopaedics. This followed similar patterns in previous years. Nonetheless, looking at response time indicators, ophthalmology is one of the specialities with the lowest percentage of patients in LIC exceeding the TMRG, median and 90th percentile of waiting time (19,8%, 2,6 and 8,4 months, respectively) [4]. All three indicators are below the overall average in 2019 (Figure 10). On the contrary, orthopaedics has one of the highest percentage of patients in LIC exceeding the TMRG, median and 90th percentile of the waiting time (40,7%, 4,6 and 17,0 months, respectively).

Finally, it is also relevant to notice the differences between NHS hospitals regarding response times. As mentioned previously, there is a significant imbalance regarding population distribution in Portugal, which is followed by an imbalanced geographical distribution of hospitals. In turn, there is also a high variability between regions and between hospitals regarding response times for surgery. This can be verified, for instance, in the median waiting time of patients in LIC which varies significantly, being the lowest 1,5 months and the highest 6,5 months, considering all NHS hospitals in 2019. Additionally, the degree of compliance with the TMRGs also varies considerably between NHS providers, with the

percentage of tardy patients in LIC varying between only 0,2% at *Centro Hospitalar Póvoa do Varzim* and 59,5% at *Centro Hospitalar Tondela Viseu*. Naturally, this comparison is very blunt, not accounting for the various hospital specific factors that influence the management of waiting times, nonetheless, the variation is significant and consistent across the whole NHS (see [4]).

5.1.6 Funding of NHS Hospitals

The global funding made available for the NHS is derived from the State Budget, partially allocated by the central Government's Ministry of Finance to the MH. The MH subsequently allocates the budget to the different entities. As mentioned previously, the CAHS, who receives its budget from the MH, is the institution responsible for managing the allocation of financial resources to the health institutions belonging to the NHS, namely deciding on the distribution between the health regions. The RHAs, although regulated, are then responsible for allocating their budget to the healthcare institutions in the region, including primary care centres and hospitals. In practice, however, the budget allocated to each hospital in the NHS is decided centrally at the CAHS level, being the RHAs' financial responsibilities limited to primary care [91]. Figure 11 shows an overview of the financial flows in the NHS.

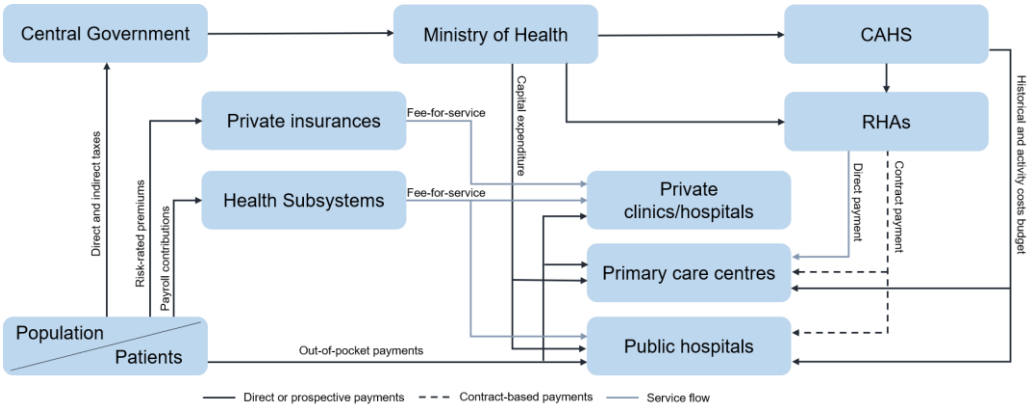

Figure 11 – Overview of the NHS financial flows. Adapted from [91].

As shown in Figure 11, public hospitals are funded through various income streams. A part of the income comes from patients in out-of-pocket payments, namely through user charges, and from health subsystems retrospectively in a fee-for-service basis. However, the majority of the financial input for NHS hospitals is through programme contracts (*Contratos-Programa*), which hospitals sign with the MH through CAHS and RHAs.

Each NHS hospital signs a programme contract with the duration of one year, in which the expected production of the hospital and the respective payment are established. As such, a set of production, quality, and efficiency goals are defined for the institution, as well as a set of indicators used for the evaluation of its performance in terms of quality and access [100]. The basis for defining payment in programme contracts regarding production are Diagnostic Related Groups (DRGs), according to the DRG grouping system "All Patient Refined DRG 31". DRGs group patient types with similar characteristics, considering diagnoses, procedures, associated pathologies, age, and gender. The DRGs system guarantees homogeneity in terms of consumption of resources within each DRG, which makes it a useful methodology to determine hospitals' production, and to determine payment

considering the degree of complexity of different procedures. DRGs' productions from previous years are used to define an updated case-mix index for each hospital. For example, in 2020, case-mix indexes are defined according to production from 2015, separately for inpatient, medical and surgical ambulatory services. To calculate the monetary value to pay hospitals for production, a unitary price is defined for all institutions, which in 2020 is 2 759€ [22]. Therefore, the payment for medical and elective surgical services in the context of programme contracts is calculated as: $no.equivalent\ patients \times casemix\ index \times unitary\ price$. The number of equivalent patients corresponds to hospitals' expected level of production, either inpatient or ambulatory patients. The expected surgical production in hospitals' contracts includes the surgical activity they expect to perform internally, and all surgical activity included in their LIC, that might need to be performed in other hospitals in the framework of the SIGIC programme. This is detailed in section 5.3.3. Based on the production objectives defined in the programme contract, the hospital's administrative board also negotiates with the services the normal activity and the additional activity (outside normal working hours). Additional activity is remunerated in a fee-for-service basis to staff, based on the DRG of the patient and on the price table published in *Portaria 254/2018* [17].

Programme contracts also establish incentives to the hospitals with the aim of increasing healthcare quality and efficiency, with 5% of the value of the contract corresponding to this type of incentives. For instance, regarding SIGIC indicators, in 2020 the percentage of patients operated within the TMRG, and the percentage of patients in the LIC within the TMRG, each account for 10% of the total incentive value. Other incentives correspond to the percentage of patients awaiting consultations within consultations' TMRGs, percentage of ambulatory surgeries, operational expenses per standard patient, among others. Furthermore, penalisations corresponding to at most 3% of the value of the contract are also defined. These penalisations are assigned when hospitals do not comply with established objectives. These objectives include the reduction by 10% of the percentage of patients in the LIC exceeding the TMRG, reduction of 5% of patients in the LIC, reduction of LIC cancelations by 10%, and other objectives in the context of access to consultations and to the long-term care network, among others [22].

5.2 SIGIC System and Early Waiting List Reduction Programmes

Like in most OECD countries, the demand for health services is also increasing in Portugal, showing a clear need for the creation of effective waiting list management programmes [5], [24]. SIGIC is the implemented system to manage surgery waiting lists in the NHS and decrease the impact of problems caused by inadequate response times. This section gives an overview of the path that led to the creation of SIGIC, focusing then on the structure and operating principles within the NHS framework (section 5.2.1). In section 5.2.2 the management of SIGIC is further detailed by describing the flow followed by a surgical patient in SIGIC and describing its four phases divided in pre- and peri- and post-operative periods.

5.2.1 Early Waiting List Reduction Programmes

As seen in the previous section, the supply for elective surgery services in the NHS is not sufficient to meet demand. This leads to long waiting lists and waiting times in the country, which represents an important concern for healthcare policy makers in Portugal. This concern is not recent and has been

addressed since the mid-1990s. As such, since 1995 several programmes have been developed to face the problem of long waiting lists.

The first programme to be implemented was PERLE which was active between 1995 and 1998. It was followed by PPA, between 1998 and 2000, then PECLEC, from 2002 to 2004 [101]. In 2004 SIGIC was implemented as detailed in the following section. All of these programmes were created to be short-term initiatives whose main mechanism of action was increased funding for performing additional surgeries. PERLE's additional funding was aimed at buying capacity from the private sector. The remaining programmes provided additional funding targeted at NHS hospitals. Some programmes have also been developed for certain specialities, such as PIO, a specific programme for ophthalmology waiting list reduction, which was active between 2008 and 2009, and PTCO, which targets bariatric surgery waiting lists and has been running since 2009.

Except for the PTCO programme, which is still active, these initiatives focused in reducing the backlog and waiting time only of surgeries with higher waiting times and volumes of patients in the short-term, Hence, according to Barros et al. [2], the little evidence available regarding their effects suggest they led to an initial reduction in waiting lists followed by an increase sometimes to even higher levels. As such, they did not provide viable long-term solutions. There was also an additional programme implemented only in 2015, PIC, which provided funding for the execution of extra surgeries in additional production, agreed in adhering hospitals' programme contracts. However, an audit performed by *Tribunal de* Contas [24] shows that these hospitals did not achieve the contracted production (achieving only 69% of the agreed amount), and more than half of them (58%) actually increased their waiting times for the targeted procedures.

5.2.2 Overview and Main Operation Mechanisms of SIGIC

After the succeeding programmes implemented in Portugal with minor effects, finally, in June 2004 SIGIC was created. SIGIC took a different approach from the previous programmes, by creating a national system that encompasses all elective surgeries covered by the NHS, independently of their waiting times and number of patients. Furthermore, it has the objective of performing an integrated and continuous management of the waiting list rather than aiming to eliminate it. In 2007, SIGIC's management was allocated to CAHS. More recently, in 2017, the programme SIGA SNS, was created with the objective of providing equitable, timely and transparent access to the NHS institutions in all its areas. As such, SIGIC is now incorporated in SIGA SNS.

The principal objective of SIGIC is thus to improve access to elective surgery in the NHS, ensuring compliance with acceptable waiting times for surgery, equity, efficiency and transparency [3]. Towards this goal, SIGIC established maximum waiting time guarantees, TMRGs, for surgery execution (defined in Portaria 153/2017 [18]) and created an explicit system that allows higher patient choice through transfers to provide timely surgery. In 2007, SIGIC expanded its activity to the use of private and social entities contracted with the NHS to receive transfers. SIGIC also introduced payment per surgery case in additional activity (non-normal working hours contracted with physicians) and public reporting of hospitals' performance regarding waiting times and productivity. In its first five years, SIGIC achieved a

reduction of median waiting times by close to 63% and of waiting lists by approximately 35% [2]. Additionally, surgical production increased by close to 40%, which was attributed to increased normal production, increased capacity due to the introduction of additional production, and use of private sector production. Another important impact was the decrease in variability of mean and median waiting times between NHS hospitals across the country in the first years. Nonetheless, these positive effects and waiting time reductions have since then ceased, as seen in the previous section.

In summary, patients are registered in the LIC with an assigned priority level that results in a TMRG. Hospitals are thus obliged to perform surgery within the TMRG. Besides the TMRG, hospitals must also comply with stipulated thresholds for surgery booking, which correspond to a certain percentage of the TMRG according to the priority. After this threshold, it is considered that hospitals do not have capacity to perform timely surgery, leading to the issuing of either a transfer note (TN) or a surgery voucher (SV). TNs allow transfers to other NHS hospitals while SVs include both NHS and contracted hospitals. Patients are thus transferred to a HD, where they are registered in the HD's waiting list to be booked and receive surgery in a shorter waiting time than they would in the HO. Patients then return to the HO for follow-up. These steps are detailed in section 5.2.2 and the management of transfers through TNs and SVs in section 5.3.

In order to perform an efficient management of this system, SIGIC uses the information system *Sistema Informático de Gestão da Lista de Inscritos para Cirurgia* (SIGLIC), centralised in CAHS. SIGLIC integrates information from both public and private providers, and is permanently updated regarding waiting times, length of waiting lists, installed capacity and portfolio of services. The system thus provides a global view of the movements in the LIC. Additionally, SIGLIC is also the tool that supports several stages of the process, such as identifying patients approaching the threshold for surgery booking, being essential for the centralisation and coordination of SIGIC. As such, the use of SIGLIC allows for the process of transferring patients to be monitored in a centralised way, improving efficiency in the use of resources across the country.

Despite the higher level of centralisation provided by SIGLIC, the management of the LIC is done locally by each hospital or even by the surgical services within the hospital. Note that there are individualized waiting lists for each surgical service in each hospital to facilitate planning. Furthermore, when transfers are necessary, they occur generally within the corresponding RHA, to facilitate transportation and maintain patient comfort.

To aid in the management of SIGIC, its organic structure is defined in support units at three levels: central, regional and local, assured by CAHS, RHAs and NHS hospitals, respectively. These three levels of management complement each other, with the central and regional units performing mainly a regulating and supervising role, while the local units are the ones that establish contact with the patients and put in practice the directives by the central and regional units. The central management, under the responsibility of CAHS, is done through SIGA SNS's central support unit, the UGA. At the regional level, SIGIC's management is within the responsibility of each RHA through the Regional Units for Management of Access (*Unidades Regionais de Gestão do Acesso*, URGAs). Finally, the local level

management of SIGIC is assured by each of the NHS hospitals with surgical production, within the Local Units for Management of Access (*Unidades Locais de Gestão do Acesso*, ULGA).

5.2.3 The Patient Flow in SIGIC

This section describes the surgical patient flow in SIGIC. This flow is referred to as single episode, which starts with the referral to the first speciality consultation and ends with the conclusion of the episode. The SIGIC episode thus corresponds to the set of chronological events that have the objective of resolving the patient's pathology through a care plan. As such, its management is done in a set of phases including all activities performed related to the episode, that is, clinical acts (such as consultations, surgeries, hospitalizations, treatments or exams) and administrative acts (such as bookings, admissions, cancelations and billing). These activities are organised in four phases: the proposition, execution, follow-up and conclusion, defined with the aim of increasing optimization and integration in the use of the available resources during the process, making it more effective and equitable. Figure 12 schematizes the four phases, which are detailed in the following sections. Section 5.2.3.1 details the pre-operative period, which corresponds to the proposition phase, while section 5.2.3.2 describes the peri- and post-operative periods, comprehend the execution, follow-up and conclusion of the patient's episode.

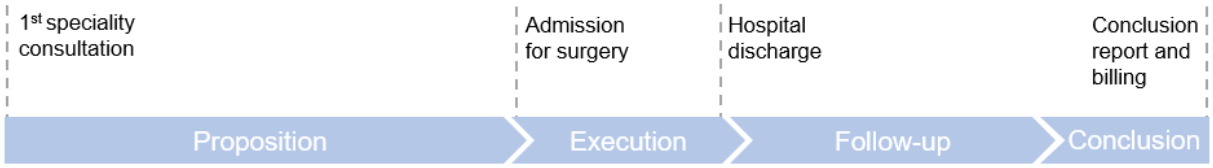

Figure 12 - Phases of the SIGIC episode

5.2.3.1 Pre-operative period and Surgery Scheduling

The typical flow for an NHS surgical patient starts with a consultation with a general practitioner (an external consultation), who then refers the patient to a speciality department in an NHS hospital. Additionally, this referral could also be done by a private or social sector hospital, or by the patient himself, usually in emergency cases. The waiting time for the first speciality consultation is also subject to TMRGs defined in the context of a programme named *Consulta a Tempo e Horas*, integrated in SIGA SNS like SIGIC, which manages consultations' waiting lists.

