Extended Abstract to obtain the Master of Science Degree in Biomedical Engineering

# Assessing the Voucher Strategy's Impact on Surgery Waiting Lists A network/regional context

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**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.

## 1. Introduction

The Portuguese health system is composed by the Portuguese National Health Service (NHS) and a network of private and social sector hospitals, that provide primary and secondary 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 most publicly funded health systems [1], the NHS undergoes a problem of long waiting lists and waiting times for elective surgery services. Long waiting times can lead to possible deterioration of patients' health and have received significant media attention since they are perceived as a consequence of poor management of the system. *Sistema Integrado de Gestão de Inscritos para Cirurgia* (SIGIC) was implemented in 2004 to improve the management of surgery waiting lists. In its first years, SIGIC was successful in significantly reducing waiting lists and waiting times, as well as increasing surgical production volumes [2]. This was possible due to the introduction of a combination of strategies targeting hospitals and patients, including the use of additional activity to increase production, the possibility of patient choice of transfer to an alternative NHS or privately contracted hospital through a system of vouchers, and the establishment of maximum waiting time guarantees (TMRG) [3]. Hence, the possibility of patient choice is given when it is plausible that the hospital will not be able to comply with the established TMRG.

Nonetheless, after the initial significant decrease, waiting times have later stabilised, showing a slightly increasing trend in recent years. Additionally, there are relevant waiting times variabilities between NHS hospitals, significant disparities in the level of utilisation of the private sector between regions and a significant percentage of patients in waiting lists - 32,1% in 2019 - are breaching the TMRG [4].

As such, the main contributions of this work include: providing a structured systematic literature review on elective surgery waiting list management strategies; identifying possible approaches to the improvement of issues identified in the case study; and identifying topics related to SIGIC strategies that would benefit from further research. To attain these goals, the remainder of this paper is organised in six sections: Section 2 provides a definition of the waiting list problem. Section 3 depicts the methodology followed to attain the proposed objectives, including the literature review research protocol, while Section 4 presents the results of the literature review. Afterwards, Section 5 provides the case study, with an overview of the NHS's institutional setting and the operation mechanisms of SIGIC. Section 6 presents the discussion and bridges the findings of the previous sections. Section 7 concludes the paper.

## 2. Problem Definition

The demand for healthcare services has been rising in the past decades, as population factors are changing, including population growth, higher life expectancy, changing socioeconomic contexts, the development of new health technologies and thus new treatment possibilities, or decreased thresholds for treatment eligibility [5]. On the other hand, the supply for healthcare services is not sufficient to meet demand. Deficit of supply is strongly related to shortage of resources, such as beds, operating rooms (ORs), surgeons, anaesthetists, among others. However, it is also the result of poor strategical planning and system inefficiencies. The mismatch between supply and demand contributes to the formation of waiting lists. Waiting lists have been a rising concern in health systems across the world, especially in those with universal publicly funded healthcare, where demand is especially high and waiting lists have a rationing role [1]. Furthermore, these systems have inherent cost and resource restrictions, which results in lower supply levels. Long waiting lists and long waiting times lead to patient dissatisfaction and possible deterioration of patients' health. In addition to health-related costs for patients, longer waiting times can result in additional costs for the health system due to additional consumption of resources.

In Portugal, long waiting lists for elective surgery are also an important policy concern. Due to clear gaps between demand and supply each year, waiting lists are consistently growing. Internationally, several different strategies are used by health systems to tackle the waiting list problem, generally acting directly on

waiting times or either on the demand or the supply of health services. This is detailed in Section 4.

## 3. Methodology

One of the main objective of this work is to assess the impact of SIGIC strategies on the NHS surgical activity. To attain this objective, a qualitative research based on published information regarding surgical activity in the NHS, as well as on literature on the topic of surgical waiting list management is performed. Qualitative research is considered by many researchers an added value when dealing with complex systems, being a valuable method for the generation of hypotheses, moving towards explanations for the research questions and suggesting new research questions [6].

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. The findings of each methodological step are then reported in Sections 4, 5, and 6, respectively.

### *3.1 Literature Review Methodology*

The literature review developed in this work concerns international literature regarding governments' strategies to tackle long waiting times or waiting list management. Therefore, 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?*".

To select the literature, the databases PubMed and Web of Science Core Collections were accessed. The search terms used consist of a combination of free text terms and controlled vocabulary using MeSH terms, identified in accordance with the research questions. On the one hand, controlled vocabulary allows 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. Free text terms were first identified using terms related to waiting lists and waiting times, elective surgery and respective variations. Terms related to health policy, strategies, health systems, among others were also identified and combined with the former using Boolean operators. MeSH terms were identified by searching the MeSH database, and by identifying terms that commonly index relevant papers on the topic. Due to the large quantity of citations retrieved initially, other irrelevant terms were excluded. All terms identified were searched in abstracts, titles, and keywords.

