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Cost-Benefit Analysis of a Domiciliary Blood Transfusion Program in a Portuguese Tertiary Hospital

Diana Cibele Faria e Costa Gonçalves

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FACULDADE DE **ECONOMIA**

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Dissertation

Master in Health Care Economics and Management

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Abstract

Activity in the Day Hospital (DH) of *Centro Hospitalar Universitário São João (CHUSJ)* is fundamental in the reduction of hospitalization for patients with hematological diseases. This service allows for treatments that require hospital care to happen in an outpatient setting, and it guarantees that frail patients have an easy access to their health care providers.

Transfusional dependence is frequent among patients with hematological diseases and plays a big part in their poor quality of life: patients need to go to the DH frequently and wait several hours until it is decided if they benefit from transfusion, or not. From the DH point of view, transfusion also appears to be responsible for a fair share of its total occupancy rate, limiting the capacity to reach more patients.

Home Transfusion (HT) is a valuable alternative to transfusion in the DH: it is more comfortable for patients and it is known to be safe; however, from the National Health Service's point of view, it may be associated with higher costs.

This work aims to estimate the costs associated with a HT program in CHUSJ. Two models for eligibility were designed, in an attempt to simulate the gradual implementation a project like this would probably have – initially a more cautious approach, that would develop over time.

As expected, per transfusional session, HT would have a higher cost than a transfusion in the DH (even if it may be as low as about 21 €). Nonetheless, the impact over global budget may be overcome if the increased availability in the DH, and associated cost-opportunity, are accounted for.

Resumo

A atividade do Hospital de Dia (HD) do Centro Hospitalar Universitário São João (CHUSJ) é fundamental para a diminuição da taxa de internamentos no Serviço de Hematologia Clínica. Este serviço permite a realização em ambulatório de tratamentos que devem ser feitos a nível intra-hospitalar, bem como um acompanhamento dos doentes que, apesar de não estarem hospitalizados, têm uma saúde frágil e que requer cuidados constantes.

A dependência transfusional, frequente nos doentes com doenças hematológicas, é um importante contributo para a diminuição da sua qualidade de vida: obriga a deslocações frequentes ao HD e a várias horas de espera enquanto é decidido se o doente necessita, ou não, de suporte transfusional. Do ponto de vista da organização do HD, este procedimento parece ser também responsável por uma percentagem importante da sua ocupação, limitando a sua capacidade de atender a mais doentes.

A transfusão domiciliária (TD) surge como uma alternativa possível à transfusão em HD: mais confortável para doentes, já dada como segura, mas possivelmente associada a maiores custos para o Serviço Nacional de Saúde.

Este trabalho procurou esclarecer o custo associado a um programa de TD no CHUSJ. Foram definidos dois modelos de seleção dos doentes que procuraram antecipar o formato de implementação gradual de um serviço com estas caraterísticas – inicialmente mais restritivo, com tendência à maior abrangência de doentes.

Como seria de esperar, este serviço teria, por sessão transfusional, um custo superior ao previsto para uma transfusão em HD (ainda que a diferença possa não chegar a 21 €). No entanto, esta diferença de custos poderá não ser impeditiva, dado o custo-oportunidade do espaço livre em HD que é gerado.

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1. Introduction

Patients with hematological diseases are prone to have frequent transfusional needs. In *Centro Hospitalar Universitário de São João* (*CHUSJ*), patients who are not hospitalized may receive this treatment, in a scheduled way, at the Day Hospital (DH). This outpatient service is shared by several medical specialties and if it were to have an increased availability, this would have a disseminated impact over hospital activity.

In CHUSJ, the domiciliation of hospital services has proven to be a valuable tool to improve the management of hospital bed's occupancy, while allowing patients to be more comfortable and in close proximity to their loved ones while receiving a service as complete as the one provided in a typical hospitalization. Among others, transfusion is one of the treatments offered by home hospitalization.

This dissertation aims to evaluate the possibility of developing a home program to exclusively transfuse hematological patients at their homes. If its benefits surpass eventual limitations, and considering the volume of patients it could serve, this work aims to determine the costs of this service, in comparison with the existing one (in the DH).

The fundamental questions this work seeks to answer are:

- *What are the costs and benefits associated with a home transfusion (HT) program for hematological patients of CHUSJ?*
- *How would the cost of a HT program impact the budget of CHUSJ?*

This dissertation began with this introduction (Section 1), meant to explain the relevance of this study, the aim of the research and the answers this work hopes to answer. Section 2 presents the existing literature on this topic, including its conceptual framework and practical background framing. Section 3 details the chosen methodological steps necessary for data selection and evaluation. Section 4 gradually presents the obtained results and Section 5 discusses the main findings. Finally, Section 6 presents a conclusion to this work, proposes a HT program for CHUSJ and identifies its limitations.

2. Theoretical Framework, Literature Review and Practical Backround

2.1. National Health Service Regulators and Providers

The Portuguese National Health Service (NHS) was established in 1979 and it is a universal tax-financed system, accessible to all residents in Portugal (Simões et al., 2017). According to the Portuguese law that establishes the basis for health services, the NHS must tend towards being free of out-of-pocket charge (Assembleia da República Portuguesa [ARP], 2019).

Public health providers are predominant both in primary and hospital care, with a gate-keeping system in place for access to hospital care. Public hospitals are funded by global budgets, according to their activities and using diagnosis-related groups (Simões et al., 2017).

The NHS may also find a revenue source through basic fees charged to patients. These payments are part of the existing measures to regulate the use of public health care services (ARP, 2019).

Since 1993, the management of the NHS occurs at a regional level, through Regional Health Administrations (*ARS*) that respond to the Ministry of Health (MH) and that are responsible for: strategic health management of the population, supervision of hospital activity, management of the primary care public units and implementation of public health policies established by the MH (Simões et al., 2017). Portugal is divided into five *ARSs*.

The Central Administration of the Health System (*ACSS*) is a public institute, indirectly under the government's administration, responsible for the management of financial and human resources of the NHS, as for its facilities, equipment, systems and information technology. In association with the *ARSs*, it is also responsible for the regulation and planning of contracts with public health institutions, that must respect national health policies (Simões et al., 2017).

Each year, the ACSS publishes a document (*Termos de Referência para Contratualização de Cuidados de Saúde no SNS*) that establishes the main concerns regarding the establishment of contracts with the NHS providers. In recent years, the development of home care services has been identified as one of the goals for the NHS, through two types of services: hospital activity at home (for example, home medical consultations) and home hospitalization (Administração Central do Sistema de Saúde, I.P. [ACSS], 2021b).

In compliance with the Portuguese law that establishes the basis for health services, access to the NHS must be equitable across the country (ARP, 2019). In Portugal, when a patient is referred from primary care to a hospital, he may select, with his general practitioner

(GP) doctor, to which hospital he would like to be referred given the expected waiting time for a first consultation and geographical distance (Gabinete do Secretário de Estado da Saúde, 2016). Also, for most hospital specialties, there is a National Network for Hospital Specialties and Referral (RNEHR) that establishes the referral options for each patient, according to his medical condition and his residence (Simões et al., 2017).