With the execution of the first speciality consultation, the proposition phase begins. This phase includes all events from the consultation until the last event immediately before admission for surgery, being divided in four stages: the analysis, the pre-registration in LIC, the registration in LIC, and, in some cases, the transfer, as schematized in Figure 13.

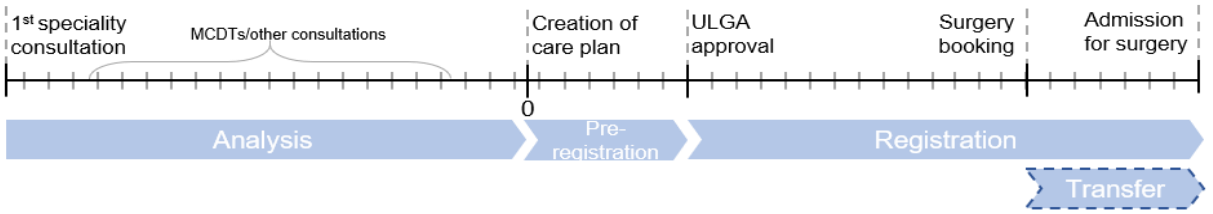

Figure 13 - Stages of the proposition phase

The analysis stage includes the events occurring before a surgery proposition is made to the patient. It includes the first speciality consultation, and all other clinical acts such as exams or other consultations performed to better study the patients' pathology and later create an adequate and well-founded care plan.

If it is decided that the patient is in need of surgical treatment, the care plan, that includes the surgery proposition, is elaborated and the patient is pre-registered in the LIC. The care plan is a document that includes all events the hospital proposes to resolve the patient's pathology or pathologies, including, besides the surgery, exams, consultations and pre- and post-operative procedures. Furthermore, it includes the priority level of the patient, which is essential for the scheduling process, and the date of creation which marks the date in which the patient's waiting time in the LIC starts counting. The priority levels defined for NHS patients in the context of SIGIC were established in *Portaria 45/2008* [19] and are assigned according to the patient's base pathology, associated problems, severity, impact on lifespan, autonomy and quality of life. These criteria are applied to all surgical specialities and procedures, except for the specialities of cardiology and oncology, which have more specific criteria (although they are also the same for all procedures within these specialities). Taking these factors into account, four levels of priority are defined. The lowest level priority corresponds to level 1 and the highest to level 4, which is considered a semi-elective surgery, or deferred urgency, as it can be postponed only for 72 hours. The TMRGs for surgery execution are assigned to each level of priority taking also into account three different groups of pathologies: general condition, oncology disease and cardiac disease. Cardiac disease was only recently established by *Portaria 153/2017* [102] as a pathology group with specific TMRGs. Furthermore, the TMRGs for the normal priority, that is, level 1, were also redefined in 2018 to 180 days instead of 270 days, through the same *Portaria*. This reduction had the objective of reducing the median waiting time, by bringing the TMRG closer to the current median practiced by the NHS hospitals. The TMRGs for all priority levels and pathology groups are shown in Table 6.

To finalize the pre-registration stage, the care plan is registered in the hospital's information system, transited to SIGLIC and associated to an identification number in the LIC. It must then be validated by the head of surgical service in question and consented by the patient, so that the registration in the LIC can be activated by the ULGA.

The activation of the registration in the LIC sets the beginning of the registration stage, which corresponds to the period in which the patient is registered in LIC and awaiting surgery. As such, it is during this stage that the surgery scheduling process occurs. Surgery scheduling is performed by the corresponding head of surgical service, who periodically (ideally every day and at most every week) plans the surgical production for the following period. This is done according to a list issued by the hospital's ULGA through SIGLIC, with the patients in LIC in the corresponding surgical service, ordered by priority and waiting time. The total waiting time of a patient corresponds to the number of days passed since the care plan is created until the date of surgery execution or cancelation of the registration. It excludes, if applicable, the period between the issuing of a SV or TN and its activation (see section 5.3.2). The waiting time is used to determine the patient's place in LIC, which is ordered according to

operational priority, which corresponds to the TMRG, and waiting time. The LIC is thus ordered using two criteria:

- first, the patient's operational priority, the TMRG;
- and second, the patient's waiting time in LIC.

As such, the first patients to be scheduled for surgery are the patients with the shortest TMRGs, and, within a group of patients with the same TMRG, the patients selected are those with the highest waiting time until the moment of scheduling, that is, in a system of first come first serve, aiming at both vertical and horizontal prioritisation. Furthermore, as stated in section 5.2.1, thresholds for surgery booking are also established. After these times it is considered that the HO cannot guarantee the execution of surgery within the TMRG, and the patient is transferred through the issuing of a TN or a SV (see section 5.3.2). These threshold times, presented in Table 6, are set according to the priority level of the patient, being them 75% of the TMRG for level 1 patients, 50% of the TMRG for level 2 and 5 days for level 3. More recently, TNs have started being issued after 3 months in LIC (at 50% of the TMRG) for general pathology level 1 patients [20]. However, in the case of priority level 3, transfers occur only by request since the TMRG for these patients is only of 15 days. It is also important to note that even if the surgery booking (the registration of the surgery date in SIGLIC) is done before the threshold, the transfer may still occur if the surgery date exceeds the patient's TMRG, as the registration does not comply with the regulation of SIGIC.

Table 6 - TMRGs and thresholds for surgery booking or transfer (Portaria 153/2017).

Priority Level	Pathology Group	TMRG	Threshold for booking or transfer
1	General	180 days	90 and 135 days
1	Cardiology	90 days	68 days
1	Oncology	60 days	45 days
2	General	60 days	30 days
2	Cardiology/Oncology	45 days	23 days
3	General/Cardiology/Oncology	15 days	5 days (by request)
4	General/Oncology	72 hours	Not applicable

After the final list with the patients to schedule is completed, the ULGA makes the registration in SIGLIC being then in charge of notifying the patients of the surgery date at least 20, 10 or 5 days in advance, according to the patient's priority level being 1, 2 or 3, respectively. It is also responsible for informing the patients of any pre-operative events that might be necessary. The pre-operative events might include pre-anaesthetic consultations, re-evaluation consultations and exams in order to confirm the surgery proposition is still adequate and updated before surgery execution or transfer, especially for patients with priority level 1 who have long waiting times.

The last stage of the proposition phase is the transfer, which occurs only when necessary due to the inability of the HO to perform the surgery. This inability can be due to a lack of capacity, when the hospital does not schedule the patient's surgery before the threshold for booking, to a lack of technical

capacity of the hospital. These different reasons for a transfer to occur translate into different types of transfers which are detailed in section 5.3.1.

5.2.3.2 Peri- and Post-Operative Period

The peri-operative period consists of the execution phase, which starts with the patient's admission for surgery. This phase includes the administrative process of admission for surgery, the execution of the surgery and other critical events and is prolonged until the patient is discharged from the hospital either from an ambulatory or inpatient surgery. After surgery, patients are sent to a post-anaesthesia care unit and then to a recovery unit, usually intermediate care units. In the case of ambulatory surgery, patients are then discharged. On the other hand, inpatient surgeries, which need longer hospital stays, are harder to manage since they require coordination with the available beds in inpatient units. The execution phase comprises all events that occur during the hospitalization period, which include not only the surgery but also any other post-operative complications that might arise, which the hospital is responsible for.

In the admission, a technical assistant and the doctors verify that the patient's exams are updated, that the clinical and personal information is complete, and that the patient knows the procedure and the possible risks and consequences. Afterwards, the surgery can be executed, coinciding its date with the patient's exit from the LIC. Following the surgery and the hospitalization period the patient is discharged when appropriate, by a surgeon from the surgical service, either to his home or a long-term care facility.

After the patient's hospital discharge, the hospital is still responsible for accompanying the patient during a period after surgery, corresponding to the follow-up or catamnesis phase. This phase therefore includes the monitoring events foreseen in the care plan (consultations, exams or post-surgical treatments), and possible complications identified. The follow-up ends with a synthesis consultation and has varying durations depending on the case but lasts at most 60 days in the general programme.

In the case of a patient who received surgery in a HD, that is, a patient who was transferred, both the HO and the HD are responsible for accompanying the patient in this phase. The HD performs the post-surgical consultations during the normal recovery period and the HO contacts the patient afterwards to proceed with the necessary further treatments, and to perform a review consultation to evaluate the patient's condition and conclude on the HD's performance. If, in the review consultation there are complications that the HD is responsible for, identified within the 60 days following hospital discharge, the HO refers the patient back to the HD who is responsible for resolving the situation. In summary, the hospital that performs the surgery is always responsible for resolving any complications occurring in the 60 days following the patient's discharge and the HO is always responsible for accompanying the patient in the follow-up phase independently of whether the patient received surgery in the context of a transfer.

The last phase in the patient's course in SIGIC, the conclusion phase, corresponds to the closure of the episode, which occurs at most 60 days after hospital discharge. It consists of a series of administrative procedures providing the synthesis of the episode, guaranteeing the completeness of the information and, in the appropriate cases (that is, when transfers occur), billing of the episode and its payment. The final report of the episode is registered in SIGLIC, including the episode's complete clinical information

(diagnoses, surgical procedures, complications, exams, among others), and other relevant information such as the patient's episodic DRG, essential for billing the episode. Furthermore, it is important to note that, besides the surgery, other factors also lead to the conclusion of the episode, namely the cancelation of the registration in LIC and responsibility transfers to other hospitals or surgical services (seen in section 5.3.1).

Cancelations of episodes can occur at any moment during the period in which the patient is registered in LIC, corresponding to an exit from the LIC. According to the annual access report released by CAHS [4], 13,7% of all exits, i.e. episode conclusions, were due to cancelations in 2019 and this percentage has remained fairly constant since 2013.

Finally, as mentioned, billing of the episode is also done at this phase, after information regarding all the procedures involved in the episode is complete. When the episode does not involve a transfer, the billing process is completed according to the programme contract of each institution, being essential for funding the hospital and accompanying the contracted surgical production (see section 5.1.6). When a transfer occurs, the HD bills the HO, with the support of SIGLIC. This is detailed in section 5.3.3.

5.3 Patient Transfers for Surgery in SIGIC

Transfers of patients between two hospitals is one of the main concepts introduced by SIGIC to provide timely surgery for NHS patients, namely by recurring to contracted social and private sector hospitals. As such, this section provides an understanding of the transfer mechanism, differentiating between the different possible types of transfer in section 5.3.1. As the transfers that occur through the utilization of a SV or TN are the type of transfer created to reduce waiting times, section 5.3.2 further details the transfer stage in this case and provides some data to give an overview of the proportion of utilization of this mechanism in the NHS. Finally, section 5.3.3 gives insights on the financial flow and on how the billing process is made in the particular case of SVs and TNs.

5.3.1 Types of Transfers

Patient transfers in the context of SIGIC occur during the proposition phase, after the patient is registered for surgery in the LIC. Different types of transfer exist according to whether the transfer is of the full responsibility for the episode or only for the execution of surgery, and to whether the transfer is between two hospitals or between surgical services within one hospital. As such, a transfer can occur due to different reasons: an inability of the hospital to guarantee the execution or booking of the surgery before the TMRG is exceeded, a loss of technical capacity of the hospital (or service), or due to another surgical service with the same capacity to perform the surgery having better response times. In all cases, the consent of the patient is mandatory. Figure 14 schematizes the different types of transfer established in the NHS for patients needing surgery.

In a transfer of surgery, the patient is transferred for surgery execution, returning then to the HO which proceeds with the patient's follow-up and concludes the episode. On the contrary, a transfer of responsibility consists of a transfer of the full responsibility for the episode, including the follow-up phase and conclusion of the episode. Regarding administrative processes, this type of transfer leads to the

cancellation of the episode in the HO and to the creation of a new care plan consented by the patient and validated by the new head of service.

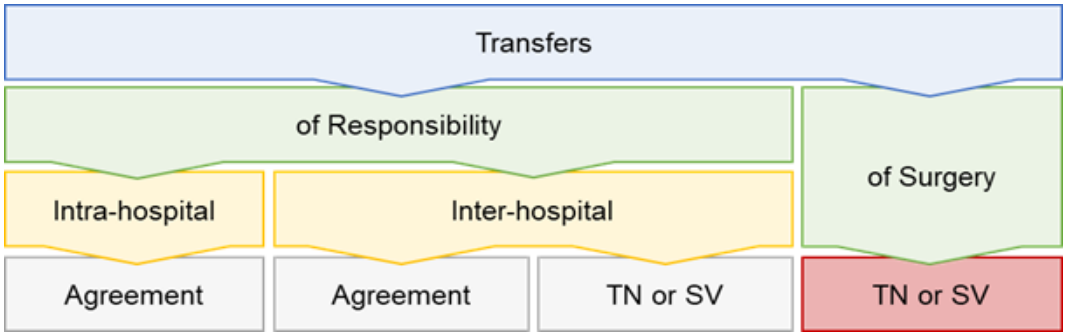

Figure 14 – Types of transfers. Adapted from [3].

Intra-hospital transfers occur by agreement between two surgical services within a hospital, with the responsibility for the whole treatment of the patient being transferred. These situations are promoted by the hospital as they occur, for instance, when both services have the capacity to perform the surgery but have significantly different average waiting times. In this case, patients with highest priorities and waiting time are transferred to the service with better response times. As such, when a service schedules a patient, there should not be a patient in another service's waiting list awaiting the same intervention and having the same operational priority, with a waiting time more than 30 days higher than that of the patient being scheduled. In this case, the patient with the highest waiting time is the one to be scheduled and receive surgery, in order to guarantee equity in the process of surgery booking in the hospital. This rule is established and recommended in the regulations of SIGIC [3], however, it highly depends on each hospital's management model and data on the extent of this practice in NHS hospitals is not easily accessible.

Inter-hospital responsibility transfers can occur through an agreement between the hospitals or through the utilization of a TN or SV. Regarding transfers of responsibility between different hospitals that occur through an agreement between the hospitals, these generally occur in the context of the national speciality referencing networks. These networks consist of links of hospitals and primary care centres for each speciality, usually based on geographical proximity , which regulate the relationships between institutions providing services in that speciality. They were created to improve the sustainability and efficiency of the NHS, and the profitability of the installed capacity through an integrated vision of the healthcare delivery system, by increasing the concentration of experience and technical resources. As such, these networks determine the flow of patients between institutions within each speciality, taking into account the patients' residence area and location of the hospital and its differentiation and accessibility. Furthermore, this system is based on a hierarchical classification of the NHS hospitals in 4 groups according to their specialisation level, being the flow of the patient from less to more differentiated hospitals. However, it is important to note that these networks were created to define an optimized flow of patients not only for surgical services but also for all types of healthcare services. Moreover, even though these networks are well established for each speciality and started to be developed in the 1990s, there are still some specialities for which networks are not yet defined and

approved, while the ones that are defined, although provided by law, have not been utilized to a big extent in practice, at least with the objective of decreasing waiting times.