The inclusion criteria applied to retrieved records were: 1) articles that study at least one wait list management strategy, 2) the strategies must be directed at elective surgery, 3) the strategies must be designed for national or regional context, 4) articles from the databases PubMed or Web of Science Core Collection, 5) articles published between 1st January 2000 and 31st May 2021, 6) articles published in English or Portuguese. Additionally, exclusion criteria were also defined: 1) articles that do not report effects of the studied strategies, 2) articles that are not directly related to waiting time or waiting list management, 3) simulation models or other type of non-empirical research, 4) articles focusing on elective transplantation, oncology, gynaecological or dental surgery, 5) studies regarding the Portuguese system, and 6) letters, news or conference proceedings. The mentioned surgical specialities were excluded because their management is more particular than the remaining surgical specialities. Screening of citations retrieved was performed by excluding duplicate manuscripts, screening abstracts to eliminate clearly irrelevant papers, and full-text screening for the specific inclusion and exclusion criteria. The findings of the literature review are reported in Section 4.

### *3.2 Case Study Data Collection and Selection*

The methodology used to develop the case study consists of an extensive document analysis of various sources about the SIGIC programme and its operation. As pointed out by [7], qualitative research requires robust data collection methods so that the researcher can develop a deep understanding of the studied problem. Nonetheless, it is also important to note that documents may not always provide precise and complete information, meaning that the researcher needs to analyse them from a critical viewpoint, and that several sources should be used. Documents analysed in this work included: SIGIC Operation Manual [3], legislation documents [8]–[12], NHS hospitals contract specifications for 2020 [13], NHS 2019 Access Report [4], National Statistics Institute (INE) data [14], among others. The case-study is presented in Section 5.

## 4. Systematic Literature Review Results

This section presents the results of the literature review, providing first the characteristics of the articles included (Section 4.1), and afterwards the findings of the review (Section 4.2).

### *4.1 Article Characteristics*

As mentioned, study selection was performed in three stages: deduplication, abstract screening and full-text screening. 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. 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, which led to 64 manuscripts included in the review.

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, or country. 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. 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 identified and are described in the following sections. Regarding country, most studies were from Organisation for Economic Co-operation and Development (OECD) countries and with publicly funded health care.

### *4.2 Waiting List Management Strategies*

To tackle the presence of waiting lists, different types of 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 acts mainly on the demand, which corresponds to patients seeking care, or on the supply of the services, i.e., the provider-side. Additionally, waiting time guarantees act directly on waiting times, affecting both demand and supply [5]. In practice, governments often combine different side strategies, in order to obtain more effective outcomes. Each of these strategy groupings is addressed in each of the following subsections.

*4.2.1 Supply-Side Strategies*

Strategies acting on the supply of health services are generally applied when the volume of public surgical production is considered insufficient [1], [5]. They consist of increasing the supply through various ways, including increases in capacity or in activity. Some of the most common policies used by governments are increasing funding to public hospitals and increasing hospital productivity [5], however, other supply side strategies are used, as described below.

Increasing hospital productivity by funding extra activity

This strategy is one of the most direct ways of increasing supply of treatment. 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 [5], [15]. Short-term bursts of funding consistently decreased waits initially but returned to the same or higher levels shortly after [5]. Nonetheless, when extra activity funds are provided long-term, their effectiveness rises [16]. A specific model of extra activity funding that has been especially successful consists of conditional funding of both extra activity and reduced waiting time [1], [15].

Increasing productivity by using activity-based financing

This strategy consists of paying providers by case treated, usually based on pre-established Diagnostic Related Groups (DRGs) pricing. Under activity-based budgets, higher productivity leads to higher revenue. Hence, providers are incentivised to increase their productivity which in turn result in shorter waiting times and lists [1], [15], [17]. For example, the increase in the DRG pricing of a subset of DRGs led to increased surgery volumes of the affected DRGs [17]. However, according to [5], despite the success in increasing productivity, activity related payments do not necessarily reduce waiting times, even though it is frequently combined with other strategies, such as provider choice, producing successful results. Still, this strategy 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, verifying the presence of this effect in most of the DRGs analysed [18]. The presence of deliberately shifting patients' reported DRGs to more profitable DRGs (DRG-creep), has also been identified [1].

Reforming contracts of specialists

This strategy has been implemented through either providing specific incentives to physicians who reduce wait times, or restricting the dual practice [1]. The first approach was implemented in Spain with successful results, while in The Netherlands the opposite policy was implemented (applying fixed budgets instead of fee for service payments to physicians) resulting in decreases in activity and increases in waiting times. The second approach was introduced, for instance in Ireland, to avoid the possibility of physicians keeping long waiting times to bring patients to their private clinics or hospitals.