As such, tertiary hospitals are responsible for the treatment of patients with complex medical and surgical diseases, referred from primary and secondary care centers. CHUSJ is a Portuguese tertiary hospital, located in the northern region of Portugal, in the city of Porto.

The Northern Region of Portugal - a NUTS 2 subdivision according to *Base de Dados Portugal Contemporâneo* [PORDATA] (2013) - has a population of 3 688 037 individuals, distributed through its area with a density of 167.8 inhabitants per square kilometer (PORDATA, 2021). ARS-North includes 85 Portuguese municipalities; health care public providers are divided into 21 Clusters of Health Centers (*ACES*), 3 Local Health Units (*ULS*) and 13 Hospitals and Hospital Centers (Appendix 1) (Neto et al., 2017). Porto metropolitan area (a NUTS 3 region) has 17 municipalities and a total population of 1 732 210 individuals, with a population density of 846.5 inhabitants per square kilometer (PORDATA, 2021; PORDATA & Instituto Nacional de Estatística [INE], 2021).

CHUSJ assists part of the population from Porto (of its 7 parishes, this hospital assists the population from Bonfim, Paranhos, Campanhã and Aldoar, Foz do Douro, Nevogilde – Appendix 2), as those from Maia (120 743 inhabitants) and Valongo (86 340 inhabitants), in a total of 334 783 individuals.

2.2. CHUSJ's Hematology Day Hospital

CHUSJ's Day Hospital (DH) is part of its Outpatient Center (OC). This service, that has its own building and staff (except for doctors), allows patients to receive treatments without the need to be hospitalized. DH is meant to allow continuous treatment for chronic patients of several medical specialties – among 26 specialties that can schedule treatments there, Hematology, Neurology and Transplant Center also allow patients to come in without an appointment (Table 1). Currently, the DH has a team of 36 nurses, but only 25 are fully active. According to its head nurse, the occupancy rate of the DH's chairs consistently rounds up to 90 %. An intervention to transfer patients from the DH to other facilities would raise the existing availability to assist other patients from all the 26 medical specialties.

	Basic, n (%)	Hematology, n (%)	IHT*, n	Psychiatry*, n	Total, n
2018	58 606 (76.9)	3 897 (5.11)	1 124	12 625	76 252
2019	57 910 (76.2)	3 313 (4.4)	967	13 828	76 018
2020	43 308 (78.6)	4 385 (8.0)	1 023	6 372	55 088
2021	51 825 (77.7)	4 285 (6.4)	1 048	9 570	66 728

*Table 1 - DH Sessions in CHUSJ, 2018-2021; *Special facilities other than CHUSJ's OC (Administração Central do Sistema de Saúde, I.P. [ACSS] et al., 2018; ACSS et al., 2019; ACSS et al., 2020; ACSS et al., 2021)*

In the DH, patients with hematological diseases may benefit from several treatments, according to their conditions – from therapeutic phlebotomies to chemotherapy, or blood transfusions, among others. In the last 4 years, the impact of the Hematology DH in the Contract-Programs for CHUSJ has been oscillating (Table 2).

	Hematology DH			
	2018	**2019**	**2020**	**2021**
Price/ Unit (€)	294	309	309	324
N	3 897	3 313	4 385	4 285
Total Value (€)	1 145 718	1 023 717	1 354 965	1 388 340

Table 2 - Hematology DH in the Contract-Programs of CHUSJ, 2018-2021 (ACSS et al., 2018; ACSS et al., 2019; ACSS et al., 2020; ACSS et al., 2021)

According to the RNEHR for Clinical Hematology, population belonging to ACES or ULS other than the ones served by CHUSJ (Appendix 1), may be referenced to this Hospital Center for treatment of hematological malignancies, in a total of 1 870 874 inhabitants (Miranda et al., 2016).

The need for blood transfusion (red blood cells – RBC - or platelets) is transversal among patients with malignant hematological diseases and accounts for many of their visits to the DH. An important part of these patients is considered as transfusion dependent – in a broad categorization, they need more than one RBC transfusion and/or Platelet Dosage (PD) over a specified period, due to bone marrow failure. This definition is not homogeneous for all hematological diseases or, even, well defined for each one of them (Gale et al., 2011). Among other hematological diseases, acquired marrow failure syndromes (AMFS) - aplastic anemia (AA), paroxysmal nocturnal hemoglobinuria (PNH), myelodysplastic syndromes (MDS) -, plasma cell disorders (PCD), non-Hodgkin lymphomas (NHL) or myeloproliferative

neoplasm (MN) are often associated with this dependence. For example, the World Health Organization Prognostic Scoring System for MDS defines Transfusional Dependency (TD) as "at least one RBC transfusion every 8 weeks over a period of 4 months" (Malvonati et al., 2007). Patients needs for transfusional support fluctuate along with their disease progression and, in the end-stage of disease progression, is important to control symptoms like fatigue. According to the clinical characteristics of hematological diseases, transfusional needs aren't passible of much delay without endangering patients.

Transfusions have proven to be highly time demanding and patients often have periodical appointments in the DH only for this purpose. According to the process in place in CHUSJ, after being admitted in the DH, the patient must wait to collect blood samples, which are then transported to the hematology laboratory (HL) and to the blood bank (BB). The patient then returns to the waiting room and the BB starts compatibility tests while the hemogram is being done. Doctors from the BB periodically consult the patient's electronic process until hemoglobin value and platelet count are available. According to these results and clinical evaluation performed by the hematologist, the BB doctor decides if the patient needs a transfusion. At this point, if the patient does not need a transfusion, he may return home. On the opposite, if there is a need for transfusion, the blood components must be transported to the DH, to be infused. The patient can return home 30 minutes after receiving these treatments. Optimally, each transfusion at the DH implies 120 additional minutes to the necessary time to collect blood samples (15 minutes) and to complete transfusion (time expenditure depends on the transfused components per session). Patients who are not transfused still need to stay in the hospital for more than 90 minutes (Figure 1).

Patients who need transfusional support, according to the National Chart of Incapability, have an incapacity degree superior to 60 points and are exempt of basic fees (Centro Nacional de Proteção Contra os Riscos Profissionais, 2018; ARP, 2017). Also, if they are in an economical insufficiency situation and do not benefit from a special health subsystem, they may receive financial help to support their travel expenses to the hospital.