The issuing of TNs or SVs only leads to a responsibility transfer in the context of special programmes such as the NHS programme for surgical treatment of obesity (the PTCO programme mentioned previously). These transfers have some specifications, including some deadlines, that differ from the general programme, but are subject to the general regulation in most of their inherent procedures.

Finally, transfers of surgery imply only the surgical procedure itself, the normal recovery period and possible complications that the HD is responsible for. These transfers only occur through the issuing of TN or SV and are the most common inter-hospital transfers. In comparison, while the utilization of either TNs or SVs corresponded to approximately 7,5% of all episodes in 2019, responsibility transfers corresponded to only 0,4% [4]. The context and operationalisation of surgery transfers through the use of TNs or SVs are detailed in the following section.

5.3.2 Operation of TN and SV Transfers

Transfers of surgery through TN or SV imply that the responsibility for the patient remains at the HO's level. These transfers occur when the HO does not have capacity to perform surgery within the TMRG. This lack of capacity is assumed when the HO does not book the surgery before the threshold for surgery booking, that is, 50% or 75% of the TMRG depending on the priority (Table 6), leading to the issuing of a TN or a SV. Additionally, SVs are also issued at 100% of the TMRG when patients are still in LIC and the surgery is not booked.

During the period of registration in LIC, when patients reach 70% of the TMRG for priority level 1 or 45% of the TMRG for priority level 2 as well as at 95% of the TMRG for all priority levels, the SIGLIC system signals the patient so that the hospital can prepare the clinical process for transfer or booking. ULGA verifies that the process is complete, updated and contains the correct clinical coding of the patient's diagnoses and procedures, allowing an independent evaluation of the patient by the new surgeon after the transfer. In the case of patients with normal priority (level 1), the hospital must also contact the patient for a clinical revaluation and possibly update exams, due to these patients' long TMRGs and the possibility of variations in the clinical condition and adequateness of the surgery proposition. For this reason, pre-operative exams should also not be taken more than 2 months before the surgery date. Furthermore, it is also important to note that some patients may be classified as non-transferable due to clinical or social reasons. In these cases, the head of service must guarantee the patients' surgeries are scheduled and executed within the TMRG.

Generally, when the threshold for booking is reached without the surgery booking registered in SIGLIC, the episode is transferred to UGA. From this moment, the HO is also restricted from booking consultations, exams or the surgery for that patient. After the episode is transferred to UGA, a TN is automatically primarily issued if possible, allowing the patient to be transferred to an NHS hospital. Both TNs and SVs are issued through SIGLIC using an algorithm that determines the list of available hospitals from which the patient can choose, according to SIGIC rules. As such, at 50% or 75% of the TMRG, SIGLIC automatically selects the NHS hospitals available to perform the surgery, according to the following order:

1st in the patient's municipality of residence;

2nd in the bordering municipalities;

3rd in the patient's district of residence.

If there is at least one hospital in these conditions, UGA issues the TN which is sent to the patient so that he can choose among the hospitals in the provided list. If there aren't available NHS hospitals in these conditions, UGA issues a SV at 75% of the TMRG which allows a transfer to any available hospital, including social and private sector contracted hospitals, which can be outside the original region. Furthermore, it is important to note that a hospital is only considered available to receive transfers when its portfolio of services includes all necessary procedures, its peri-operative conditions coincide with the patient's requirements, and there are no patients in its LIC with a waiting time higher than 25% of the transferred patient's TMRG.

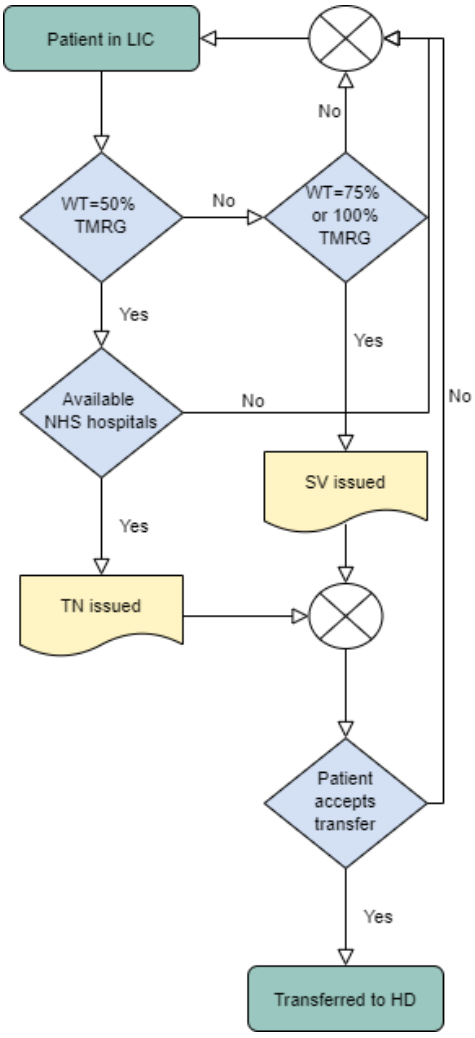

Figure 15 – Flowchart of TN or SV transfer process.

When receiving the TN or SV, the patient selects one of the hospitals in the attached list and activates it in the chosen HD. After the activation, the HO provides the HD with the patient's clinical process in a maximum of 5 weekdays and the HD is then responsible for contacting the patient for an evaluation of the clinical condition and registering him in its waiting list. The HD can also consider that other exams are necessary to better evaluate or update the patient's clinical condition, requesting these exams to the HO, which is responsible for providing them. Afterwards, the HD books the surgery, which must be performed by the HD without exceeding 25% of the TMRG. Initial consultation booking or surgery booking by the HD must also be done within 5 days of receiving the patient's TN or SV. After the normal recovery period, the patient then returns to the HO to complete the follow-up phase. It is also important to note that the issuing of a TN or SV may not result in the patient's transfer in some situations. These situations include the possibility of the HD not agreeing with the surgical proposition (requesting the return of the episode to URGA), the patient not activating

the TN or SV before its expiry date, or the patient refusing the transfer. In this case, the TN or SV is cancelled, and the patient returns to the HO, maintaining the same position in the LIC. If, when reaching 100% of the TMRG, the surgery is not yet booked at the HO, a new SV is issued, after which no other SVs or TNs are issued except by the patient's specific request. Figure 155 shows a flowchart of the patient's path when a TN or SV is issued.

In 2019, 200 779 SVs and 49 183 TNs were issued, corresponding to a total of 249 962 [4], an increase of 96% regarding 2017, which is related to the reduction of TMRGs in place since 2018. Regarding SVs, the LVT RHA is the one that most contributes to the quantity issued, accounting for 46,1% of the total number of SVs. On the contrary, regarding TNs, LVT accounts only for 11,3% of the total number, while the Norte region issues 77,5% of them. Algarve generally does not issue TNs as there is only one NHS hospital centre in this region. Table 7 presents the number of SVs and TNs issued in each of the five RHAs, as well as their percentages regarding the NHS's total.

Table 7 - Number of TNs and SVs issued per RHA and in total, and respective percentages in 2019. Adapted from [4].

Region	TNs	Percentage of TNs	SVs	Percentage of SVs	TNs + SVs
Norte	38 116	77,5%	48 625	24,2%	86 741
Centro	5 370	10,9%	40 667	20,3%	46 037
LVT	5 540	11,3%	92 572	46,1%	98 112
Alentejo	151	0,3%	8 197	4,1%	8 348
Algarve	6	0,01%	10 718	5,3%	10 724
Total	49 183	100%	200 779	100%	249 962

Looking at the data in the table, it is possible to see that the number of SVs issued is significantly higher than the number of TNs. This leads to most HD's being private contracted rather than NHS hospitals. In fact, according to a 2014 report by the Health Regulatory Entity [25], only 1% of HD's are NHS hospitals. Additionally, Figure 16 shows the evolution of the total number of SVs and TNs issued in the past decade.

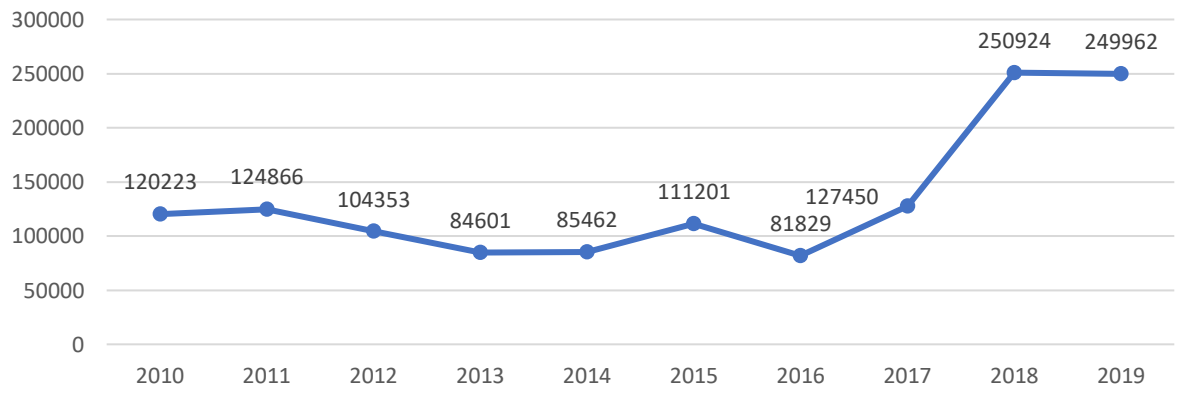

Figure 16 – Evolution of the total number of SVs and TNs issued between 2010 and 2019. Adapted from [4].

However, it is also important to note that each year only a small percentage, 18,8% in 2019, of the total number of SVs and TNs were activated leading to transfers to HDs. The evolution of the percentage of TN or SV activations is shown in Figure 17. It is possible to see that this ratio has suffered an overall decrease in the past years. The most common reason for a non-activation is a refusal by the patient, corresponding to 67,2% of all cancellations, followed by the expiry of the SV or TN, 21,8%, and lastly, due to the patient having been operated in the HO, 4,9% [4].

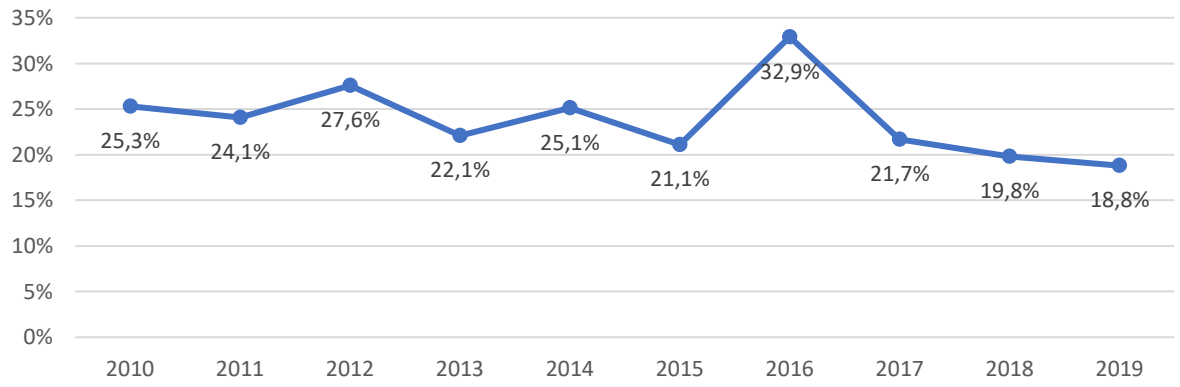

Figure 17 – Evolution of the percentage of TN or SV activations between 2010 and 2019. Adapted from [4].

Regarding the reasons for patients to refuse transfers, a study made in 2008 [26] showed that the main reason was the unwillingness of the patients to switch to a different doctor or hospital, accounting for 34% of the patients' refusals. The second most common reason, given by 30% of the patients, was the patient's unavailability to use the TN or SV before its expiry date, while 26% did not want to receive surgery in a hospital outside their residence area, as very often there isn't an available hospital in the patients' district of residence and the SV is issued including options that may be in a different region. The fourth reason identified by the study leading to 10% of refusals was lack of information regarding the transfer process either by the patients or by staff. However, the same study notes that even though only 10% of refusals were due to lack of information, information deficits of patients interviewed were identified across all groups.

5.3.3 Financial Flow and Billing of Transfers

When an episode involves the issuing of SVs or TNs, it is necessary to perform the billing of the episode, so that the HD, either an NHS or a contracted hospital, receives the payment for the services provided to the NHS. In this process, the HD bills the episode, sending it then to URGA, which verifies the bill, makes the necessary corrections and validates it. In the case of the HD being an NHS hospital, it bills the HO directly, while in the case of the HD being a contracted hospital, it bills the respective RHA, who then bills the HO. In both cases, if the HO does not comply with the maximum period for completion of the payment (90 days), the CAHS can captivate the value correspondent to the outstanding bill from the monthly advances of the HO's programme contract and provide it to the HD, in the first case, or to the RHA, in the second.

To define the value of the bill, the patient's diagnoses and procedures are assigned standardized codes according to the International Classification of Diseases – 10th revision – ICD10CM/PCS, which are described in the patient's clinical process until the date of admission. The set of codes in the patient's episode leads to the establishment of DRGs for the patient. A SIGIC patient can be assigned more than one DRG as they are defined for each independent surgical intervention the patient undergoes during hospitalization. Having the DRGs defined, the bill is completed according to the rules established in Portaria 207/2017 for transferred additional production in the context of SIGIC. This *Portaria* sets a price for each of the DRGs according to a price table that accounts also for the level of severity within the DRG and for the typology of the surgery, that is, ambulatory or inpatient surgery. The monetary value billed to the HO corresponds thus to the price assigned to the episode's DRG, which includes all services provided during hospitalization and normal recovery period. If more than one DRG is assigned to the episode, the billed value corresponds to the price for the principal DRG (which is the one with the highest value), adding 45% of the sum of the values of the remaining DRGs without exceeding a maximum of 45% of the value of the principal DRG. Some cases include other monetary increments, namely in the presence of neoplasms, or when the surgery includes the placement of a prosthesis. Besides the DRG price, the HD also bills the HO other exams allowed by the HO, that the HD considers necessary before surgery execution. This only excludes the normal pre-surgical procedures such as blood tests or x-rays, which are included in the DRG pricing.