Improving management of waiting lists to increase efficiency

These strategies have been implemented to improve cost-effectiveness or reduce inefficiencies that can lead to longer waiting lists. They can include booking systems, pooling of waiting lists, new information systems, streamlining patients' pathway, ring fencing, or contracting physician assistants. Booking systems, where patients are directly booked for a surgery date without going through a waiting list, have been widely employed [19]. These systems decrease uncertainty for patients and can decrease cancellation rates, however, their implementation may be hindered by the difficulties of long-term planning of elective surgery. The use of pooled waiting lists as opposed to lists for individual surgeons is associated with improving efficiency, promoting equity and reducing waiting times [20]. Under this strategy, patient referrals are centralised and are directed to the next available clinician from a pool of available surgeons. The main objective is the reallocation of patients with long waiting times to surgeons with short waiting times. One of the largest difficulties with pooling methods is that surgeons may be reluctant to interrupt the continuity of care of their patients or to operate on patients for whom they have different clinical opinions, although patient acceptance is generally high [20].

Increasing fixed capacity in the public sector

Some studies have shown the long-term positive impact of increasing capacity of wait times. [21] concludes that a resource increase reflected in an increase in the daily surgery cap in Canada, and wait times were decreased. 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. However, capacity alone is not sufficient to achieve higher productivity, being its efficient use also critical. In a later study, Siciliani et al. [22] state that many countries with long waiting times do not necessarily have significant capacity constraints.

Contracting with the private sector

Contracting out elective surgery services from the private sector is a quicker and more affordable way to deliver more efficient and timely care to publicly funded patients [23]. However, 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 [15]. In England and Scotland, the purchase of a large volume of private capacity resulted in low private activity volumes and overpayment [24]. Another issue with this strategy is that private providers are often 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 [23]. There is also the option 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 private providers prices [25]. Another risk of this strategy is that dual practice may create perverse incentives to maintain higher wait times [23]. When under careful planning and monitoring and if linked to other strategies, private contracting can have successful results, including increased competition leading to improved efficiency [26]. In the long-term, it is important to note that it may be cheaper to increase capacity directly.

Cooperation with international hospitals

Similar to contracts with private sector providers, agreements can also be made with foreign hospitals, for example to avoid competition between private and public providers for medical staff [1]. In Norway, a policy to send waiting list patients to neighbouring countries was implemented in 2001 but costs were excessively high due to both transportation and treatment costs as DRG pricing was more expensive in the receiving hospitals abroad [27]. In addition, no evidence of an overall decrease of waiting times is present, which is in accordance with other literature [15].

Increasing choice

Increasing patient choice can be used with the aim of shifting demand from providers with longer wait to those with shorter wait, thus improving resource utilisation. However, several studies suggested consistent inequities between patients who choose alternative providers and those who do not. 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 [28]. One of the main issues identified with choice policies is the overall low proportion of patients that use their right to choose alternative providers [29]. 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 [29]. 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 [29]. A choice project in London led to significant convergence of wait times within the area [30]. 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 [28], 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.

*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 seen below.

Subsidies to private health insurance uptake

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 [31]. Australia has one of the most well-known private health insurance (PHI) subsidization strategies. Early studies suggested it resulted in sharp increased share of private treatments attributed to both increase in private and decrease in public activity [1]. However, higher private activity in the country has not been related to reduced waiting times and the initiative's costs were extremely high [31]. Other risks associated with this strategy are also present, namely that PHIs may mostly attract young and low-risk patients that are likely not the source of the pressure on the public system [15]. These patients also often require more profitable procedures that end up being performed by private hospitals. On the other hand, higher economic status patients are more likely to pay for PHI or any co-payments, raising equity concerns [15].

Prioritisation strategies

Prioritisation of different groups of patients is used to ensure shorter waiting times for patients with higher need or who might benefit more from expedite surgery. Thus, prioritisation practices generally focus on ethical, or equity concerns rather than overall wait time reductions or efficiency issues. The most widely used criteria are clinical based, however, in some cases social non-clinical criteria are also considered such as ability to work or limitations on activities [32], [33]. Prioritisation can be applied through more general guidelines, where patients are grouped in 2 to 4 categories according to a general urgency level, or more specific scoring systems, where more quantitative criteria are used. Guidelines are commonly implemented [34], [35], and are generally able to reduce wait for more prioritised patients despite not impacting overall waiting times. Guidelines also have a high degree of subjectivity, and have been characterized as insensitive and lacking transparency, which can lead to inequities [34]. On the other hand, scoring systems were developed to be more explicit, objective, and transparent. This system has a lower acceptability among surgeons as it decreases their autonomy and can lead scores they consider inappropriate [36].

Demand Rationing

Another way to reduce demand is by having physicians raise the criteria for patients to be eligible for treatment. One of the most explicit demand rationing systems was implemented in New Zealand, where scores determine access to surgery [37]. For that, financial thresholds were established as the score above which hospitals could provide treatment given the available funding. This system faced several criticism, namely that financial thresholds were set differently across the country and were often above clinical thresholds [37]. Moreover, patients below the financial threshold but that would benefit from surgery are 'invisible' to the system since they are removed from hospital records [38]. Many of these patients eventually undergo surgery, however with much higher waiting times and having used non-operative resources in the meanwhile. Hence, 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.