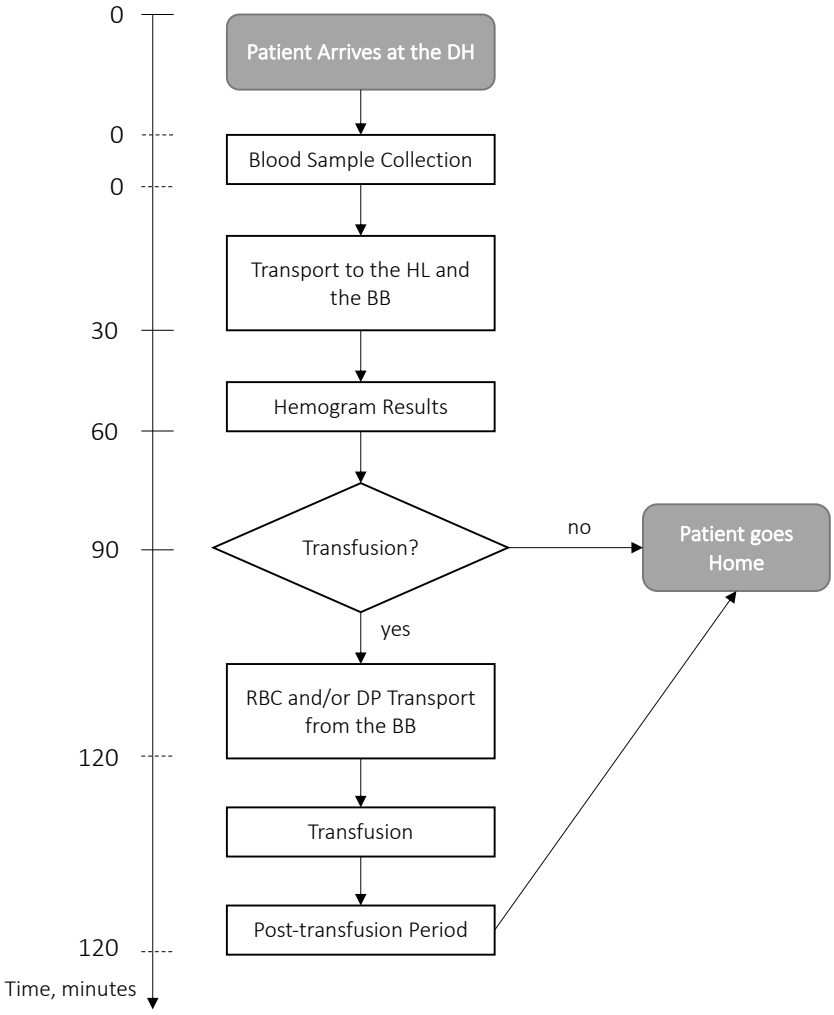

Figure 1 - Route since admission to transfusion, in the DH of CHUSJ; Elaborated by the author.

2.3. Home Hospitalization Department

Since May 2019, CHUSJ has a Home Hospitalization Department (HHD), that integrates a multidisciplinary team of doctors, nurses, social workers, operational and technical assistants. In 2021, the Department was organized into 4 teams, that were able to care for up to 16 patients simultaneously.

For a patient to be considered eligible to home hospitalization (HH), he must fulfill several clinical criteria:

- The patient, and his caregiver, must be willing to accept HH.
- The patient must have a well-established diagnosis, despite the need for further treatment.

- The patient's clinical condition must benefit from a level of care as complex as the one provided by HHD.
- Patient's comorbidities must be possible to control in a home setting. He must not have uncompensated psychiatric diseases, alcohol addiction, hemodynamic instability or special epidemiological risk.

When it comes to geographical criteria, the only criterion in place is the distance between CHUSJ's emergency department and the patient's home – less than 30 minutes and/or 20 km.

Other important criteria take into account patients' social integration:

- If the patient is not at his full capability, a capable caregiver must assist him;
- The patient must have a working phone to allow contact with the HHD team;
- Patients' home must have adequate living conditions – drinkable water, electric power, basic sanitation;
- The patient, or his caregiver, must have the physical or emotional capacity to assist the HHD team with any necessary medical procedures.

The HHD operates 24 hours per day, every day of the year – a doctor and a nurse are permanently available by phone, when not physically present. Every working day, the team of nurses and doctors have a morning meeting to discuss their patients, before visiting them. In their experience, transportation to and from the patient's home lasts 15 minutes, and the team spends 30 to 45 minutes with the patient. If considered appropriate, a nurse returns to the patient's home in the afternoon.

CHUSJ, through HHD and Psychiatry home consultations (HC), meets the development of home care services goal defined by the ACSS (Table 3) (ACSS, 2021b).

	HC				**HHC**			
	2018	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
Cost/ Unit (€)	38	38	40	40	1 714	2 399	2 759	2 896
N	*1 700*	*1 138*	*2 130*	*1 888*	*125*	*150*	*242*	*510*
Total (€)	64 600	43 244	85 200	75 520	285 059	463 507	860 007	1 902 408

Table 3 - Home Care in the Contract-Programs of CHUSJ, 2018-2021 (rounded to units) (ACSS et al., 2018; ACSS et al., 2019; ACSS et al., 2020; ACSS et al., 2021)

2.4. Home Transfusion

It is a consensual opinion that, for people with hematological diseases or other chronic conditions, constant appointments in the HD for medical visits, blood sample collections and transfusions represent a source of stress, concern and fatigue (Ademokum et al., 2005; Niscola et al., 2012; Ritchie, 2012; Charron et al., 2019).

Home transfusion (HT) has risen as an option to guarantee improved accessibility for the patients, and has been a way to refine the use of the hospital infrastructures and human resources (Havet et al., 2011).

The main topic of concern regarding HT settles in patients' safety. Adverse transfusion reactions (ATRs) are defined as undesirable consequences of the administration of a blood component. ATRs are considered as infectious or non-infectious. The risk of transmission of infectious diseases through blood components is the same, independently from the local of blood infusion. When it comes to non-infectious adverse transfusion reactions (NIATRs), the risk associated with these events, in a home setting, has been considered an important topic to address. NIATRs may be acute (if they occur less than 24 hours after transfusion) or delayed (if symptoms arise after more than 24 hours following the procedure), and their severity is highly variable – symptoms range from a simple pruritus to an anaphylactic reaction (Sahu et al., 2014). Severe acute NIATRs need to be addressed in a timely manner and distance to an emergency room is a topic of concern both for patients and medical staff before considering HT. The most frequent NIATRs are related with clerical errors, namely in patients' identification.

The distance to an emergency department, in the event of adverse reactions, plays an important psychological role for some patients (Ademokum et al., 2005; Garcia et al., 2018). Nonetheless, if all safety measures are secured, HT has proven to be as safe as transfusions in a hospital setting (Ademokum et al., 2005; Benson, 2006; Cohn et al., 2020).

To avoid Transfusion Associated Circulatory Overload – a serious NIATR -, it is not recommended to transfuse more than 2 blood component per session (2 RBCs or 1 PD plus 1 RBC) (Benson, 2006; Cohn et al., 2020).

Eligibly criteria for HT must consider some important aspects:

- Age is not a definite limiting criterion – the youngest and oldest patients appear to be the ones who benefit the most from these initiatives.
- Despite the expected frailty of these patients, it is important to exclude the ones who have important cardiac conditions, that may decompensate easily with variation in the patient's volemia.