Since 2012, the financial responsibility for the patients in LIC who do not receive timely surgery in the HO, consequently receiving surgery in other institutions, has been attributed to the respective NHS hospitals. As such, public hospitals' programme contracts include not only the surgical activity they expect to achieve internally, but also the activity required for the remaining of the hospitals' LIC which may need to be performed by other hospitals, as mentioned in section 5.1.6. However, the monetary values concerning transferred surgeries are deducted from the programme contract's value. This also means that when a HD performs a surgery following the issuing of a TN or SV, this extra surgical activity is not included in the hospital's programme contract, being considered a profit for the HD.

5.4 Chapter Conclusions

The NHS is a universal publicly funded healthcare service with a large network of public hospitals distributed across the country. NHS hospitals have a certain degree of autonomy, being, however, also subject to regional and central monitorisation and regulation. In the past decades, consistent increases in surgical demand have been taking place, which current supply has not been sufficient to address. As such, like in many OECD countries, waiting times and waiting lists for elective surgery are an important policy concern in Portugal.

Several short-term programmes to face the surgery waiting list problem have been developed since the late 20th century, however, all have been unsuccessful to achieve sustainable waiting time reductions.

The SIGIC system was created as a long-term strategy to tackle the growth of waiting lists for surgery in the NHS, being the first programme in Portugal to achieve viable results in the long-term, effectively decreasing hospitals' length of waiting lists in its first years. For that, the system established a set of

new policy strategies including giving patients a choice of alternative public or private hospitals upon breaching defined TMRGs, as well as providing regulations for the use of additional production by NHS hospitals. However, as the demand continues rising, NHS hospitals continue to have patients exceeding the TMRGs and having longer waiting times than reasonable. Related to this, is the fact that most patients are reluctant to accept transfers, not taking advantage of this system and consequently waiting longer for their surgeries. Furthermore, the fact that the waiting lists are managed independently by each hospital leads to a large variability of response times within the NHS, translated into the existence of inequities between the institutions and their patients.

6 Discussion

Throughout the previous chapter, the institutional context of the NHS and elective surgery production and waiting list management strategy were described. Some issues in the operation of the SIGIC system regarding waiting list management and waiting times were also identified. In this chapter, these issues are discussed in light of the information and insights provided by the systematic literature review reported in chapter 4, and possible recommendations or new study subjects are discussed. As such, the first four sections each discuss one of these issues. They include the presence of waiting time inequities and variability, the frequent breaching of TMRGs still occurring in the NHS, the low acceptability rate of TNs and SVs, and the unbalance between the number of issued TNs and SVs across the country and between regions resulting in differing contributions of private providers for surgical supply. Afterwards, section 6.5 discusses additional considerations or strategies used by SIGIC Finally, section 6.6 concludes the chapter.

6.1 Waiting Time Variability in the NHS

Inequities in waiting times is a problem reported frequently in universal healthcare systems. Inequities are most frequently associated with disparities in access to healthcare services between different socioeconomic groups, however, they can also arise between regions, providers, priority groups or specialities within a country. Although in this case study of the Portuguese NHS no information regarding social inequities is present, there is a high variability of waiting times across the country.

According to an audit by *Tribunal de Contas* [24], the mean waiting time of patients operated in 2016 was 87 days in Norte but 162 days in Algarve. The information of mean witing times per region is not made available in a systematic way, however, looking at the percentage of patients operated after exceeding the TMRG for the years 2018 and 2019 reported by the Health Regulatory Entity, shown in Figure 18, there is also a high degree of variability between regions. In the first semester of 2018, this difference was especially large with Alentejo reaching 34,3% of patients operated after breaching the TMRG and Algarve only 7,1%. Within regions, variability between providers is also present, which can be perceived in the mean waiting time per provider (since patient-level data is not available) in 2019 represented in the box plot in Figure 19 (excluding oncology hospitals in Norte, Centro and LVT since the TMRGs for this speciality are lower). Alentejo and Algarve are not represented since there are only four and one hospital institutions in these regions, respectively. In Alentejo, the mean waiting time per provider varies between 2,2 and 4,8 months and Algarve's hospital centre has a mean waiting time of 3 months. The variability between minimum and maximum waiting times is especially high in the regions of Centro and Alentejo, even though these regions have a lower number of hospitals, while Norte has the lowest variability.

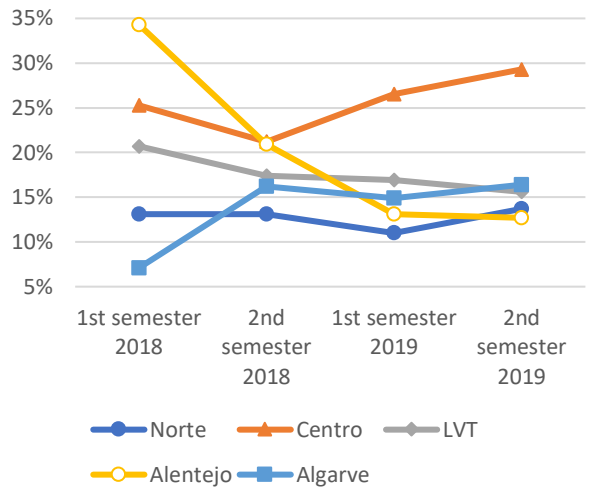

Figure 18 - Percentage of surgeries performed after exceeding the TMRG per region. Data source: [99], [103], [104].

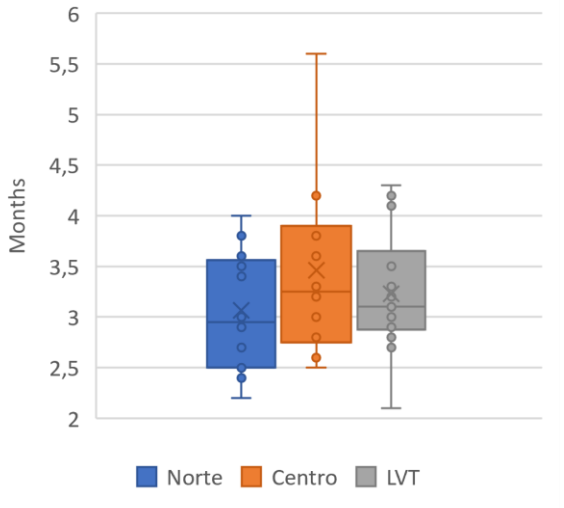

Figure 19 - Distribution of mean waiting times per NHS hospital in Norte, Centro and LVT in 2019. Data source: [4].

In addition to waiting times, inequities can also be found in the supply of each of the regions. In 2019, calculating and comparing the ratio of patients operated per number of new entries in LIC, this was close to 0,8 in all regions except in Algarve where it was less than 0,6. This means that relative to the number of all new referrals for surgery per year in the region, NHS hospitals in Algarve could only provide surgery to approximately 60%. This also results in private contracted providers playing a much larger role in this region to provide surgery to an additional portion of patients, as discussed in section 6.4.

As reported in the literature review, one of the approaches to waiting list management that is intended to reduce waiting time inequities and variability is the implementation of patient choice policies. By redistributing patients from providers with longer waiting times to those with shorter waiting times, these strategies have the possibility of increasing waiting time convergence between hospitals (seen, for instance, in the London choice project, in section 4.2.1). Similarly, objectives of the SV/TN strategy include improvement of the distribution of waiting time and utilisation of available capacity and resources in the NHS by allowing patient transfers to providers with shorter waiting times. In fact, as mentioned in section 5.2.2, according to the analysis of Barros et al. [2], the variation of mean and median waiting times between providers decreased after the initiation of SIGIC leading to a more homogenous access to surgery services. However, this reduction was only in place until 2009, having started to increase afterwards. The authors attributed the variability decrease to a period of increase in the number of participating providers, both public and private, in SIGIC, which occurred until 2009, having remained relatively stable afterwards.

One of the problems of allowing transfers of patients through choice in the NHS, as seen in section 5.3.2, is the significantly low proportion of patients who accept these transfers and use their right to choose an alternative provider, which hinders the effects of the strategy in waiting times variability. This is more thoroughly discussed in section 6.3. However, as reported by the literature on this subject, it is also common for choice policies to fall short of their intended objectives of better distributing demand.

For instance, patients may primarily choose providers with perceived higher quality rather than according to waiting times. However, since choice through SVs or TNs is restricted to a list of available providers, this is unlikely to be occurring in the NHS. In theory, patients can also choose a provider that is not listed in the SV or TN if it still complies with SIGIC regulations, however, this information is generally unknown so it is unlikely to be occurring to a big extent in practice. Another reason for the lack of success of choice policies reported in the literature is the lack of central coordination. In fact, through SIGIC, the issuing of TNs or SVs is done at the centralised level by UGA and the contracts with private providers are done at the regional level which is an important feature to assure control and coordination. The central coordination allows for a more efficient management. This is done, for example, by removing RHA geographic boundaries and allowing a more comprehensive and integrated view of the global network of hospitals. On the other hand, the regional level coordination allows easier monitorisation of the system. However, since NHS hospitals also have some management autonomy, there are still different practices employed by hospitals regarding the management of waiting lists, which can benefit some patients over others, creating inequities [105]. Additionally, centralised level management issues can also occur. For instance, even though TNs and SVs are intended to be issued at 50% and 75% of the TMRG, *Tribunal de Contas* [24] reported a mean waiting time for TN issuing of more than 7 months and SV issuing of more than 8 months in 2016. In that year, TNs and SVs should be issued at 3 months and 6 months 23 days, respectively. Additionally, it was also reported that more than 60% of the SVs and TNs in that year were issued during one single month and that several patients also received a TN or SV before reaching the threshold waiting times. According to CAHS this was a single situation due to administrative problems, in which TNs and SVs stopped being issued for a large part of the year. With the available data, it is not possible to assess whether this was a unique event. However, being a disruptive situation, the occurrence of similar events brings inefficiencies to the system and diminishes the impact of the SV/TN system. Monitoring with appropriate indicators is essential to ensure that this is not a systematic problem.

In 2018 and 2019 the number of TNs and SVs issued was significantly higher than in previous years, which led to a significantly higher number of SVs and TNs used and thus to higher patient mobility. This is discussed further in section 6.3, but it clearly represents an interesting opportunity to analyse possible decreases in waiting time variability in these years.

In addition to the SV/TN strategy, since 2016 the policy *Livre Acesso e Circulação*, which allows a higher degree of choice by patients, has also been implemented [106]. This policy establishes that referrals from primary to secondary care can contemplate any hospital of the patient's choosing. As such, its effects are mainly directed at waiting times for first specialist appointments, being the effect on elective surgery waiting times less understood. Nonetheless, it would be interesting to study the actual influence of the policy on waiting times variability.

In conclusion, the SV/TN strategy is, in fact, likely contributing for some reduction in variability of waiting times across the country by promoting transfers of patients within and between regions. This is because the SV/TN strategy has relevant characteristics that, according to the literature, can determine the success of choice policies, such as the existence of central coordination and a regional purchaser.

However, this effect is largely reduced due to the low acceptance rate of SVs and TNs. Despite this, waiting time variabilities also depend on several other factors, such as an appropriate distribution of capacity according to demand needs in each region, and homogenisation of NHS hospitals' waiting list management practices.

6.2 TMRG Breaching

As mentioned above and reported in section 5.1.5, even though there are maximum waiting time guarantees, TMRGs, established for NHS patients, these guarantees are often breached. According to CAHS annual access reports, there is a significant proportion of patients in LIC who have already exceeded the TMRG - 32,1% in 2019 [4]. Additionally, according to the data provided by the Health Regulatory Entity regarding waiting time monitorisation, approximately 17,2% in 2018 and 16,5% in 2019 of patients were operated after exceeding the TMRG [99], [103], [104]. TMRGs were established as the maximum waiting time at which it was clinically adequate for patients to receive surgery. As such, exceeding these times can lead to worsening of the patient's health condition.

According to the literature, the establishment of waiting time guarantees has been seen as one of the most used and effective policies in reducing waiting times, at least for long waiting patients, as long as clear penalisations or incentives to comply with the guarantees are established, as seen in section 4.2.3 of this work. Even though this may be at a cost of shifting prioritisation practices due to favouring high waiting time patients, in many of the international examples of the establishment of waiting time guarantees, the proportion of patients breaching the guarantee can be effectively reduced. In the NHS, TMRGs are defined according to priority levels (named conditional guarantee in the literature), so the risk of shifting prioritisation practices is lower, as higher priority patients have shorter TMRGs. However, another important factor, reported in the literature regarding waiting time guarantees, for the success of these policies is that the guarantees must be set to a waiting time that is challenging for providers to achieve so that reductions in overall waiting times can take place.

First, regarding incentives for NHS TMRGs, these are essentially defined in hospitals' programme contracts, which establish a number of incentives and penalisations related to waiting list indicators, as seen in section 5.1.6. According to the specifications of programme contracts for 2020 [22], incentives related to the percentage of patients in LIC and patients operated after exceeding the TMRG each account for 0,5% of the total budget defined by the contract. Additionally, penalisations of 0,21% of the budget are applied if hospitals do not reduce the percentage of patients in LIC above the TMRG by at least 10%. This means that, at most, NHS hospitals could increase their income by 1% or be penalised by 0,21% of the yearly budget value. This already represents an increase in comparison with 2019 specifications, where incentives related to TMRG compliance were at most 0,35% and penalisations 0,09% [22]. Additionally, another incentive created to encourage NHS hospitals to comply with TMRGs was the introduction of financial responsibility to HOs when their patients are transferred to another NHS or contracted hospital, since 2012. Under this regulation, the HO pays the price of the transferred patient's DRG to the HD (on a fee-for-service basis, as described in section 5.3.3). For this to represent a significant incentive, it is necessary that the price of these patients' DRGs is higher than the average

value NHS hospitals receive through programme contracts. It is also possible that the different prices and profitability of different DRGs represent an incentive to preferentially treat some patients before others independently of their waiting times so that transfers of profitable DRGs' patients are avoided, which would raise significant equity concerns. This issue has in fact been identified in international evidence (see section 4.2.3).It would thus be important to perform this analysis with Portuguese data. Additionally, since the proportion of patients who accept SVs or TNs being actually transferred is significantly low, the impact of financial responsibility for HOs as an incentive may be diminished, as also observed in the literature. This is because hospitals know beforehand that it is unlikely that patients will accept the transfer, so the breaching of TMRGs (or booking thresholds) will probably not bring direct consequences, aside from programme-contracts incentives or penalisations.