*4.2.3 Waiting Time Guarantees*

The introduction of maximum guaranteed waiting times is one of the most common strategies, although their formulation can vary considerably regarding length of wait, sanctions, and type of patients covered [39]. Universal guarantees with strong sanctions, implemented in England and Scotland, can significantly reduce waiting times and guarantee breaching [40]. This reduction is mainly in long waiting patients, which has raised concerns of prioritisation shifting occurring, i.e., prioritising patients that are close to breaching the guarantee at the expense of shorter waiting patients possibly with higher need [41]. However, this effect can be reduced by establishing more challenging guarantees, and providing enough resources [15]. Conditional guarantees, where higher need patients are prioritised, have more variable results. Covered patients are generally benefited in favour of non-covered patients and effectiveness largely depends on the incentives. For instance, in Sweden, compliance was low since penalisations only occurred when patients took the possibility to change providers, which was rare [42]. In Norway, penalisations were proportional to treatment cost, leading to more profitable treatments being prioritised [43]. Finally, other risks in the use of guarantees include neglecting other areas or stages of care not targeted by the guarantee [44], or the possibility of specialists gaming the system [40].

## 5. Case Study

After the literature review on international evidence, it is relevant to study the national setting. This section overviews the NHS organisation and surgical activity (Section 5.1), the SIGIC (Section 5.2), and the transfer process (Section 5.3).

*5.1 The Portuguese Health System and the NHS*

*5.1.1 Overview and Organisation*

The Portuguese NHS is a universal publicly funded health system, consisting of a network of primary care centres, hospitals and a long-term care network. In addition to the NHS hospitals, the private sector plays an important role, with 25% of the population being covered by PHI [45]. The Central Administration of the Heath System (CAHS) is responsible for centralising the regulation, information, and planning of NHS activities. Additionally, NHS institutions are organised in five health regions, managed and monitored by Regional Health Admin-

istrations (RHAs) – Norte, Centro, Lisboa e Vale do Tejo (LVT), Alentejo, and Algarve. NHS hospitals also have some management autonomy and can be managed as single institutions or grouped in hospital centres that allow better cooperation between geographically close hospitals.

The availability of resources varies between RHAs. This can be perceived for instance in the relative number of ORs and anaesthesiologists, with Alentejo and Algarve having significantly lower proportion than the remaining regions [14], [46]. The number of hospitals also varies significantly between regions: Alentejo has only one specialised care hospital, and three Local Health Units, while Norte and LVT have the highest number of hospital institutions (16 for each). Nonetheless, according to the Health Regulatory Entity [47], 99,3% of the population is covered by NHS and protocolled (see following section) hospital institutions at most 60 minutes away from their municipality. Table 1 shows the number of public hospital institutions, private, SIGIC contracted and protocolled hospitals per region, and the number of beds in public and private hospitals to better compare sizes. It is important to note that not all private hospitals are contracted, and that some contracted hospitals have agreements with more than one RHA. The following section provides insight on surgical production in the NHS.

Table 1 - Number of public hospital institutions[(i)], public[(ii)], private[(ii)], contracted[(iii)] and protocolled[(iii)] hospitals per region.

| Region | Public hospital institution | Public hospitals (beds)[(iv)] | Private hospitals (beds)[(iv)] | Total | Contracted hospitals | Protocolled hospitals |
|---|---|---|---|---|---|---|
| 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) [48] (ii) [14] (iii) [49] (iv) calculated using data from INE [14]

### *5.1.2 Surgical Production and Waiting Times in the NHS*

Surgical care accounts for close to 50% of health services provided in hospitals. Being the sector one of the main sources of expenditure and income in hospitals, it is essential to maintain an efficient management and quality care. As seen in Figure 1, the demand for surgical services in the NHS, represented by the number of entries in the surgical waiting list (LIC), and the supply, represented by the number of patients operated, have consistently increased in the past decade. However, the gap between supply and demand is also noticeable throughout the years, leading to increasing waiting lists.

The provision of surgery to NHS patients can be done by NHS hospitals, contracted hospitals, or protocolled hospitals. 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 (HO) for NHS patients, contracted hospitals are hospitals of destination (HD) 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]. These proportions have a high discrepancy between regions. 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. Also noticeable is the high proportion of patients operated in protocolled hospitals in the Norte region (approx. 12%), however this is related to the high number of *Misericórdias* in this region, which act as protocolled hospitals for the NHS.

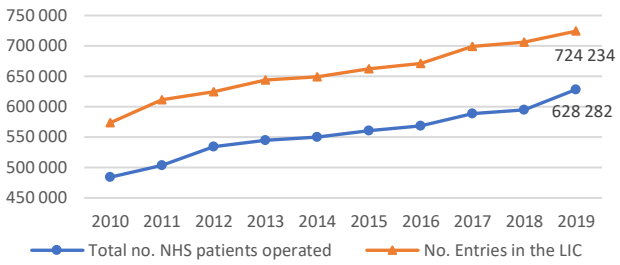


Figure 1 - Evolution of patients operated and entries in LIC. Adapted from [4].