- In order to secure patient's safety, it is fundamental to guarantee that he is capable of giving informed consent and communicate any symptom that may associated with an adverse transfusional reaction.
- Patients must have been previously transfused in a hospital setting and must not have a previous history of severe NIATRs (Benson, 2016; Garcia et al., 2018; Cohn et al., 2020).

Social criteria for HT eligibility are the same as the ones selected by the HHD. The patient's caregiver has a vital role in this service – he must be able to fully understand the associated risks and to act in case of an emergency. Despite the several time and comfort-related advantages this service has also to this agent, it is important to explain that he must be with the patient for 2 hours following transfusion.

Infusion of blood components must respect several regulations and legal demands, made to assure the safety of this process. As such, a HT program must guarantee that every step of the process is secured. Uniform procedures must be in place to guide the HT team on the subjects of:

- Inclusion and exclusion criteria for HT;
- Clinical indications for HT;
- Patient identification;
- Pre-transfusion blood analysis;
- Shipment, transportation and product storage;
- Clinical indications for pre-transfusional treatments;
- Infusion of blood components – infusion rhythm, catheters, vital signs and temperature monitorization;
- Approach to a suspected or confirmed transfusional adverse reaction;
- Post-transfusional patient monitorization;
- Management of waste with biological risk;
- Documentation of every intervention;
- Selection criteria for human resources;
- Description of responsibilities for each professional (Cohn et al., 2020).

The fundamental steps for HT are described in Figure 2. A model for HT that does not include the doctor's presence at the patient's home – only the nurse - is well accepted but. Nonetheless, a doctor must schedule the transfusion sessions according to the patients'

needs and be always available throughout the HT session (van Gammeren & Haneveer, 2017; Charron et al., 2019).

From a psychological and medical perspective, HT is a more comfortable solution, as it is a procedure that focus on each patient individually and protects him from possible nosocomial infections or errors in patient's identification (Ademokum et al., 2005; Benson, 2006; Niscola et al., 2012; Garcia et al., 2018; Cohn et al., 2020).

Previous studies on the topic of HT have focused on patients' interest in this service, given the potential added comfort to patients and caregivers, and in its safety (Havet et al., 2011a; Havet et al., 2011b). These studies are clear to state the potential benefits this service could bring to patients but admit to lack information about its costs.

Cost-benefit analysis concerning home care of hematological patients proved that home hospitalization has significant benefits, clinical and financial, compared to typical hospitalization, but do not address HT as a single service (Cartoni et al., 2007; Cartoni et al., 2021)

Along this work, the term "HT Visit" will be used to refer to any type of HT visit (to collect blood samples or to transfuse patients), whereas the term "HT Session" will be used to refer exclusively to visits with transfusion.

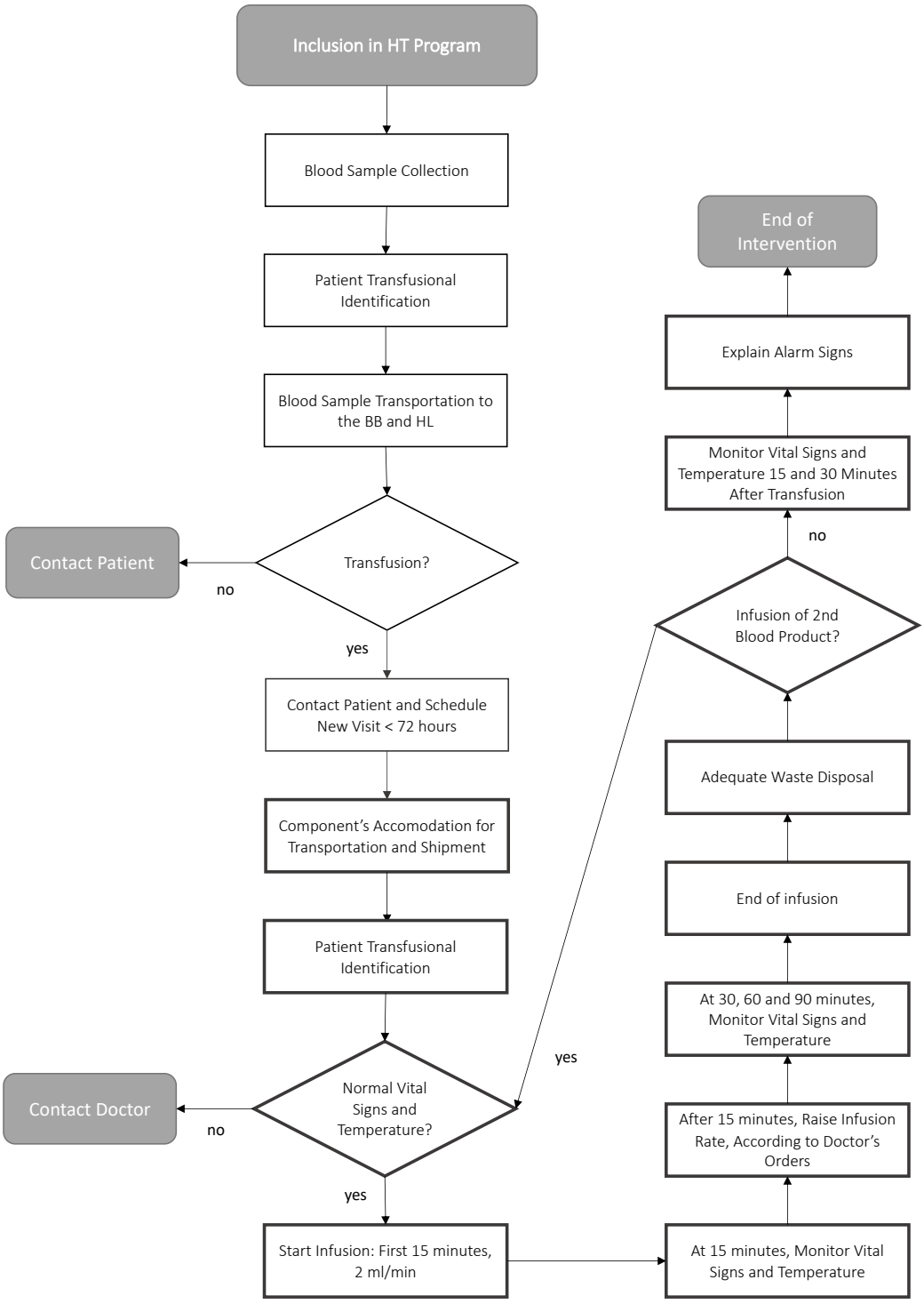

Figure 2 - Fundamental Steps for HT (Thiner squares - 1st visit; Bolder squares - 2nd visit); Elaborated by the author (Benson, 2006; Cohn et al., 2020).