Second, regarding the need for establishment of challenging TMRGs reported in the literature, it is important to note that there was a recent reduction in the TMRG for normal priority general pathology patients from 270 days to 180 days in 2018. This results in significantly higher numbers of patients considered to be above the TMRG. However, this reduction occurred when there was still a significant percentage of patients breaching the previous TMRG. In fact, considering the TMRG of 270 days, the percentage of patients in LIC above the TMRG in 2019 would still be 20,1% [4], which is already considerable. According to a 2018 report on access to healthcare in the NHS [105], the redefinition of TMRGs may have been more political than clinical, and was not accompanied by a proportional increase in the capacity of providers to react to the change in regulations. This resulted in the main impact being a higher number of TNs and SVs issued rather than a decrease in waiting times. However, it is also important to note that the TMRG reduction means that the probability of occurrence of incentives and penalisations (both in programme-contracts and through financial responsibility) increases, since they are applicable at lower waiting times.

In conclusion, it seems that incentives/penalisations for the compliance with TMRGs by NHS hospitals may not be strong enough to produce sufficient impact on providers. Nonetheless, these incentives are also being increased in recent years, which shows that this issue is being acknowledged by regulators. Additionally, defining stricter penalisations or incentives may not be enough to improve the effectiveness of waiting time guarantee policies. Sufficient funding and resources, including physical capacity and staff, also need to be available to providers if they are to have the means necessary to respond to such policies, which is not occurring in the NHS.

6.3 The low acceptance rates of SVs and TNs

Another problem identified in the operation of the SIGIC system was the consistently low share of patients who accept the SV or TN and take advantage of their right to choose an alternative provider with a shorter waiting time, as seen in section 5.3.2. As mentioned, this reduces the potential effects of the strategy in reducing both individual and overall waiting times. In fact, of all patients who receive either SVs or TNs, only 18,8% of them accepted to be transferred to another hospital and be treated in a shorter waiting time in 2019. Additionally, as seen in Figure 17 in section 5.3.2, this proportion seems to be decreasing in the past years, even though the number of SVs and TNs is increasing.

This issue is commonly reported in choice policies literature, where often there is a very low quantity of patients using their right to choose alternative providers. Although a small level of patient mobility may be sufficient to produce the intended objectives and the introduction of patient choice can be an end in it itself, it is broadly acknowledged that the extremely low levels occurring are hindering the achievement of other policy objectives, such as reducing waiting time variability and, in the NHS case, breaching of TMRGs. The main reasons identified in the literature for patients tending to refuse being treated by another provider include higher distance or travel time, lack of information and uncertainty of surgery date even if waiting time was shorter with the alternative provider. As mentioned in section 5.3.2, a study performed by the Health Regulatory Entity in 2008 identified the main reasons for refusing SVs or TNs in the NHS, including unwillingness to receive surgery outside the residence area and lack of information (26% and 10% respectively). However, the main reason (34%) was that patients did not want to be operated by a different surgical team or at a different hospital they were not familiar with. This more social factor is related to the relationship and confidence that patients have in their referring surgeons and the apprehension associated with entrusting their healthcare to unfamiliar physicians and hospitals. A final reason was the inability of patients to activate the SV or TN before the expiry date (30%), which includes personal reasons of patients who prefer to delay surgery, as well as administrative errors that lead to the issuing of SVs or TNs when the patient is not available for surgery (for instance, the patient is hospitalised, or already had a booking for surgery at the HO).

Another problem reported in the literature related to the low percentage of patients using their right to choose provider is the fact that this rate can be especially low in some groups of patients. This leads to equity problems, especially between different demographic and socioeconomic groups, and to ethical issues. The above mentioned study of patients' reasons to refuse SVs or TNs did not report significant differences between age groups, gender or regions, however this was also not specifically studied. Additionally, other socioeconomic differences are not assessed. As such, given the high risk of this effect frequently reported in choice policy literature, it would be important to better study and understand the possible presence of these issues in the NHS with a more detailed study as well as obtaining a more recent picture of the current motivations that lead NHS patients to so frequently refuse SVs and TNs.

The NHS has taken some recent measures to increase the acceptance rate, namely actively contacting patients who receive SVs or TNs to support their decision since 2017 [107]. However, the acceptance rate continued to decrease after that year, suggesting that the measure had little or no impact. Additionally, the recent reduction in TMRGs had the main effect of increasing the number of issued TNs and SVs. Even though this is not expected to increase the acceptance rate, it did significantly increase the number of TNs and SVs activated and used, thus increasing patient mobility in the NHS, as seen in Figure 20.

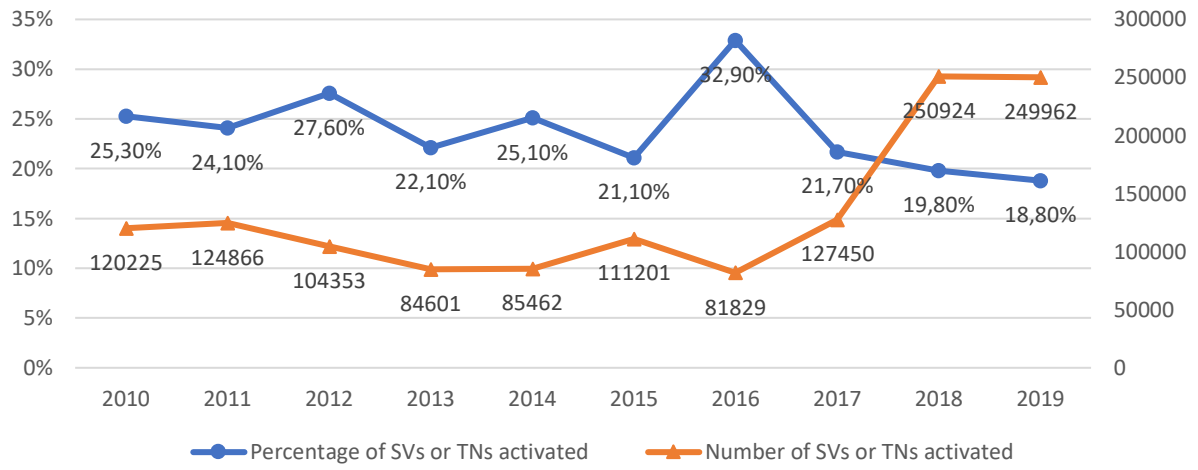

Figure 20 - Percentage and absolute number of SVs and TNs activations. Data source: [4].

In conclusion, the increase in the number of issued TNs and SVs had a significant impact in the utilisation of the transfer system, however the acceptance rate decreased in the past years. Hence, taking on measures that could further increase the utilisation of transfers and acceptance rate is important. According to international examples, factors that could more likely achieve this include giving options that require less transportation time for patients or providing transportation, giving better information to patients and providers so that patients' decisions can be supported, and giving patients certainty of the date of surgery upon choosing an alternative provider, for instance through direct booking systems for transfer patients.

6.4 Unbalance between number of TNs and SVs

The difference between the number of TNs and SVs issued is significant, as can be seen in Figure 21. The number of TNs has been consistently lower than the number of SVs, however the degree of this discrepancy has varied each year. TNs lead to transfers to other public hospitals (and in some cases to social sector hospitals) and SVs primarily to private hospitals, which means that this unbalance results in a much higher number of patients being transferred to privately contracted hospitals than to NHS hospitals. As such, this indicates that the capacity of public hospitals to receive transferred patients is significantly low. This is because TNs are only issued if there are available NHS hospitals to receive transfers under SIGIC regulations (which include ability to perform the surgery in 25% of the patient's TMRG and being located in the patient's district of residence).

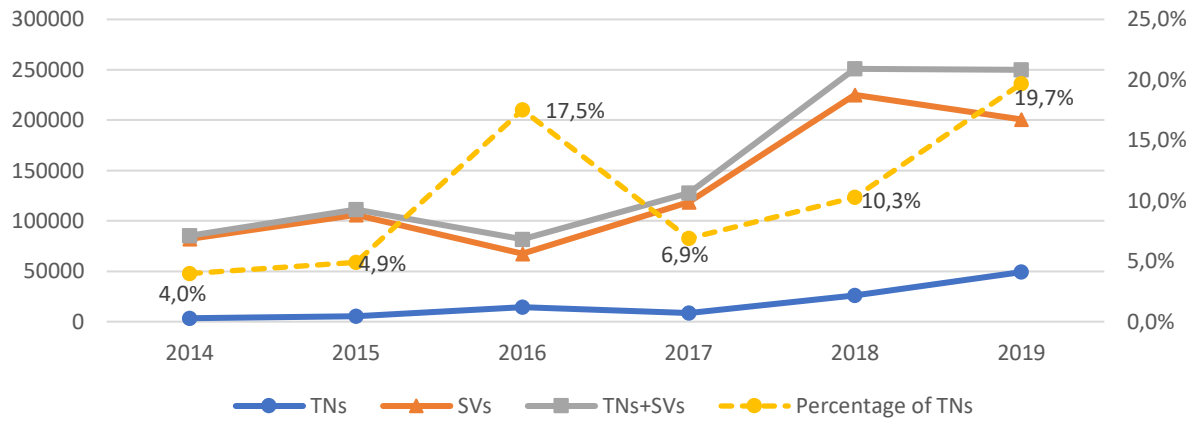

Figure 21 – Evolution of the number of TNs and SVs, and percentage of TNs between 2014 and 2019. Data sources: [4], [24], [108].

As mentioned in the literature, contracting services from the private sector is a quick and affordable way in the short-term to increase capacity for provision of surgical services to publicly funded patients. Additionally, these strategies are also intended to provide more efficient and timely care. In fact, NHS data from 2015, for example, indicate a mean waiting time for contracted hospitals of 24 days while in NHS hospitals it was close to 3 months [98]. However, as international examples suggest, this also comes with its own risks. For instance, overpayment (for activity not actually performed) has been reported, however, given that in SIGIC payment to private providers is done per patient transferred, this issue does not occur. Additionally, international examples have also suggested that contracted private providers frequently tend to only take on simpler cases, leaving more complex and costly cases for public hospitals. Nonetheless, a 2014 Health Regulatory Entity Study reported that while more than 50% of patients were operated in ambulatory surgery in NHS hospitals, in private contracted providers, this percentage was only 21% [25]. Being inpatient surgery generally more complex than ambulatory surgery, this suggests contrary evidence from what is reported in the literature. In this 2014 NHS report, one possible reason pointed out was that NHS hospitals might perform ambulatory surgeries more easily and leave inpatient surgeries in LIC with higher waiting times, thus leading to their transfer. However, this also represents increased costs for HOs since prices for inpatient DRGs are defined independently from ambulatory DRGs (see section 5.3.3), having the former generally higher prices. In either case, higher levels of transfers to private contracted providers can represent an increase in costs for NHS hospitals. It would thus be important to analyse the case-mix of transferred and non-transferred cases in the NHS and the respective DRG prices to understand if this is occurring.

In the NHS, to address the unbalance between SVs and TNs, and thus, between transfers to private and public hospitals, a modification was made to increase the number of TNs and increase internalisation of surgeries in NHS hospitals since 2016. Under the new measure, the threshold for issuing TNs started occurring after 50% of the TMRG, that is, 3 months in LIC for normal priority patients. This had already been reduced from the initial 6 months to 4 months in 2012. On the one hand, the unbalance between TNs and SVs indicates insufficient NHS hospitals supply. On the other hand, the new stipulated threshold for issuing TNs was implemented under the objective of increasing

internalisation of surgical activity in the NHS, suggesting a recognition that there is unused capacity within the NHS. According to Penedo et al. [109], who studied the current OR situation in Portugal, there is unused OR capacity in the NHS, being the deficits in human resources, such as the number of anaesthesiologists, one of the main limiting factors of surgical productivity.

The reduction in the threshold for issuing TNs in fact led to an increase in the proportion of TNs in relation to the total number of TNs and SVs. However, the significant increase in proportion was more related to the decrease in the number of SVs in that year than to the increase in the number of TNs. In recent years, there has been an effort to increase the number of TNs and the proportion has increased since 2017, as seen in Figure 21.

The problem of the unbalance between the use of SVs and TNs is present across the whole NHS, however, this problem is more evident in some regions than in others. As mentioned, the share of patients transferred to the private sector to receive timely surgery differs markedly between regions. While in Norte, NHS patients treated privately represented only approximately 2%, in Algarve they represented more than 22% in 2019, as seen in Figure 9 in section 5.1.5. This is related to the fact that in Algarve, there is only one hospital centre, which means that TNs generally cannot be issued. Hence, when patients need to be transferred, these transfers occur prominently to the contracted private hospitals in the region. This means that it is expected that the number of transfers to the private sector in comparison to the total number of transfers is higher in Algarve than in other regions. However, this should not lead to a higher number of surgeries outside the NHS overall. In fact, the number of patients operated in NHS hospitals as a proportion of all NHS patients operated in 2019 was only just above 77% in Algarve, while in all other regions it was over 85%. This represents a significant lack of NHS capacity in this region to respond to its demand. As discussed above, contracting out services from the private sector is a quick and effective way to increase capacity for publicly funded patients. The percentage of patients treated in contracted hospitals in Algarve has been decreasing in the past years, however, this issue has been present in the region for several years [24], which can represent significant costs and it would likely be more sustainable for the NHS to increase public capacity in the region. Another visible discrepancy is the high percentage of patients treated in protocolled hospitals in the Norte region. This is related to the significantly higher number of protocolled hospitals in this region, generally social sector hospitals (*Misericórdias*), as seen in Table 3 in section 5.1.4.

In conclusion, considering that the NHS is not able to achieve sufficient levels of supply to meet its demand, contracting out surgical care from private providers under SIGIC is a rapid way to increase capacity and services provision for NHS patients. Private providers have in fact significantly shorter waiting times, which brings benefits to the patients. As such, contracting out services from private providers seems to have had a positive effect on waiting times, at least for transferred patients, however, it can also be expensive. Hence, in the long-term it could be more beneficial to increase capacity in the NHS directly, so that it does not depend on such a high level on private provision.

6.5 Other Considerations and Strategies

In addition to the issues identified in the previous sections, there are still other considerations regarding strategies used under SIGIC that can be discussed. Despite not displaying specific evidence of leading to unintended effects in the NHS, there are some problems frequently associated to these strategies in the literature (reported in chapter 4 of this work), being thus here discussed.

The first of these strategies is the use of national prioritisation regulations, and specifically the tools used for NHS prioritisation practices. Even though there is no information available regarding the validity of the prioritisation guidelines used in the NHS, one of the main concerns regarding the use of qualitative prioritisation guidelines is the lack of formality and transparency. In the absence of specific rules to aid surgeons' decision-making and placing patients in different urgency categories, there is a considerable possibility of different surgeons categorising the same conditions differently, which represents a high risk of inequities between the same type of patients. Developing and employing procedure-specific regulations is a possible approach with lower risk of this issue arising. However, it would be important to study the prioritisation practices in the NHS so as to verify the robustness and validity of the prioritisation tools used and assure no inequities are occurring.