To analyse the performance of the NHS regarding response times, Figure 2 shows the evolution of four indicators between 2011 and 2019, published in [4]. First, the mean waiting time for surgery, which was 3,3 months in 2019 and has been slightly increasing in the past years. Second, the median waiting time of patients in the LIC, 3,5 months in 2019. Third, the 90$^{th}$ percentile of the waiting time of patients in the LIC, which, at the end of 2019, was 13,3 months, the highest since 2011. Fourth, the percentage of tardy patients in LIC, that is, patients awaiting surgery who have already exceeded the 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 [50].

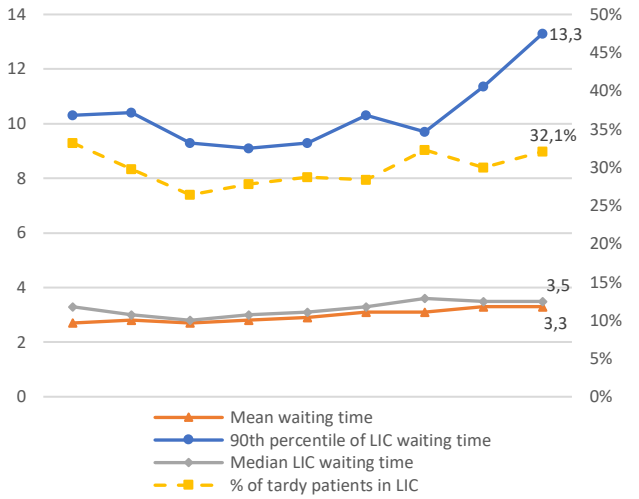


Figure 2 – Evolution of response time indicators in months. Data source: [4]

Moreover, it is important to note that significant variabilities can be found between specialities, and between NHS hospitals regarding response times [4]. This can be verified, for instance, in the median LIC waiting time which varies between 1,5 months and 6,5 months, considering all NHS hospitals in 2019. Additionally, the percentage of tardy patients in LIC varies between 0,2% and 59,5% which clearly denotes the inherent variability of the system.

### *5.1.3 Funding of NHS Hospitals*

NHS hospitals are funded through various sources, including out-of-pocket payments and health subsystems. However, most of the financial input is through programme contracts, which hospitals yearly agree with CAHS and RHAs. The contract defines the expected production of the hospital and payment, as well as a set of indicators used for the evaluation of its performance in terms of quality and access [51]. The basis for defining payment are Diagnostic Related Groups (DRGs). Hence, DRGs' production from previous years is used to define an updated case-mix index, that is then used together with a unitary price and number of equivalent patients to calculate the global value. The hospital's administrative

board also negotiates additional activity remunerated in a fee-for-service basis, through DRGs, to surgical teams [8]. Programme contracts also establish incentives and penalisation (some related to SIGIC activity) for hospitals, with the aim of increasing healthcare quality and efficiency, with 5% and 3% of the contract value corresponding to incentives and penalisations [13].

### *5.2 The SIGIC Programme*

#### *5.2.1 Overview and Organisation*

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. In 2004, SIGIC was created aiming at performing an integrated and continuous management of the waiting list. The principal objective of SIGIC is 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 TMRGs for surgery execution and created an explicit system that allows higher patient choice through transfers to private or public hospitals to provide timely surgery through the issuing of surgery vouchers (SVs) or Transfer Notes (TNs), respectively. SIGIC also introduced payment per case in additional activity and public reporting of hospitals' performance regarding waiting times and production. The SIGIC patient flow is detailed in the following section.

In its first five years, SIGIC achieved a reduction of median waiting times by close to 63% and of waiting lists by 35% [2]. Additionally, surgical production increased by close to 40%. Another important impact was the decrease in variability of mean and median waiting times between NHS hospitals across the country in the first years.

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), which is centralised in CAHS and integrates information of public and contracted providers. The system provides a global view of the movements in LIC. Moreover, SIGLIC is also the tool used to support several stages of the process, allowing transfers to be monitored in a centralised way, improving efficiency in the global use of resources. Despite this centralisation, hospitals still manage individual wait lists locally. The management of SIGIC is thus done at three levels: by CAHS, RHAs, and hospitals, in defined units for the management of SIGIC.

#### *5.2.2 The Patient Flow in SIGIC*

The SIGIC patient flow starts with the referral to first specialist consultation and ends with the billing of the episode, complying four phases: proposition, execution, follow-up, and conclusion. The first phase corresponds to the pre-operative period, while the remaining three to the peri- and post-operative period.

##### *5.2.2.1 Pre-operative Period and Surgery Scheduling*

The proposition or pre-operative phase is further divided in three stages. First, the analysis stage, where the patient's condition is assessed through consultations or exams to determine the appropriate care plan. Second, the pre-registration, which corresponds to a short-period after it is decided that the patient needs surgery. The care plan is completed and the priority level assigned. Priority levels defined are assigned according to the patient's base pathology, associated problems, severity, impact on lifespan, autonomy and quality of life [10]. Taking these factors into account, four levels of priority are defined, having level 1 the lowest priority and level 4 the highest. The third stage, registration, starts after registration in LIC is approved. This is the stage during which the patient is awaiting surgery, being thus during it that surgery scheduling occurs.