3. Methodology

The goals for this project were submitted to the Ethics Committee of CHUSJ that, together with the Responsible for the Access to Information (RAI) and the Executive Board, approved the collection of appropriate data. This approval (nº 66/21) was granted on March 23rd 2021.

This economical evaluation was developed considering the Methodological Orientations for Studies of Economical Evaluation of Health Technologies, published in the Portuguese Official Gazette (Perelman et al., 2019).

3.1. Objectives

This paper aims to evaluate, retrospectively, the impact a home transfusion program would have had in the activity of the Hematology DH of CHUSJ. The effects of two different models for selection of eligible transfusional visits (TV) – a more restrictive one (Model R) and a broader one (Model B) – were analyzed.

After identifying which TV could have been substituted by HT over a two-year period, the goal is to estimate the costs associated with it, and also potential gains.

3.2. Intervention

For each TV selected through Model R or Model B, substitute transfusion in a DH setting for HT.

3.3. Comparators

Transfusions in the DH are the established comparator to the defined intervention.

3.4. Target Population

Among all patients that received treatment for hematological diseases at the DH, between 2018 January 1st and 2019 December 31st, those who lived at a distance inferior to 20 km from CHUSJ were selected. The year 2020 was left out of the evaluated period due to the global COVID pandemic and its significant impact over all health services. The eligibility criterion related with the patients' home distance to the hospital is the same as the one defined by the HHD of CHUSJ.

Two different models for selection of TVs that could have been substituted by HT were designed - for each one of the patients who lived at less than 20 km to CHUSJ, on each one of the weeks included in the time frame, two different sets of questions were asked:

- Model R (Figure 3):
  1) Has that patient been transfused, in the DH, at least twice before?
  2) Was the patient transfused, in the DH, the previous week?
- Model B (Figure 4):
  1) Has that patient been transfused, in the DH, at least twice before?
  2) Was the patient transfused, in the DH, at least two weeks before?

For both models, the answer to both questions must be positive for those TV to be considered eligible for the program. For both models it was decided that, if a patient had more than one TV in a specific week, transfusional sessions would be divided equitably between DH and HT, with a preference for HT.

3.5. Intervention effects

Each HT session would imply two visits to the patient's home: one to collect blood samples and, less than 72 hours after, other for transfusion. Each HT session may account for the transfusion of one package of RBCs (R), one platelet dosage (P), two packages of RBCs (2R) or one package of RBC plus one platelet dosage (RP).

Each home visit would imply:

- Medical costs – Even if the value of a HT session is not established in the existing contracts, the costs associated with the some of the services it includes are well determined (cost of an infusion; cost of each blood components, cost of blood analysis) (ACSS, 2021b).
- Human resources availability – These interventions require a nurse and a doctor. It is assumed that, for each day spent working in the HT program, the nurse would go from CHUSJ to the first patient's home and then to the following, before returning to the hospital (Figure 3, 4 and 5). Visits meant only to collect blood samples should not exceed 15 minutes at each patient's home (Figure 3) – the time necessary for this depends on the number of patients it must attend to (a single visit to a patient takes 75 minutes; if the number of visited patients is bigger than one, Equation 3.1 must apply). A nurse must be always with the patient during transfusion (Table 4) and for the 30 following minutes, to maximize patient safety. Given that a nurse works 35 hours per week, it was considered that his schedule

would include a period of 11 hours of work and three periods of 8 hours. For every week, if the HT implied more than 11 hours, the number of visits per day was organized in the most equitable way, given that only one shift can last up to 11 hours, and the following have a maximum length of 8 hours. A doctor must be always available, by telephone, to answer any doubts and guide the nurse through unexpected events. This service would be similar to the one provided in the DH setting, and it is not expected to imply additional costs.

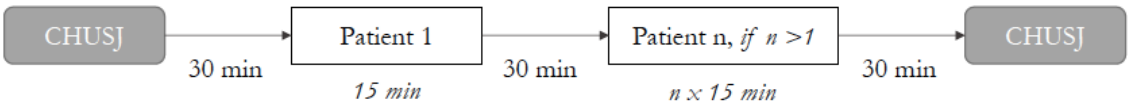

Figure 3 - Blood collection visits

$$Blood\ collection\ Visits: Hours/Visit\ = N\ Patients\ x\ 0.75\ hours + 0.5\ hours$$

Equation 3.1

Transfused Product	Transfusion Time (min)	Complete Session (min)	Session + Transportation (min)
R	90	120	180
P	20	50	110
2R	180	210	270
RP	110	140	200

Table 4 - Transfusional Session, According to Blood Components

- Transportation costs – 30 minutes were considered as an adequate time expenditure for each trip between CHUSJ and the patient's home, that is located at a maximum distance of 20 km (in a total of 1 hour for both trips, Table 4). If, per day, the number of visited patients is bigger than one, Equation 3.2 must be applied to account for the time spent in transportations between CHUSJ and the patients' houses (Figure 4). Equation 3.3 must be applied to calculate the km spent per HT session (Figure 5), if at least two patients are visited in the same day (a session corresponds to 1 visited patient).

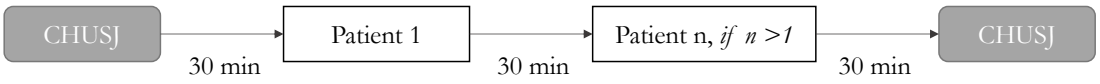

Figure 4 - Time Spent in Transportation, per day

$$\sum Minutes\ in\ Transport/\ Session = 30\ min\ x\ (n\ Patients + 1)$$

Equation 3.2

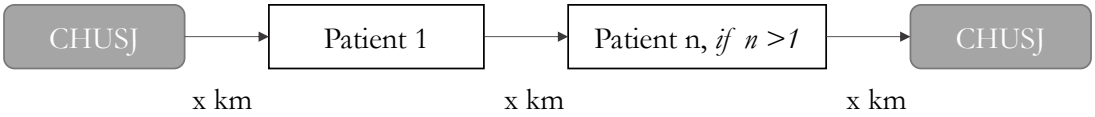

Figure 5 - Km Traveled, per day

$$\sum Km/\ Session = Mean\ Km\ to\ Patients'\ homes\ x\ (n\ Patients + 1)$$

Equation 3.3

- Indirect costs – from the patient's point of view, home transfusion would mean that he could save the time associated with transportation costs. Also, this service would allow the same time savings to his caregiver, which could be used for work productivity.

3.6. Quantifying Effects of Intervention

Number of DH visits that could have been substituted by HT, and associated costs.

Number of hours made available in the DH if HT was in place.

3.7. Perspectives

This study aims to evaluate the cost of a project with these characteristics, from the NHS point of view. This project would implicate a different allocation of resources and it intends to evaluate associated costs to the NHS and consequent benefits for the patients.