Another strategy with possible implications is the use of DRG-related payments to NHS hospitals. As described in section 5.1.6, NHS hospitals are funded through yearly defined budgets via programme-contracts. The definition of these budgets is done according to not only previous activity volumes but also previous years' case-mix, which results from the distribution of DRGs treated by each hospital. As seen by literature examples, the use of DRG-based payments to providers can create perverse incentives to favour patients with more profitable DRGs, leading to cream-skimming or to DRG-creep. In fact, the presence of DRG-creep, or upcoding, in the NHS has been the focus of a study by Barros and Braun [110]. The authors analysed NHS data to study the presence of this effect when DRG prices and weights were redefined in 2006, verifying that upcoding occurs in NHS hospitals. However, this effect led to a small economic impact, suggesting that DRG-based payments are still adequate funding mechanisms for NHS hospitals.

A third strategy that is used under SIGIC is the utilisation of additional activity to increase the volume of surgeries performed in NHS hospitals. This is done by allowing surgical teams to operate on patients outside normal working hours and paying teams for these surgeries according to DRGs of operated patients. According to Barros et al. [2], in the early years of SIGIC, additional activity played an important role in the increase in surgical activity. However, this information is not made available by CAHS annual access reports. The fee-for-service payment system in additional activity represents an incentive to increased productivity by specialists, although the effects on waiting times are more difficult to assess. A more direct way of encouraging specialists to reduce waiting times reported in the literature consists of linking the specialists' incentives directly to waiting time objectives. Additionally, it is also important to mention one programme implemented in 2015, PIC, which contracted with some NHS hospitals to perform an additional volume of surgeries through additional production only during 2015. This additional volume of surgeries was also directed only to a specific group of procedures. The use of short-term

funding to solve surgery backlogs is one of the strategies whose unfavourable effects are most unanimous, according to the literature. In fact, as mentioned in section 5.2.1, PIC participating hospitals did not achieve the contracted surgery volume and many increased their waiting times for the targeted procedures [24].

Another observation is the large number of SVs and TNs that hospitals send, while also receiving a large number (even though, as mentioned, the majority are not used). Hospitals can only receive SVs or TNs if they can perform surgery within 25% of the transferred patient's TMRG. Hence, this indicates internal management problems occurring within hospitals. The fact that a hospital cannot provide timely surgery for some patients, but at the same time have sufficient capacity to receive patients from other hospitals indicates an unbalanced distribution of resources within the hospital. Even though this could be related to different capacities in the hospital's different surgical services or specialities, this still represents a management problem with possible efficiency consequences. Some strategies are directed at increasing efficiency at a more local level, including, for example, waiting list pooling. This strategy is also effective in reducing variability of waiting times within the hospital as well as overall waiting times. Although this type of strategy highly depends on effective local implementation, central regulations can also promote its employment.

Finally, it is also important to note that the use of maximum waiting time guarantees in international cases has been attributed to decreases in quality or increases in waiting times of uncovered services or wait periods. The TMRGs established by SIGIC were first only defined for the wait between inclusion in LIC and date of surgery, which did not account for the also extensive waiting in previous stages of the patient's path. However, TMRGs have since then been established also for the period of waiting time for first specialist appointment (that is, from referral to secondary care until date of appointment) and more recently to waiting for medical examinations for diagnosis and treatment, which was an important step to a more comprehensive and integrated view of the patients' entire pathway through the different stages of healthcare.

6.6 Chapter Conclusions

Several issues hindering the effective operation of SIGIC have been identified throughout the case study depicted in chapter 5. These issues include the large variability of waiting times in the country, the consistent and widespread breaching of TMRGs, the low proportion of patients accepting TNs and SVs, and the unbalance in the number of SVs and TNs across the country and between regions. Many of these issues are also found in international literature, as well as possible measures that can be taken to face these problems and decrease the risk of their occurrence.

The use of the SV/TN system in the NHS can contribute to the reduction in waiting times variability by allowing transfers that can redistribute demand to hospitals with higher available supply for that procedure. However, as many other choice policies used internationally, the low proportion of patients accepting rereferral to other providers is very low, which reduces the policy's effects. This issue also contributes to the limited effect of SVs and TNs in reducing the number of patients breaching the TMRGs. This is because it reduces the incentive for providers to avoid exceeding threshold times for

transfer, since they are aware beforehand that it is unlikely that patients will actually be transferred. Some factors have been pointed out in the literature that can increase the probability of patients accepting mobility to an alternative hospital, including giving options that do not require excessively long travel times, providing transport, decreasing uncertainty through direct booking measures, and providing more information to both patients and providers to support patients' decisions. However, it is important to note that in addition to these measures, the capacity available in NHS hospitals also needs to be sufficient to respond to them, especially in human resources, namely, anaesthesiologists who are one of the main limitations of surgical supply in the NHS. This NHS shortage of capacity also leads to the large majority of transfers to occur to the private sector instead of NHS hospitals, which may represent unnecessary costs for the NHS in the long-term, as well as sustainability concerns.

Additionally, other strategies implemented under SIGIC can also require consideration and assessments. For instance, the use of prioritisation guidelines which use qualitative and non-specific criteria can raise important equity concerns since there is a high risk of differential judgements by different physicians. The presence of DRG upcoding has been identified in the NHS, however the financial impact is low, being DRG-based hospital budgets an adequate method to incentivise hospitals' productivity. DRG-based payments are also applied to surgical teams probably with positive impacts on productivity, although waiting time effects are more difficult to assess. In conclusion, there are several implications of strategies used in the NHS to reduce waiting times that require further assessment in order to verify that no unintended consequences are occurring or what processes need to be improved.

7 Conclusions

The presence of elective surgery waiting lists is a growing problem for many healthcare systems. In recent decades, the healthcare sector witnessed consistent increases in the demand for health services. The development of new technologies which enables new treatments, the aging of the population, the evolution of socioeconomic factors, along with the population's higher expectations regarding their health status and quality of life have heavily contributed to this increase. Consequently, the need to fulfil the demand and, therefore, the supply for these services has also increased. Nevertheless, there has been a constant gap between supply and demand, which leads to the emergence and the growth of waiting lists, resulting in long waiting times. In turn, long waiting times may bring negative consequences for the patients, such as deteriorating health conditions, lower quality of life, or work absenteeism.

The waiting list problem is especially critical in publicly funded universal healthcare systems. In these systems demand is extremely high, since there is no rationing by price, and waiting lists are the only rationing mechanism in place. As such, public providers are under increasing pressure to address this demand, frequently under cost and resource restrictions. Thus, numerous waiting list management strategies have been developed over the years to manage the waiting lists of various health services. These strategies generally have as their primary objective the reduction of waiting times, adopting different practices that directly or indirectly aim at reducing waiting times for these services. The problem of waiting lists for elective surgery is also present in the Portuguese NHS. In this case, the SIGIC system was created to address this issue by developing a system of inter-hospital transfers through the issuing of SVs or TNs, contracting with the private sector, defining TMRGs, and introducing nationally regulated additional production.

In the literature, the problem regarding the existence of long waiting lists, is also largely studied, since it is a common challenge to different health systems globally. To better understand the state of the art, it is essential to comprehend the strategies and policies used across different countries, their possible effects, as well as unintended consequences. In this work, a systematic literature review of waiting list and waiting time reduction strategies is undertaken, and the respective findings reported. Strategies used to tackle the waiting list problem have been divided between strategies acting on the supply or on the demand of elective surgery. Additionally, another type of strategy, namely, waiting time guarantees, are designed to act directly on waiting times, thus affecting both supply and demand, being one of the most commonly used strategies. Supply-side strategies include providing additional funding, using activity-based payments, reforming specialists' contracts, improving local management of waiting lists, increasing fixed capacity, private contracting, cooperating with hospitals abroad, or increasing patient choice. Activity-based payments are found in the majority of health systems, having a positive impact especially when combined with other strategies, nevertheless waiting list pooling is deemed in literature to be a useful tool to increase efficiency of waiting list management. Contracting with the private sector and increasing choice can both have important roles in reducing waiting times, however they require careful planning and monitoring. On the demand-side, strategies include subsidising PHI, the usage of prioritisation tools, and explicitly rationing demand. Prioritisation tools are used in most systems while for instance, subsidising PHI is employed in Australia, where it is found to be an expensive measure

without clear effects on waiting times according to the literature. The adoption of supply-side strategies and waiting time guarantees have been also found to be more common than demand-side strategies. However, when used alone, strategies that increase only the supply of services have limited successfulness. This occurs because when supply is increased, demand also tends to increase due to inherent feedback mechanisms characteristic of the behaviour of waiting lists.

Regarding the national scenario, the Portuguese NHS is a universal publicly funded health system, where care is provided essentially free at the point of care. In some cases user charges apply, however these are generally not applicable in elective surgery services. The NHS thus consists of a network of primary care centres, hospitals, and a long-term care network – all divided in five health regions. In addition to the network of hospitals within the NHS, private and social sector hospitals play an important role in the provision of elective surgery – and other – services. To tackle the growth of elective surgery waiting lists and times in the NHS, several consecutive short-term programmes were developed, in which the main measures were the provision of extra funding for the performance of additional surgeries. However, these programmes consistently failed to achieve sustained waiting time reductions since they did not address improvement in the management of waiting lists, but rather tried to eliminate them without introducing any changes in the system. Afterwards, SIGIC was developed in 2004 introducing regulations for the practice of additional production, and also a system of inter-hospital transfers where patients are able to opt to receive surgery at an alternative provider with shorter waiting times upon breaching a threshold for surgery booking in the HO. This is made through the issuing of a TN (for NHS hospitals) or SV (generally for private contracted hospitals). This threshold, in turn, corresponds to a percentage of the defined TMRG attributed to each patient based on their priority level. Additionally, each RHA contracts out services from other private and social sector providers to increase the capacity available to NHS patients. Contrary to the previous programmes, the SIGIC system was able to achieve a consistent decrease in waiting lists and waiting times and an increase in production in the first years. In the past decade however, waiting times have ceased decreasing and actually display a slightly increasing trend. TMRGs are frequently breached, with the percentage of patients in LIC exceeding the TMRG being above 30% and the percentage of patients operated after the TMRG being over 16% in 2019. Additionally, there is a high variability of waiting times between providers and regions, being this variability also present in terms of capacity distribution between regions. The insufficient levels of supply of NHS hospitals are evident when analysing the difference between the number of TNs and SVs (49 183 TNs and 200 789 SVs issued in 2019), which results in most patients being transferred to private hospitals. Furthermore, due to the public surgical supply variability between regions, the quantitative contribution of the private sector in each region varies considerably, being more evident in Algarve RHA with 22,1% of its patients operated in the private sector in 2019, compared to Alentejo RHA with only 1,5% for the same year. Other important factor that is reducing the potential effects of SIGIC strategies is the low proportion of patients accepting SVs or TNs (18,8% in 2019), thus not taking advantage of the transfer system.

The identification of these issues and their discussion under an evidence-based knowledge provided by the systematic literature review undertaken is critical for the identification of possible solutions that need

to be assessed. It is possible to infer that choice policies, such as the SV/TN system, are often expected to decrease waiting times variability. A positive aspect of the SV/TN choice policy is the centralised level at which transfers occur, since TNs and SVs are issued by UGA. This central coordination allows for a more homogeneous management of transfers, along with a holistic view of the entire system. It also removes regional boundaries that could, in some cases, prevent more efficient transfer flows. However, the low proportion of patients who use their right to choose alternative providers can significantly hinder the effect of increased patient mobility on waiting times variability. In 2018 and 2019 there have been significant increases in the number of SVs and TNs activated, i.e. patient transfers increased. The impacts on the global and local waiting times caused by this increase represent an interesting opportunity to study the effect of increased patient mobility in waiting time variability. Despite this increase, the overall low acceptability rate of TNs and SVs also hinders the effects of the establishment of TMRGs, since one of the incentives for the compliance with TMRGs is the financial responsibility of NHS hospitals if their patients are transferred. Hence, if these transfers seldom occur, they do not represent a strong incentive to operate patients before breaching the TMRG. In fact, one of the main factors related to the successfulness of waiting time guarantee policies is the establishment of clear penalisations or incentives. TMRG related incentives in the NHS are found to be limited to a maximum of 1% of hospitals' total annual budget and penalisations to 0,21%. As such, the low acceptance rate of TNs and SVs is an issue that requires significant attention. Several reasons have been pointed out for this, as well as possible measures that can help increase acceptance. These include giving options closer to the patients' residence area, giving certainty of date of surgery after acceptance, which is not always the case, and mainly improving information for both patients and clinicians so that patients can be supported in their decision. However, it is important to thoroughly analyse the motivations for NHS patients to refuse transfers as well as assess whether there is a difference between socio-economic and demographic groups regarding these choices. Furthermore, it is important to note that in addition to the low proportion of patients accepting transfers, the deficits in NHS capacity, especially in human resources such as anaesthesiologists, prevent hospitals to respond appropriately to SIGIC strategies. The unbalance in the distribution of these resources between regions contributes to varying levels of private provision for NHS hospitals, which can represent increased costs and sustainability concerns for the NHS. Other strategies used by SIGIC can also require further assessment. For instance, the use of non-specific prioritisation guidelines can lead to differential judgements between surgeons and should thus be validated. The use of additional production could also be further studied since its effect in waiting times is unclear, and whether it may be creating perverse incentives to treat some procedures first under additional activity since payment to surgical teams is DRG-based.

One of the factors that hinders the analysis of the performance of waiting list policies in the NHS is the lack of data available and, especially, the lack of rigour in the data. It is frequent to find differences or incongruences for the same measures when reported by different sources. Even though in relative quantities this may not lead to substantially different conclusions, it demonstrates the lack of homogeneity in data collection between providers in a system that is under the same central regulations. Additionally, the aggregation level of the data available can conceal important information and variation within regions or providers. This hinders comparisons between providers and the assessment of new

initiatives and their impact in the performance of the NHS. The extension of this work for the inclusion of more detailed quantitative and qualitative data would be beneficial. The empirical evidence of these strategies is difficult to obtain since experimenting new policies in real settings is often infeasible, especially in a wide system context. Operational research applications such as simulation can play an important role in healthcare systems research.

Sustainability of waiting list management strategies is also an important question to further investigate since it has been described as difficult to attain in the long-term. Most studies have relatively short periods of analysis after the policy implementation, which does not represent the consistent impact of the strategies. In fact, some strategies are notoriously non-sustainable, mainly the ones using short bursts of funding that do not change the systems' behaviour towards waiting lists. As such, this issue needs to be better studied since it may lead to the deterioration of the effects of a strategy even if initial impact is considered to be positive.