Surgery scheduling is performed by the head of surgical service, who periodically plans the surgical production for the following period. This is done according to a list issued through SIGLIC, with the patients in LIC ordered first by operational priority (TMRG) and second by waiting time. The TMRGs for surgery execution are assigned to each level of priority taking into account three different groups of pathology. The TMRGs for all priority levels and pathologies are shown in Table 2. Furthermore, 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 a TN or SV. These threshold times are set according to the patient's priority, being 75% of the TMRG for level 1 patients, 50% for level 2 and 5 days for level 3. More recently, TNs have started being issued after 3 months in LIC (50% of the TMRG) for general pathology level 1 patients [11].

Table 2 - TMRGs and thresholds for surgery booking or transfer [10].

| Priority | 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 |

##### *5.2.2.2 Peri- and Post-Operative Period*

The peri-operative period corresponds to the execution phase, which includes the surgery and any hospitalisation period. After discharge, the follow-up phase begins including any post-operative treatments or complications. In the case of a transfer, the HD is responsible for post-operative care at most 60 days after the surgery, after which the patient is contacted by the HO for a review consultation. The last phase, the conclusion, corresponds to the episode's closure and in the case of a transfer, includes the billing process.

### 5.3 *Patient Transfers for Surgery in SIGIC*

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 within one hospital. As such, a transfer can occur due to different reasons: inability of the hospital to guarantee the execution or booking of the surgery before exceeding the TMRG, or loss of technical capacity of the hospital (or service). SIGIC transfers that occur due to TMRG breaching through TNs or SVs are the type studied in this paper and are detailed in the following section.

#### *5.3.1 Operation of TN and SV Transfers*

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 2), 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. Hence, when patients reach 70% or 45% of the TMRG, SIGLIC signals the patient so that the hospital can prepare the clinical process for booking or transfer. In some cases, it may be necessary to update medical exams. Generally,

when the threshold for booking is reached without the surgery booking registered in SIGLIC, the episode is transferred to UGA (*Unidade de Gestão do Acceso*), restricting the HO from booking the surgery. A TN is then primarily issued if there are NHS hospitals in the patient's district of residence able to provide surgery within 25% of the TMRG. If that is not the case, UGA issues a SV at 75% of the TMRG which allows a transfer to any available hospital, including social and private sector contracted hospitals. The patient is then required to activate the TN/SV in the selected HD, being included in its wait list. After receiving surgery and the normal recovery period, the patient returns to the HO to complete the follow-up phase.

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. This is related to the reduction of TMRGs in place since 2018. Regarding SVs, LVT is the RHA 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. Since the number of SVs is significantly higher than TNs, this results in most HDs being private rather than NHS hospitals. It is also important to note that each year only a small percentage of the total number of SVs and TNs were activated leading to transfers to HDs (18,8% in 2019). This ratio has suffered an overall decrease in the past years, as seen in Figure 3. 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].

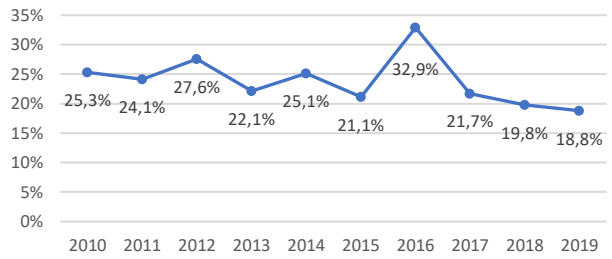


Figure 3 - Evolution of the percentage of TN or SV activations between 2010 and 2019. Adapted from [4].

### *5.3.2 Financial Flow and Billing of Transfers*

After completing a transfer episode, the HD bills the episode, which is verified at the regional level. The HO is then responsible for the case, paying the HD. To define the value of the bill, the patient's diagnoses and procedures are assigned standardized codes, which result in a DRG for the patient. The value per transfer is defined by *Portaria* 207/2017 which sets a price for each of the DRGs according to its level of severity and the typology of the surgery, i.e. ambulatory or inpatient surgery. Since 2012, the financial responsibility for the patients in LIC not receiving timely surgery in the HO, and consequently receiving surgery in other institutions, has been attributed to the respective HO. 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. 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.

## 6 Discussion

Some issues regarding waiting list management in SIGIC have been identified above. In this section, each of these issues are discussed in the following sections in light of the new findings reported by the literature.

### *6.1 Waiting Time Variability in the NHS*

As mentioned in Section 5.1.2, large variability exists in the NHS between regions and providers. Looking at the percentage of tardy patients operated, this varied between 7,1% in Algarve and 34,3% in Alentejo in the first semester of 2018 [52]. Within regions, variability can be perceived in the mean waiting time per provider, which was especially high in Centro and Alentejo in 2019 [4]. Variability can also be seen in each region's supply. In 2019, comparing the ratio of patients operated per number of entries in LIC, this was close to 0,8 in all regions except in Algarve where it was less than 0,6.