3.8. Resource Use and Costs

The costs associated with the transfusional process in a home setting or in-hospital, as a whole, may be divided into categories: transfusional decision, costs directly associated with

the transfusion and costs associated with the hospital's operation. From the NHS point of view, some of these costs vary depending on where the transfusion takes place - in the hospital or in the patient's home (Table 5). Nonetheless, other costs might not need to be weighted in order to determine the cost of HT:

- In a DH setting, a doctor schedules the patient's next appointment according to his needs. This step would not be different in a HT setting.
- According to the existing contracts, the cost of transfusing a blood components includes most of the services and products involved, except for the blood component itself and for the blood analysis that must be made. The exception is a DH session with transfusion – its cost accounts for all necessary products and services. For that reason, costs with consumable materials may be excused.
- The administration of pharmaceutical products during transfusion is similar on both settings, with similar prices.
- During and after transfusion, all information regarding the procedure must be registered, independently from where it takes place.
- Hospital's activities such as its pharmacy, its emergency room or its waste treatment center must work independently from the existence of HT.

3.9. Measurement and Validation of Health

This study did not apply the EQ-5D-5L questionnaire to assess health-related quality of life, nor aims to evaluate changes in the patients' quality-adjusted life years (QALYs). The proposed intervention does not intend to alter the patients' health outcomes, but to improve their well-being while receiving the same treatment (Havet et al., 2011b).

This work hopes to establish a foundation for the determination of financial incremental costs of model B or R, compared to the existing service – exclusively based in the DH.

3.10. Model Structure

This analysis was performed using a decision tree model (Figure 6 and 7). The unit of analysis was each week included in the study's time frame. This model was designed *de novo*.

3.11. Outcomes

Costs associated with HT in comparison to the costs of transfusion in the DH.

Costs associated with HT if Model R was used for TV selection, in comparison to Model B.

Costs			**DH ≠ HT?**
Transfusional Decision	Schedule for blood collection		No
	Blood collection	Consumable material *Tubes, needles, disinfectant, etc*	No
		Transportation *Nurses, consumable materials, blood tubes and associated wastes* *Patients*	Yes
		Hotel Operations *Laundry, food, cleaning, waste management*	Yes
		Nurse's Work	Yes
	Blood analysis		Yes
Costs Directly Associated with Transfusion	Consumable material		No
	Pre-transfusion medication		No
	Management of information collected during transfusion		No
	Transportation *Special containers for blood components, medication and waste* *Nurse* *Patient* *Monitoring Equipment*		Yes
	Blood Components		Yes
	Nurse's Work		Yes
	Monitoring equipment		Yes
	Hotel operations and other materials		Yes
Costs Associated with Hospital's Operation	Time for quality control and hemovigilance		No
	Maintenance of infrastructure and equipment		No
	Hospital pharmacy		No
	Waste treatment		No
	Emergency department		No
	Time necessary for personnel's coordination, information exchange and formation		No
	Transportation vehicle		Yes

Table 5 - Costs Associated with Transfusion – Do they differ from the DH to the patient's home?