These findings cannot be seen as definite evidence of the effects of a strategy nor can they be used to determine whether or not a strategy will be effective in the NHS. However, they can be used as a foundation for an evidence-based discussion of possible implications of strategies used in the NHS that may not be evident through available or commonly used monitoring indicators, as well as identify possible solutions to problems already identified in the NHS. Additionally, these insights can also be applied to assess implications for any other health system where the management of long elective surgery wating lists represents a challenge. To conclude, it is important to mention that the Covid-19 pandemic has important implications for the management of elective surgery waiting lists in the near future. Due to large restrictions of hospital activity, waiting times for elective surgery and other areas of care have significantly increased, and cancellations of urgent and elective procedures have a significant impact. To counterbalance, the capacity of many hospitals has been increased. This variation and the maintenance of installed capacity and the increase of waiting lists have unclear consequences that are important to be analysed and further studied in future work.

References

[1] L. Siciliani and J. Hurst, “Tackling excessive waiting times for elective surgery: A comparative analysis of policies in 12 OECD countries,” *Health Policy (New. York).*, vol. 72, no. 2, pp. 201–215, 2005.

[2] P. P. Barros, R. Cristovão, and P. A. Gomes, “Portugal,” in *Siciliani, L., Borowitz, M. & Moran, V. (2013). Waiting Time Policies in the Health Sector: What Works? In OECD Health Policy Studies*, OECD Health Policy Studies, 2013, pp. 237–261.

[3] ACSS, “Manual de Gestão de Inscritos para Cirurgia.” 2011.

[4] Ministério da Saúde, “Relatório Anual Acesso a Cuidados de Saúde nos Estabelecimentos do SNS e Entidades Convencionadas,” 2020.

[5] L. Siciliani, M. Borowitz, and V. Moran, “Waiting times for health care: A conceptual framework,” in *Siciliani, L., Borowitz, M. & Moran, V. (2013). Waiting Time Policies in the Health Sector: What Works? In OECD Health Policy Studies*, OECD Health Policy Studies, 2013, pp. 19–32.

[6] L. Siciliani, M. Borowitz, and V. Moran, “A review of waiting times policies in 13 OECD countries,” in *Siciliani, L., Borowitz, M. & Moran, V. (2013). Waiting Time Policies in the Health Sector: What Works? In OECD Health Policy Studies*, OECD Health Policy Studies, 2013, pp. 49–68.

[7] A. Queirós, D. Faria, and F. Almeida, “Strengths and Limitations of Qualitative and Quantitative Research Methods,” *Eur. J. Educ. Stud.*, vol. 3, no. 9, pp. 369–387, 2017.

[8] S. Sofaer, “Qualitative Methods: What Are They and Why Use Them?,” *Health Serv. Res.*, vol. 34, no. 5 Pt 2, pp. 1101–1118, 1999.

[9] M. P. Fisher and M. K. Hamer, “Qualitative Methods in Health Policy and Systems Research : A Framework for Study Planning,” 2020.

[10] O. P. Atieno, “An Analysis of the Strengths and Limitation of Qualitative and Quantitative Research Paradigms,” *Probl. Educ. 21St Century*, vol. 13, pp. 13–18, 2009.

[11] Y. Xiao and M. Watson, “Guidance on Conducting a Systematic Literature Review,” *J. Plan. Educ. Res.*, vol. 39, no. 1, pp. 93–112, 2019.

[12] M. Dixon-Woods *et al.*, “How can systematic reviews incorporate qualitative research? A critical perspective,” *Qual. Res.*, vol. 6, no. 1, pp. 27–44, 2006.

[13] J. Lavis, H. T. O. Davies, A. Oxman, J. L. Denis, K. Golden-Biddle, and E. Ferlie, “Towards systematic reviews that inform health care management and policy-making,” *J. Heal. Serv. Res. Policy*, vol. 10, no. SUPPL. 1, pp. 35–48, 2005.

[14] M. Gusenbauer and N. R. Haddaway, “Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources,” *Res. Synth. Methods*, vol. 11, no. 2, pp. 181–217, 2020.

[15] N. Baumann, “How to use the medical subject headings (MeSH),” *Int. J. Clin. Pract.*, vol. 70, no. 2, pp. 171–174, 2016.

[16] G. A. Bowen, “Document Analysis as a Qualitative Research Method,” *Qual. Res. J.*, vol. 9, no. 2, pp. 27–40, 2009.

[17] Ministério da Saúde, “Portaria n.º 254/2018 de 7 de setembro,” *Diário da Repub.*, pp. 4497–4706, 2018.

[18] Portaria n.º 153/2017 de 04 de Maio, *Diário da República, 1.ª série — N.º 86/2017. Saúde*. 2017.

[19] Portaria n.º 45/2008 de 15 de Janeiro, *Diário da República, 1.ª série — N.º 10/2008. Ministério da Saúde.* 2008.

[20] ACSS, “Circular Normativa 12/2016.” 2016.

[21] Ministério da Saúde, “Portaria n.º 207/2017 de 11 de julho,” *Diário da República*, vol. 1.ª série,

pp. 3550–3708, 2017.

[22] ACSS, “Termos de Referência para Contratualização de Cuidados de Saúde Hospitalares no SNS para 2020,” pp. 1–62, 2020.

[23] INE, “Portal do INE,” 2020. [Online]. Available: https://www.ine.pt/xportal/xmain?xpgid=ine_tema&xpid=INE&tema_cod=1712&xlang=pt. [Accessed: 02-Jun-2020].

[24] Tribunal de Contas, “Auditoria ao Acesso a Cuidados de Saúde no Serviço Nacional de Saúde,” 2017.

[25] Entidade Reguladora da Saúde, “Gestão Da Lista De Inscritos Para Cirurgia No SNS,” 2014.

[26] ACSS, “Estudo dos motivos de recusa de transferência,” 2008.

[27] R. Pawson, T. Greenhalgh, G. Harvey, and K. Walshe, “Realist review - A new method of systematic review designed for complex policy interventions,” *J. Heal. Serv. Res. Policy*, vol. 10, no. SUPPL. 1, pp. 21–34, 2005.

[28] S. A. Kreindler, “Policy strategies to reduce waits for elective care: A synthesis of international evidence,” *Br. Med. Bull.*, vol. 95, no. 1, pp. 7–32, 2010.

[29] V. C. Bachelet, M. Goyenechea, and V. A. Carrasco, “Policy strategies to reduce waiting times for elective surgery: A scoping review and evidence synthesis,” *Int. J. Health Plann. Manage.*, vol. 34, no. 2, pp. e995–e1015, 2019.

[30] S. Willcox, M. Seddon, S. Dunn, R. T. Edwards, J. Pearse, and J. V. Tu, “Measuring and reducing waiting times: A cross-national comparison of strategies,” *Health Aff.*, vol. 26, no. 4, pp. 1078–1087, 2007.

[31] A. R. Levy, B. G. Sobolev, R. Hayden, M. Kiely, J. M. FitzGerald, and M. T. Schechter, “Time on wait lists for coronary bypass surgery in British Columbia, Canada, 1991 - 2000,” *BMC Health Serv. Res.*, vol. 5, 2005.

[32] S. Derrett, K. Cousins, and R. Gauld, “A messy reality: An analysis of New Zealand’s elective surgery scoring system via media sources, 2000-2006,” *Int. J. Health Plann. Manage.*, vol. 28, no. 1, pp. 48–62, 2013.

[33] R. Verzulli, G. Fiorentini, M. Lippi Bruni, and C. Ugolini, “Price Changes in Regulated Healthcare Markets: Do Public Hospitals Respond and How?,” *Heal. Econ. (United Kingdom)*, vol. 26, no. 11, pp. 1429–1446, 2017.

[34] A. R. van de Vijsel, P. M. Engelfriet, and G. P. Westert, “Rendering hospital budgets volume based and open ended to reduce waiting lists: Does it work?,” *Health Policy (New. York).*, vol. 100, no. 1, pp. 60–70, 2011.

[35] P. E. Martinussen and T. P. Hagen, “Reimbursement systems, organisational forms and patient selection: Evidence from day surgery in Norway,” *Heal. Econ. Policy Law*, vol. 4, no. 2, pp. 139–158, 2009.

[36] L. Midttun and P. E. Martinussen, “Hospital waiting time in Norway: What is the role of organizational change?,” *Scand. J. Public Health*, vol. 33, no. 6, pp. 439–446, 2005.

[37] F. T. Schut and M. Varkevisser, “Tackling hospital waiting times : The impact of past and current policies in the Netherlands,” *Health Policy (New. York).*, vol. 113, no. 1–2, pp. 127–133, 2013.

[38] H. McLeod, C. Ham, and R. Kipping, “Booking patients for hospital admissions: Evaluation of a pilot programme for day cases,” *Br. Med. J.*, vol. 327, no. 7424, pp. 1147–1150, 2003.

[39] Z. Damani, B. Conner-spady, T. Nash, H. T. Stelfox, T. W. Noseworthy, and D. A. Marshall, “What is the in fl uence of single-entry models on access to elective surgical procedures ? A systematic review,” 2017.

[40] P. Leach, S. A. Rutherford, A. T. King, and J. R. S. Leggate, “Generic waiting lists for routine spinal surgery,” *J. R. Soc. Med.*, vol. 97, no. 3, pp. 119–120, 2004.

[41] Z. Damani *et al.*, “Improving the quality of care with a single-entry model of referral for total joint replacement: A preimplementation/postimplementation evaluation,” *BMJ Open*, vol. 9, no. 12, pp. 1–11, 2019.

[42] Z. Damani *et al.*, “Insights from the design and implementation of a single-entry model of referral for total joint replacement surgery: Critical success factors and unanticipated consequences,” *Health Policy (New. York).*, vol. 122, no. 2, pp. 165–174, 2018.

[43] D. G. Maclellan, P. C. Cregan, B. C. Mccaughan, and K. M. Mcgrath, “Applying clinical process redesign methods to planned arrivals in New South Wales hospitals,” *MJA*, vol. 188, no. 6, 2008.

[44] E. R. Bohm, M. Dunbar, D. Pitman, C. Rhule, and J. Araneta, “Experience with physician assistants in a Canadian arthroplasty program,” *Can. J. Surg.*, vol. 53, no. 2, pp. 103–108, 2010.

[45] R. Valente *et al.*, “A model to prioritize access to elective surgery on the basis of clinical urgency and waiting time,” *BMC Health Serv. Res.*, vol. 9, pp. 1–15, 2009.

[46] J. Hurst and L. Siciliani, “Tackling Excessive Waiting Times for Elective Surgery: A Comparison of Policies in Twelve OECD Countries,” *OECD Heal. Work. Pap.*, vol. no. 6, pp. 1–55, 2003.

[47] L. Bellan, “The Impact of Allocation of Additional Resources on the Waiting Time for Cataract Surgery,” *Healthc. Q.*, no. June, pp. 54–56, 2004.

[48] T. Ashton, “THE NEW ZEALAND procedures to private providers,” *Journal of the New Zealand Medical Association,* vol. 123, no. 1314, pp. 79–86, 2010.

[49] A. Harrison and J. Appleby, “Reducing waiting times for hospital treatment: Lessons from the English NHS,” *J. Heal. Serv. Res. Policy*, vol. 14, no. 3, pp. 168–173, 2009.

[50] G. C. A. Wood and C. Howie, “Do waiting list initiatives discriminate in favour of those in a higher socioeconomic group ?,” *Scottish Medical Journal* pp. 1–4, 2011.

[51] G. Kirkwood and A. M. Pollock, “Patient choice and private provision decreased public provision and increased inequalities in Scotland: A case study of elective hip arthroplasty,” *J. Public Heal. (United Kingdom)*, vol. 39, no. 3, pp. 593–600, 2017.

[52] Z. Cooper, S. Gibbons, and M. Skellern, “Does competition from private surgical centres improve public hospitals’ performance? Evidence from the English National Health Service,” *J. Public Econ.*, vol. 166, no. September, pp. 63–80, 2018.

[53] T. P. Hagen, “Outsourcing day surgery to private for-pro fi t hospitals : the price effects of competitive tendering,” no. 1, 2017.

[54] G. Botten, S. Grepperud, and S. M. Nerland, “Trading patients: Lessons from Scandinavia,” *Health Policy (New. York).*, vol. 69, no. 3, pp. 317–327, 2004.

[55] D. Dawson *et al.*, “The impact of patient choice and waiting time on the demand for health care : results from the London Patient Choice project” *Appl. Econ.*, vol. 38, no. 12, pp. 1363–1370, 2006.

[56] Å. Ringard and T. P. Hagen, “Are waiting times for hospital admissions affected by patients ’ choices and mobility ?,” *BMC Health Serv. Res.*, vol. 11, no. 1, p. 170, 2011.

[57] M. Hanning, A. Aḥs, U. Winblad, and M. Lundstroḿ, “Impact of increased patient choice of providers in Sweden: Cataract surgery,” *J. Heal. Serv. Res. Policy*, vol. 17, no. 2, pp. 101–105, 2012.

[58] H. O. Birk and L. O. Henriksen, “Why do not all hip- and knee patients facing long waiting times accept re-referral to hospitals with short waiting time?. Questionnaire study,” *Health Policy (New. York).*, vol. 77, no. 3, pp. 318–325, 2006.

[59] A. Aggarwal, D. Lewis, M. Mason, R. Sullivan, and J. Van Der Meulen, “Patient Mobility for Elective Secondary Health Care Services in Response to Patient Choice Policies: A Systematic Review,” *Med. Care Res. Rev.*, vol. 74, no. 4, pp. 379–403, 2017.

[60] M. Fotaki, M. Roland, R. Mcdonald, R. Scheaff, A. Boyd, and L. Smith, “What benefits will choice

bring to patients ? Literature review and assessment of implications," *Journal of Health Services Research & Policy,* vol. 00, no. 0, 2008.

[61] D. Dawson, R. Jacobs, S. Martin, and P. Smith, "Is Patient Choice an Effective Mechanism to Reduce Waiting Times ?," *Appl Health Econ Health Policy,* vol. 3, no. 4, pp. 195–203, 2004.

[62] D. Dawson, H. Gravelle, R. Jacobs, S. Martin, and P. C. Smith, "The effects of expanding patient choice of provider on waiting times: evidence from a policy experiment," *Health Econ.*, 2007.

[63] S. J. Duckett, "Private care and public waiting," *Aust. Heal. Rev.*, vol. 29, no. 1, pp. 87–93, 2005.

[64] B. Hanning, A. Health, and S. Alliance, "Has the increase in private health insurance uptake affected the Victorian public hospital surgical waiting list ?," *Australian Health Review,* vol. 25, no. 6, pp. 1996–2003, 2002.

[65] N. Gutacker, L. Siciliani, and R. Cookson, "Waiting time prioritisation: Evidence from England," *Soc. Sci. Med.*, vol. 159, pp. 140–151, 2016.

[66] L. Bellan and M. Mathen, "The Manitoba Cataract Waiting List Program," *Cmaj*, vol. 164, no. 8, pp. 1177–1180, 2001.