As reported in the literature, one of the strategies that is intended to reduce wait variability is increasing patient choice, such as the SV/TN strategy. By redistributing patients from providers with longer waiting times to those with shorter waiting times, waiting time convergence between hospitals can be increased. In fact, as mentioned in Section 5.2, the variation of mean and median waiting times between providers decreased after the start of SIGIC. One of the problems of allowing transfers of patients through choice in the NHS is the low acceptance rate (18,8%), which hinders the effects of the strategy in waiting times variability. This is also a common issue in the literature. Another reason for the lack of success of choice policies in the literature is the lack of central coordination. The issuing of TN/SV is done centrally by UGA and contracts with private providers are done at the regional level which is an important feature to assure control and coordination. However, since NHS hospitals also have some management autonomy, there are still different practices employed by hospitals. 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 conclusion, the SV/TN strategy is, in fact, likely contributing for some reduction in variability of waiting times across the country. 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 in Section 5.1.2, TMRGs are largely breached in the NHS (32,1% in LIC in 2019). According to the literature, the establishment of guarantees has been one of the most used and effective policies in reducing long waiting times if clear penalisations or incentives are established. In the NHS, TMRGs are defined according to priority levels (conditional guarantee), so the risk of shifting prioritisation practices reported in the literature is lower. Another important factor, reported in the literature, for the success of these policies is that the guarantee must be set to a waiting time that is challenging for providers so that reductions in overall waiting times can take place.

First, regarding incentives for NHS TMRGs, these are defined in programme contracts, as seen in Section 5.1.3. In 2020, NHS hospitals could increase their income by at most 1% or be penalised by 0,21% of the yearly budget value [13], which already represents an increase since 2019. Another incentive created was the introduction of financial responsibility to HOs when their patients are transferred to another NHS or contracted hospital, being payment defined in a fee-for-service basis. 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 independent of their waiting times. 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 acceptance rate of SVs or TNs is significantly low, the impact of financial responsibility for HOs as an incentive may be diminished, as also observed in the literature.

Second, regarding the need for 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. However, this change was not accompanied by a proportional resource increase, leading mainly to increased SVs/TNs rather than decreased waiting times. However, it is also important to note that the TMRG reduction means that the probability of occurrence of incentives and penalisations increases.

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, it is also important to note that sufficient funding and resources also need to be available for providers to be able to respond to changes in the TMRG policy.

### *6.3 The low acceptance rates of SVs and TNs*

As mentioned, the low acceptance rate of SVs and TNs, depicted in Figure 3, reduces the effects of the SV/TN strategy in reducing both individual and overall waiting times, impacting waiting time variability and TMRG breaching.

The low proportion of patients using their right to choose an alternative provider is frequently reported in choice policies literature. The main reasons identified in the literature for this include higher distance or travel time, lack of information and uncertainty of surgery date even if waiting time was shorter at the alternative provider. In the NHS, a 2008 study 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%). However, the main reason (34%) was that patients did not want to be operated by a different surgical team. 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.

Another problem reported in the literature related to the low percentage of patient using their right to choose is the fact that this rate can be especially low in some groups of patients, leading to socio-economic and demographic inequity concerns, and to ethical issues. 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.

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 [53]. However, the acceptance rate continued to decrease after that year. 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 [4], thus increasing patient mobility in the NHS. In conclusion, taking on measures that could further increase the use of transfers, such as increasing information or direct booking would be important to increase the potential of the SV/TN system.

### *6.4 Unbalance between the number of TNs and SVs*

The number of TNs has been consistently lower than the number of SVs, as can be seen in Figure 4, which results in a much higher number of patients being transferred to private than to NHS hospitals.

As mentioned in the literature, contracting services from the private sector is a quick and affordable way in the short-term to increase capacity and provide timely care. In fact, NHS data from 2015 indicate a mean waiting time for contracted hospitals of 24 days while in NHS hospitals it was close to 3 months [49]. However, as international examples suggest, this also comes with its own risks, such as that private providers tend to only take on simpler cases, leaving more complex and costly cases for public hospitals. Nonetheless, a 2014 study reported that while more than 50% of patients were operated in ambulatory surgery in NHS hospitals, in contracted providers, this percentage was only 21% [47]. One reason pointed out was that NHS hospitals might perform ambulatory surgeries more easily and leave inpatient surgeries in LIC with higher waiting times. However, this also represents increased costs for HOs. 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, a modification was made to increase the number of TNs by issuing them sooner and increase internalisation of surgeries in NHS hospitals, suggesting a recognition that there is unused capacity within the NHS. The problem of the TN/SV unbalance is more evident in some regions than in others. As mentioned, private provision in Algarve represented more than 22% in 2019, a significant difference from other regions. This is related to the fact that in Algarve, there is only one hospital centre, which means that TNs generally cannot be issued. However, this should not lead to a higher number of surgeries outside the NHS overall, representing a lack of capacity in the region to respond to demand. This can represent significant costs and it would likely be more sustainable for the NHS to increase public capacity in the region.