Model R

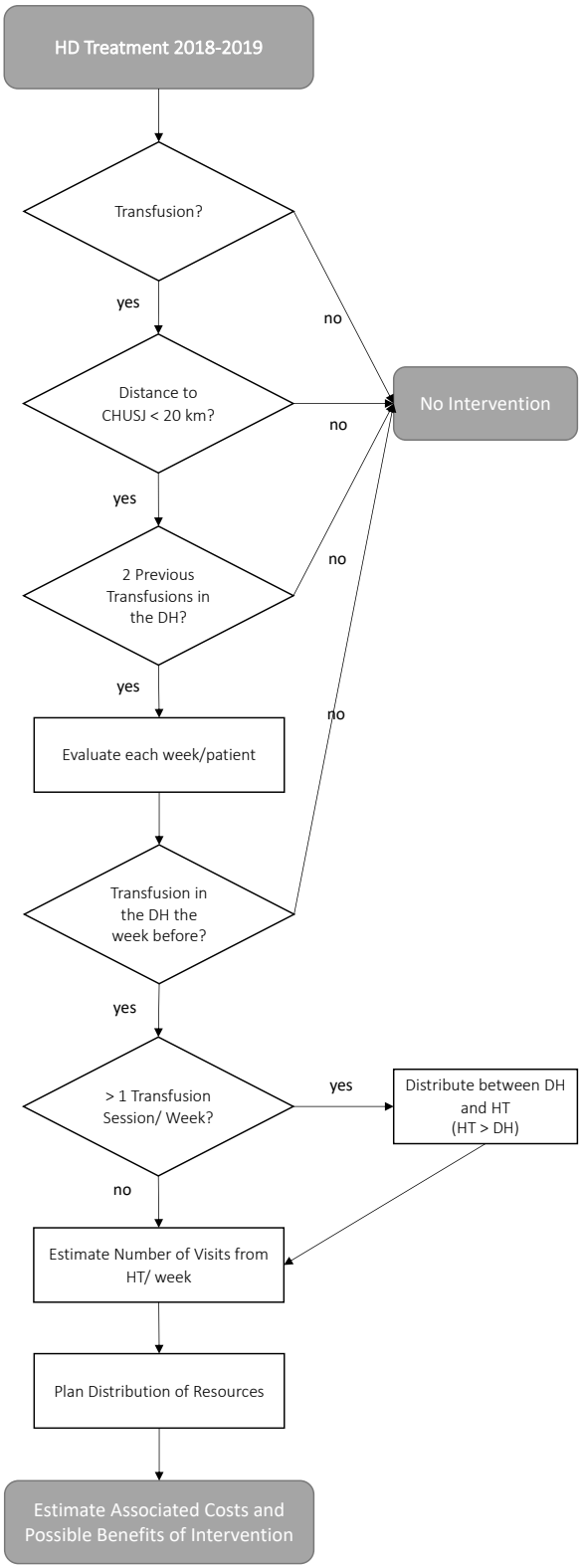

Figure 6 -Model R; Elaborated by the author

Model B

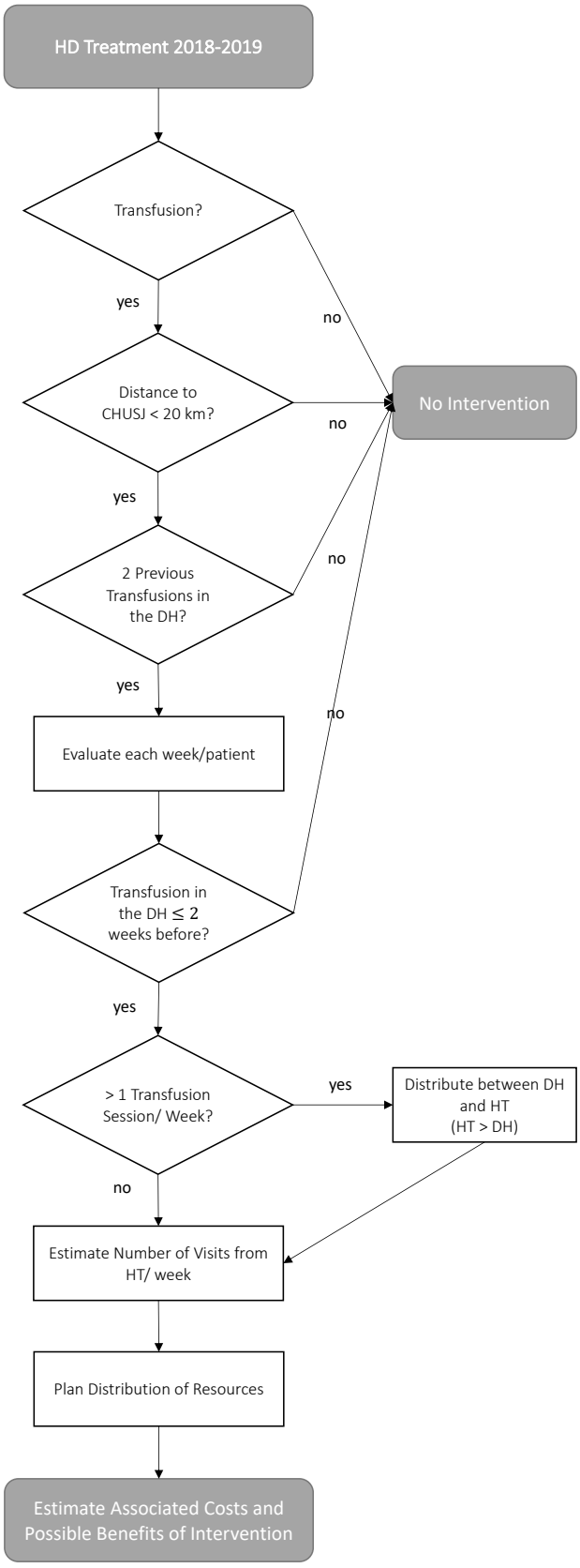

Figure 7 - Model B; Elaborated by the author

3.12. Uncertainty

This work has a few points of structural uncertainty:

- The criteria for selection of potential HT visits that may not account for important factors – it was not determined if the patient would accept to be transfused at home, if the patient would have living conditions that would allow transfusions at home, or even if the medical team would agree with it. It was assumed that this would not be a significant problem as previous works demonstrate patients' preference for this service. Also, according to the HHD, it is rare for patients to be excluded from domiciliary hospitalization for these reasons.
- Simultaneously, some patients may not fit the selected inclusion criteria but, from their doctors' point of view, still benefit greatly from HT and could be included. The selection criteria defined in this work tried to anticipate the initial caution when implementing this service.

Additionally, it is important to refer the existing uncertainties related to parameter precision:

- This study is based on a retrospective analysis over a limited period. As such, the weekly variability found is this 2-year period, may not reflect future needs. In an attempt to validate retrieved data, the year 2020 will be evaluated and the number of weeks that exceed the predicted occupancy rate of HT will be determined.
- The value established in CHUSJ's Contract-Program for each DH session may suffer variations. Also, there is not an established value for HT in this contract.
- The estimated costs for transportation or human resources may be altered in the future.

3.13. Software

Data was collected in a computer spreadsheet (Microsoft Excel.) and analyzed with statistical software (IBM SPSS v28, SPSS, Inc). A descriptive analysis of the studied variables was performed. Kolmogorov-Smirnov's Z test was used to evaluate normality of distribution.

4. Results

According to the information made available by CHUSJ, in the period between January 1st 2018 and December 31st 2019, 3121 patients were assisted in the Hematology DH of CHUSJ. Among these patients, 628 (20.1 %) were said to be transfused in this setting. After revising the given data for codification errors, it was determined that only 566 of those had been transfused (18.1 % of the total sample) – Table 6.

n		566
Age, mean (SD)		68.26 (14.919)
Male sex, n (%)		298 (52.7)
District	***Porto*, n (%)**	364 (64.3)
	***Braga*, n (%)**	115 (20.3)
	***Viana do Castelo*, n (%)**	49 (8.7)
	***Aveiro*, n (%)**	23 (4.1)
	***Viseu*, n (%)**	9 (1.6)
	***Bragança*, n (%)**	3 (0.5)
	***Vila Real*, n (%)**	2 (0.4)
	unknown, n (%)	1 (0.2)
Distance, median (IQR)		30 (43)
Distance < 20 km, n (%)		224 (39.6)

Table 6 - Population Transfused in the DH, 2018-2019

The following selection step was the distance from the patient's home to CHUSJ – eligibility criteria defined that it should be inferior to 20 km (Table 7).

Among these patients, and according to the different criteria established above for Model R and Model B, it was determined which DH visits could have been replaced by HT (Tables 8 and 10). To determine eligibility criteria in the first weeks of January 2018, TVs in December 2017 were also analyzed.

n		224
Age, mean (SD)		70.55 (14.622)
Male sex, n (%)		122 (54.5)
Municipality, n (%)	***Porto***	69 (30.8)
	Maia	48 (21.4)
	Valongo	36 (16.1)
	Gondomar	26 (11.6)
	Matosinhos	23 (10.3)
	Gaia	12 (5.4)
	Vila do Conde	4 (1.8)
	Paredes	2 (0.9)
	Trofa	2 (0.9)
	Santo Tirso	2 (0.9)
Distance to CHUSJ, mean (SD)		7.82 (4.203)
DH Visits 2018, n		544
DH Visits 2019, n		1084
DH Visits, n	**R**	833
	P	150
	2R	260
	RP	228
DH visits/ week, mean (SD)		18.51 (7.11)
Transfused RBC, n		1573
Transfused RBC/ Patient, median (IQR)		3 (7)
Transfused PD, n		396
Transfused PD/ Patient, mean		0 (1)

Table 7 - Transfused Population in the DH, 2018-2019, < 20 km to CHUSJ

4.1. HT Scope, according to Model R

n (%)		67 (29.9)
Age, median (IQR)		70 (16)
Male sex, n (%)		43 (64.2)
Municipality, n (%)	***Porto***	17 (25.4)
	Maia	12 (17.9)
	Matosinhos	12 (17.9)
	Valongo	11 (16.4)
	Gondomar	8 (11.9)
	Gaia	4 (6)
	Vila do Conde	2 (3)
	Trofa	1 (1.5)
Distance to CHUSJ, mean (SD)		8.49 (3.839)
Death < 1m after transfusion in DH, n (%)		18 (26.9)
Diagnosis, n (%)	**AMFS**	23 (34.3)
	MD	11 (16.4)
	PCD	8 (11.9)
	NHL	8 (11.9)
	MN	5 (7.5)
	ALL, LL	5 (7.5)
	CLL	4 (6)
	AUA	2 (3)
	T	1 (1.5)
HT Sessions, n (%)	**2018**	72 (13.2)
	2019	224 (20.7)
HT Sessions, n (%)	**R**	129 (15.5)
	RP	84 (36.8)
	2R	43 (16.5)
	P	36 (24)
HT Sessions/ Week, median (IQR)	**R**	1 (2)
	P	0 (0)
	2R	0 (1)