[67] R. Gauld and S. Derrett, "Solving the surgical waiting list problem? New Zealand's 'booking system,'" *Int. J. Health Plann. Manage.*, vol. 15, no. 4, pp. 259–272, 2000.

[68] A. Aakvik, T. H. Holmås, and E. Kjerstad, "Prioritization and the elusive effect on welfare - A Norwegian health care reform revisited," *Soc. Sci. Med.*, vol. 128, pp. 290–300, 2015.

[69] A. J. Curtis, C. O. H. Russell, J. U. Stoelwinder, and J. J. McNeil, "Waiting lists and elective surgery: Ordering the queue," *Med. J. Aust.*, vol. 192, no. 4, pp. 217–220, 2010.

[70] J. Q. Ng and M. Lundström, "Impact of a National system for waitlist prioritization: The experience with NIKE and cataract surgery in Sweden," *Acta Ophthalmol.*, vol. 92, no. 4, pp. 378–381, 2014.

[71] D. McLeod *et al.*, "Use of, and attitudes to, clinical priority assessment criteria in elective surgery in New Zealand," *J. Heal. Serv. Res. Policy*, vol. 9, no. 2, pp. 91–99, 2004.

[72] K. Dew *et al.*, "Explicit rationing of elective services: Implementing the New Zealand reforms," *Health Policy (New. York).*, vol. 74, no. 1, pp. 1–12, 2005.

[73] T. Anitelea, E. Iosua, A. Ebramjee, and D. Gwynne-Jones, "The outcomes of patients returned to general practitioner after being declined hip and knee replacement," *N. Z. Med. J.*, vol. 130, no. 1464, pp. 25–32, 2017.

[74] T. Inglis, R. Schouten, K. Dalzell, J. Evison, and G. Inglis, "Access to orthopaedic spinal specialists in the Canterbury public health system: quantifying the unmet need," *N. Z. Med. J.*, vol. 129, no. 1442, pp. 19–24, 2016.

[75] A. F. Riley, C. N. Grupcheva, T. Y. Malik, J. P. Craig, and C. N. J. McGhee, "The waiting game: Natural history of a cataract waiting list in New Zealand," *Clin. Exp. Ophthalmol.*, vol. 29, no. 6, pp. 376–380, 2001.

[76] D. Gwynne-Jones and E. Iosua, "Rationing of hip and knee replacement: Effect on the severity of patient-reported symptoms and the demand for surgery in Otago," *N. Z. Med. J.*, vol. 129, no. 1432, pp. 59–66, 2016.

[77] L. Siciliani, V. Moran, and M. Borowitz, "Measuring and comparing health care waiting times in OECD countries ," *Health Policy (New. York).*, vol. 118, no. 3, pp. 292–303, 2014.

[78] M. Hanning and U. W. Spångberg, "Maximum waiting time - A threat to clinical freedom? Implementation of a policy to reduce waiting times," *Health Policy (New. York).*, vol. 52, no. 1, pp. 15–32, 2000.

[79] C. Propper, M. Sutton, C. Whitnall, and F. Windmeijer, "Did 'targets and terror' reduce waiting times in England for hospital care?," *B.E. J. Econ. Anal. Policy*, vol. 8, no. 2, 2008.

[80] J. Appleby, S. Boyle, N. Devlin, M. Harley, A. Harrison, and R. Thorlby, "Do english NHS waiting

time targets distort treatment priorities in orthopaedic surgery?," *J. Heal. Serv. Res. Policy*, vol. 10, no. 3, pp. 167–172, 2005.

[81] S. Dimakou, D. Parkin, N. Devlin, and J. Appleby, "Identifying the impact of government targets on waiting times in the NHS," *Health Care Manag. Sci.*, vol. 12, no. 1, pp. 1–10, 2009.

[82] S. Nikolova, A. Sinko, and M. Sutton, "Do maximum waiting times guarantees change clinical priorities for elective treatment? Evidence from Scotland," *J. Health Econ.*, vol. 41, pp. 72–88, 2015.

[83] J. Januleviciute, J. E. Askildsen, O. Kaarboe, T. H. Holmås, and M. Sutton, "The impact of different prioritisation policies on waiting times: Case studies of Norway and Scotland," *Soc. Sci. Med.*, vol. 97, pp. 1–6, 2013.

[84] U. Winblad and M. Hanning, "Sweden," in *Siciliani, L., Borowitz, M. & Moran, V. (2013). Waiting Time Policies in the Health Sector: What Works? In OECD Health Policy Studies*, 2013, pp. 275–292.

[85] M. Hanning and M. Lundström, "Waiting for cataract surgery - Effects of a maximum waiting-time guarantee," *J. Heal. Serv. Res. Policy*, vol. 12, no. 1, pp. 5–10, 2007.

[86] E. Marques, S. Noble, A. W. Blom, and W. Hollingworth, "Disclosing Total Waiting Times for Joint Replacement: Evidence from the English NHS using linked HES Data," *Health Econ.*, vol. 23, pp. 806–820, 2014.

[87] A. P. Stoop, K. Vrangbæk, and M. Berg, "Theory and practice of waiting time data as a performance indicator in health care: A case study from The Netherlands," *Health Policy (New. York).*, vol. 73, no. 1, pp. 41–51, 2005.

[88] R. E. Segall, J. L. Takata, and D. R. Urbach, "Wait-time reporting systems for elective surgery in Canada: a content analysis of provincial and territorial initiatives," *C. Open*, vol. 8, no. 4, pp. E844–E851, 2020.

[89] M. P. Pomey *et al.*, "Toward systematic reviews to understand the determinants of wait time management success to help decision-makers and managers better manage wait times," *Implement. Sci.*, vol. 8, no. 1, pp. 1–16, 2013.

[90] P. Barros, S. Machado, and J. A. Simões, "Portugal. Health system review.," *Heal. Syst Transit.*, vol. 13, no. 4, pp. 1–156, 2011.

[91] J. de A. Simões, G. F. Augusto, I. Fronteira, and C. Hernández-Quevedo, "Portugal: Health system review," *Health Syst. Transit.*, vol. 19, no. 2, 2017.

[92] J. & E. O. on H. S. and P. Barros, P; Machado, S and Simões, *Portugal: health system review. World Health Organization. Regional Office for Europe*. 2011.

[93] J. de A. Simões, *30 Anos do Serviço Nacional de Saúde, Almedina*, 2010.

[94] Ministério da Saúde, "Entidades de Saúde." [Online]. Available: https://www.sns.gov.pt/institucional/entidades-de-saude/. [Accessed: 02-Jun-2020].

[95] ACSS, "Caracterização da Entidade ACSS." [Online]. Available: http://www.acss.min-saude.pt/wp-content/uploads/2018/08/Caracterizacao-da-Entidade_ACSS.pdf. [Accessed: 02-Jun-2020].

[96] Ministério da Saúde, "Portaria n.º 147/2017." Diário da República n.º 82/2017, Série I de 2017-04-27, pp. 2062–2069, 2017.

[97] Ordem dos Médicos, "Censos Anestesiologia - Relatório 2017," 2017.

[98] UGA, "Relatório síntese da atividade cirúrgica programada - Ano 2015," vol. 2012, pp. 1–45, 2016.

[99] Entidade Reguladora da Saúde, "Informação de Monitorização sobre Tempos de Espera no SNS – 1.º e 2.º Semestres de 2019," 2020.

[100] A. Escoval, A. T. L. Santos, and P. Barbosa, “Contributo para a compreensão do financiamento da saúde em Portugal : O caso dos cuidados de saúde primários , dos cuidados hospitalares e dos cuidados continuados .,” *Tempus Actas de Saúde Coletiva*, vol. 10, no. 1, pp. 17–27, 2016.

[101] Observatório Português dos Sistemas de Saúde, “Meio Caminho Andado. Relatório Primavera 2018,” 2018.

[102] Ministério da Saúde, “Portaria n.º 153/2017 de 4 de maio,” *Diário da República*, vol. 1. série, no. n.º 86, pp. 2204–2209, 2017.

[103] Entidade Reguladora da Saúde, “Informação de Monitorização sobre Tempos de Espera no SNS – Janeiro a Maio de 2018,” 2019.

[104] Entidade Reguladora da Saúde, “Informação de Monitorização sobre Tempos de Espera no SNS – Junho a Dezembro de 2018,” 2020.

[105] Grupo Técnico Independente, “Avaliação dos Sistemas de Gestão do Acesso a Cuidados de Saúde no Serviço Nacional de Saúde,” 2018.

[106] Ministério da Saúde, “Despacho n.º 5911-B/2016.” Diário da República n.º 85/2016, 2º Suplemento, Série II de 2016-05-03, 2016.

[107] SNS, “Utentes em Espera por Cirurgia,” 2017. .

[108] Ministério da Saúde, “Relatório Anual Acesso a Cuidados de Saúde nos Estabelecimentos do SNS e Entidades Convencionadas,” 2019.

[109] J. dos S. Penedo *et al.*, “Avaliação da Situação Nacional dos Blocos Operatórios,” p. 273, 2015.

[110] P. Barros and G. Braun, “Upcoding in a National Health Service: the evidence from Portugal,” *Heal. Econ. (United Kingdom)*, vol. 26, no. 5, pp. 600–618, 2017.

[111] ACSS, “SNS RH Administrações Regionais de Saúde,” 2016. [Online]. Available: https://www.sns.gov.pt/wp-content/uploads/2016/07/SNS-RH-ARS.pdf. [Accessed: 02-Jun-2020].

Appendix A.

PubMed Query:

“waiting list*”[Title/Abstract] OR “waiting time*”[Title/Abstract] OR “wait list*”[Title/Abstract] OR “wait time*”[Title/Abstract] OR “waitlist*”[Title/Abstract] OR “Waiting Lists”[MeSH Terms]

AND

“elective surgical procedures”[MeSH Terms] OR “surger*”[Title/Abstract] OR “surgical”[Title/Abstract]

AND

(“strateg*”[Title/Abstract] OR “polic*”[Title/Abstract] OR “program*”[Title/Abstract] OR 2initiative*”[Title/Abstract] OR “reform*”[Title/Abstract] OR “scheme*”[Title/Abstract] OR “healthcare system*”[Title/Abstract] OR “health care system*”[Title/Abstract] OR “health system*”[Title/Abstract] OR “public health” [Title/Abstract] OR “health service*”[Title/Abstract] OR “health plan*”[Title/Abstract]

OR

“efficiency, organizational”[MeSH Tems] OR “Organizational Policy”[MeSH Tems] OR “Health Policy”[MeSH Tems] OR “Public Health Administration”[MeSH Tems] OR “National Health Programs”[MeSH Tems] OR “Health Services Research”[MeSH Tems] OR “program evaluation”[MeSH Tems] OR “health plan implementation”[MeSH Tems])

NOT

(“Postoperative Complications”[MeSH Tems] OR “postoperative period”[MeSH Tems] OR “postoperative complication*”[Title/Abstract] OR “Treatment Outcome”[MeSH Terms] OR “treatment outcome*”[Title/Abstract] OR “preoperative care”[MeSH Terms] OR “Pain Measurement”[MeSH Tems] OR “pain management”[MeSH Terms] OR “pain”[MeSH Terms] OR “pain measure*”[Title/Abstract] OR “pain manage*”[Title/Abstract] OR “postoperative pain”[Title/Abstract] OR “Rehabilitation”[MeSH Terms] OR “rehabilitat*”[Title/Abstract] OR “physical therapy specialty”[MeSH Terms] OR “drug therapy”[MeSH Terms] OR “therap*”[Title/Abstract] OR “drug*”[Title/Abstract] OR “diagnostic services”[MeSH Terms] OR “diagnostic tests, routine”[MeSH Terms] OR “risk fact*”[Title/Abstract] OR “psychiatry*”[Title/Abstract] OR “mental health”[Title/Abstract] OR “dialysis”[Title/Abstract] OR

“Transplantation”[MeSH Terms] OR “transplant*”[Title/Abstract] OR “organ donor*”[Title/Abstract] OR “tissue donor*”[Title/Abstract] OR (oncology service, hospital”[MeSH Terms] OR “cancer”[Title/Abstract] OR “oncolog*”[Title/Abstract] OR “chemotherapy*”[Title/Abstract]) OR ((“emergency service, hospital”[MeSH Terms] OR “Emergency Medical Services”[MeSH Terms] OR “Emergencies”[MeSH Terms] OR “urgen*”[Title/Abstract] OR “emergen*”[Title/Abstract]) NOT (“elective”[Title/Abstract]) OR “elective surgical procedures”[MeSH Terms])) OR “obstetrics and gynecology department, hospital”[MeSH Terms] OR “gynecology”[MeSH Terms] OR “pregnancy”[MeSH Terms] OR “obstetric*”[Title/Abstract] OR “gynecolog*”[Title/Abstract] OR “gynaecolog*”[Title/Abstract] OR “pregnan*”[Title/Abstract] OR

“Computer Simulation”[MeSH Terms] OR “simulation*”[Title/Abstract] OR “optimization model”[Title/Abstract] OR “optimisation model”[Title/Abstract] OR “programming”[Title/Abstract] OR “programing”[Title/Abstract] OR “heuristic*”[Title/Abstract] OR “operation research”[Title/Abstract] OR “operational research”[Title/Abstract] OR

“COVID-19”[MeSH Terms] OR “covid-19”[Title/Abstract] OR “covid 19”[Title/Abstract] OR “pandemic”[Title/Abstract] OR “coronavirus”[Title/Abstract])

Web of Science Core Collection Query:

ts=(“waiting list*” OR “wait list*” OR “waiting time*” OR “wait time*” OR “waitlist*”)

AND

ts=(“surger*” OR “surgical”)

AND

ts=(“strateg*” OR “polic*” OR “program*” OR “initiative*” OR “reform*” OR “scheme*” OR “healthcare system*” OR “health care system*” OR “health system*” OR “public health” OR “health service*” OR “health plan*”)

NOT

(ts=(“*operative complication*” OR “treatment outcome*” OR (“pain” NEAR/5 “manage*”) OR (“pain” NEAR/5 “measure*”) OR “*operative pain” OR “rehabiliat*” OR “*therap*” OR “drug*” OR “risk factor*” OR “psychiatry*” OR “mental health” OR “dialysis” OR

“transplant*” OR “organ donor*” OR “tissue donor*” OR “cancer” OR “oncolog*” OR ((“emergen*” OR “urgen*”) NOT “elective”) OR “obstetric*” OR “gynecolog*” OR “gynaecolog*” OR “pregnan*” OR “simulation*” OR “optimization model” OR “optimisation model” OR “programming” OR “programing” OR “heuristic” OR “operation* research” OR “covid-19” OR “covid 19” OR “coronavirus” OR “pandemic” OR “sars$cov-2”)

OR

ak=(“pain” OR “diagnos*” OR “recover*”) OR kp=(“pain” OR “diagnos*” OR “recover*”))