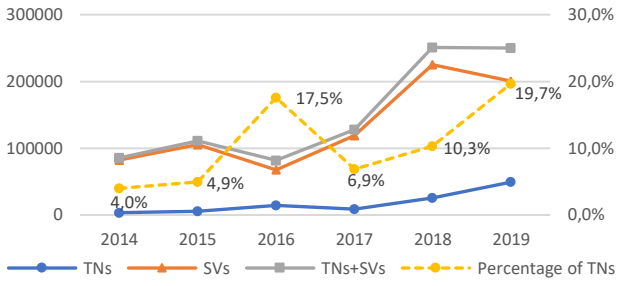


Figure 4 - Evolution of the number of TNs and SVs, and percentage of TNs between 2014 and 2019. Data sources: [4], [54], [55].

### *6.5 Other considerations*

In addition to the issues identified in the previous sections, there are other considerations regarding SIGIC strategies that can be discussed. The use of qualitative prioritization guidelines, in the absence of specific rules to aid surgeons' decision-making can lead to different surgeons categorising the same conditions differently, representing a high risk of inequities between the same type of patients. Procedure-specific regulations can lower the risk of this

issue arising; however, it would be necessary to study the robustness and validity of the prioritisation's tools used in the NHS.

DRG-related payments is another strategy used in SIGIC with potential implications. As discussed in the literature review, this budgeting method may create perverse incentives to favour patients with more profitable DRGs, leading to cream-skimming or to DRG-creep. For this scenario, [56] studied the presence of DRG-creep in NHS hospitals, concluding that small economic effects existed and considered the strategy an adequate funding mechanism for NHS hospitals.

A third strategy, used under SIGIC, is the utilization of additional activity to increase production, with a fee-for-service payment. This represents an incentive to increase 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. In 2015, a short-term funding policy was used in some hospitals to increase additional volume of surgeries to a specific a group of procedures. As reported in Section 4, it had unfavourable effects: hospitals did not achieve the contracted surgery volume, and many increased their waiting times for the targeted procedures [54].

Additionally, the evidence of hospitals issuing, while also receiving large numbers of SVs and TNs [4] indicates an unbalance in distribution of hospital resources. Even though this is also related with different specialities for the same hospital, the encouragement of wait list pooling within hospitals seems to be a promising measure to reduce inefficiencies and wait times locally.

As can be assessed, each used strategy can have different unwanted outcomes. For the NHS, there are several implications for the strategies used to reduce the waiting times, requiring further consideration to prevent or minimize unintended consequences and analyse processes that need to be improved.

## 7 Conclusions

The presence of elective surgery waiting lists is a growing problem for healthcare systems as demand has consistently increased. Although efforts to increase the supply are made, the gap between both is evident and leads to the emergence and growth of waiting lists and waiting times. In turn, long waiting times bring negative consequences for patients, such as deteriorating health conditions, lower life quality, or work absenteeism. It is especially critical in publicly funded universal healthcare systems where demand is high, there is no rationing by price, and cost and resource restrictions are inherent.

To address the waiting list problem numerous strategies have been developed and studied. 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. Regarding supply-side strategies, activity-based payments have a positive impact, especially when combined with other strategies. Still, 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, 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. Strategies using shorts bursts of funding to increase production are found to be highly non-sustainable.

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. It consists of a network of primary care centres, hospitals, and a long-term care network – all divided in five RHAs. To tackle the growth of elective surgery waiting lists and times in the NHS, several consecutive short-term programmes were developed. However, these programmes consistently failed to achieve sustained waiting time reductions. SIGIC programme introduced regulations for the practice of additional production and inter-hospital transfers where patients are able to opt to receive surgery at an alternative provider with shorter waiting times upon breaching the TMRG at the original hospital, through the issuing of a TN or SV. The SIGIC system was able to achieve a consistent decrease in waiting lists and times and an increase in production in the first years. In the past decade however, waiting times have ceased decreasing and now 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. 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, for instance, to Alentejo RHA with only 1,5% for the same year. Another 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. Giving options closer to the patients' residence area, certainty of date of surgery after acceptance, and improving information for both patients and clinicians so patients can be supported in their decision could increase this rate of acceptance.

Nevertheless, a factor that hinders the analysis of the performance of waiting list policies in the NHS is the lack of availability and rigour in the data. It is frequent to find incongruences for the same measures when reported by different sources. This heterogeneity and the high aggregation of data can conceal important information and variation between regions and providers. The extension of this work for the inclusion of more detailed quantitative and qualitative data would be beneficial to assess the outcome of different management strategies. Moreover, the empirical evidence of these strategies is difficult to obtain since experimenting new policies in real settings is often infeasible. Operational research applications such as simulation can play an important role in healthcare systems research. Likewise, the sustainability of different strategies shall also be further studied since it has been described challenging to attain in the long-term and most studies have short periods of analysis.

Finally, although these findings cannot be seen as definitive and static evidence of the effects of a strategy nor determine whether a strategy will be effective in NHS, they can be used as a foundation for an evidence-based discussion of possible implications of strategies when applied to different health systems.

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