	RP	0 (1)
HT RBC, n (%)		299 (19)
HT RBC/ Week, mean (SD)		2.96 (3.97)
HT PD, n (%)		120 (30.3)
HT PD/ Week, mean (SD)		1.12 (1.17)
HT Sessions/ Week, mean (SD)		2.85 (2.08)
Nr days/week with HT, mean (SD)		2.11 (1.051)
Nr hours/week with HT, mean (SD)		10.81 (7.73)

Table 8 - Eligible Population According to Model R; AUA - Acquired Underproduction Anemias; ALL - Acute Lymphoblastic Leukemia; LL - Lymphoblastic Lymphomas; MN - Myeloproliferative Neoplasms; T – Thalassemia; CLL - Chronic Lymphocytic Leukemia; MD - Myeloid Disorder

For each week of the 104 weeks in the determined timeframe, using the eligibility criteria defined for Model R, the number of potential HT visits was determined, according to their type – R, P, 2R, RP (Annex 1). The number of HT sessions per week varied between 0 and 4 (mean of 1.33 visits; SD 1.004), in 2018, and 2 and 9 (mean 4.37; SD 1.738), in 2019.

The number of hours necessary to account for all the HT visits was also established (Annex 2) and showed that there would be no need for HT in 13 (12.5 %) of the 104 weeks. Only one of the weeks exceeded the maximum work capacity of one nurse – it required 4 R, two times 2R and 3 PR, in a total of 28 hours and 30 minutes necessary for 4 days of transfusional sessions, plus 7 hours and 15 minutes for blood collection.

Among the 104 considered weeks, 66 (66.6 %) would require 2 days of HT visits, in a total of 4 hours and 15 minutes to 14 hours and 50 minutes. During these weeks, this would imply that the HT nurse would not work full time in this program.

On other 14 weeks (13.5 %), the program would require 3 days with home visits, in a total range of 15 hours and 55 minutes to 22 hours. During this period, the nurse would also have free time to other activities.

On the remaining 10 weeks (9.6 %), HT would require 4 days of visits – from 23 hours and 20 minutes to 28 hours and 30 minutes.

According to this eligibility model, in this 2-year period, 292 DH visits could have been replaced by HT. Considering the time necessary for blood collection, the type of transfusion session (R, P, 2R and RP) and the estimated time expenditure of each one (Table 4), this would imply a total of 636.33 hours in the DH (Table 9) that could have been made available to other treatments that require in-hospital care.

Session	Time/Session (min)	N	Total
Blood collection	15	292	4 380 min = *73 hours*
R	120	129	15 480 min = *258 hours*
P	50	84	4 250 min = *70.83 hours*
2R	210	43	9 030 min = *150.5 hours*
RP	140	36	5 040 min = *84 hours*
			636.33 hours

Table 9 - Time Saved in the DH by HT, Model R

4.2. HT Scope, according to Model B

For each week of the 104 weeks in the determined timeframe, using the eligibility criteria defined for Model B, the number of potential HT visits was determined, according to their type – R, P, 2R, RP (Annex 3).

The number of HT sessions per week varied between 0 and 8 (mean of 2.96 visits; SD 1.737), in 2018 and 3 and 14 (mean 6.77; SD 2.594), in 2019.

The number of hours necessary to account for all the HT visits was also established (Annex 4) and it showed that here would be no need for HT in 4 (3.8 %) of the 104 weeks. The full schedule of a nurse would be insufficient to collect the blood samples at the patient's home and transfuse them in 12 (11.5 %) of the total weeks.

Among the 104 considered weeks, 41 (39.4 %) would require 2 days of HT visits, in a total of 4 hours and 15 minutes to 14 hours and 50 minutes total. During these weeks, this would imply that the HT nurse would not work full time in this program.

On other 34 weeks (32.7 %), the program would require 3 days with home visits, in a total range of 15 hours and 55 minutes to 23 hours and 45 minutes. During this period, the nurse would also have free time to other activities.

On the remaining 13 weeks (12.5 %), HT would require 4 days of visits – from 24 hours and 25 minutes to 33 hours and 45 minutes.

According to this eligibility model, in this 2-year period, 490 DH visits could have been replaced by HT. Considering the type of transfusion session (R, P, 2R and RP) and the estimated time expenditure of each one (Table 4), this would imply a total of 1 083 hours in the DH (Table 10) that could have been made available to other treatments that require in-hospital care.

n		86 (38.4)
Age, median (IQR)		70 (16)
Male sex, n (%)		54 (62.8)
Municipality, n (%)	***Porto***	22 (25.6)
	Maia	18 (20.9)
	Valongo	14 (16.3)
	Gondomar	12 (14)
	Matosinhos	12 (14)
	Gaia	5 (5.8)
	Vila do Conde	2 (2.3)
	Trofa	1 (1.2)
Distance to CHUSJ, mean (SD)		8.01 (3.954)
Death < 1m after transfusion in DH, n (%)		23 (26.7)
Diagnosis, n (%)	**AMFS**	29 (33.7)
	NHL	13 (15.1)
	MD	13 (15.1)
	PCD	10 (11.6)
	MN	6 (7)
	ALL, LL	4 (4.7)
	AUA	4 (4.7)
	CLL	4 (4.7)
	T	1 (1.2)
	HA	1 (1.2)
	Others	1 (1.2)
HT Sessions, n (%)	**2018**	158 (29.0)
	2019	348 (32.1)
HT Sessions, n (%)	**R**	220 (26.4)
	RP	136 (59.6)
	2R	81 (31.2)
	P	53 (35.3)
HT Sessions/ Week, median (IQR)	**R**	1 (3)
	P	0 (0)
	2R	0 (1)

	RP	0 (1)
HT RBC, n (%)		518 (32.9)
HT RBC/ Week, mean (SD)		5.22 (3.19)
HT PD, n (%)		189 (47.7)
HT PD/ Week, median (IQR)		2 (10)
HT Sessions/ Week, mean (SD)		4.87 (2.913)
Nr days/week with HT, mean (SD)		2.88 (1.290)
Nr hours/week with HT, mean (SD)		18.19 (10.66)

Table 10 - Eligible Population According to Model B; HA – Hemolytic Anemia

Session	Time/Session (min)	N	Total
Blood Collection	15	490	7 350 min = *122.5 hours*
R	120	220	26 400 min = *440 hours*
P	50	136	6 800 min = *113.33 hours*
2R	210	81	17 010 min = *283.5 hours*
RP	140	53	7 420 min = *123.67 hours*
			1 083 hours

Table 11 - Time Saved in the DH by HT, Model B

For each one of the 104 weeks in the determined timeframe, it was determined how many RBCs and PD would have been transfused in a HT setting, according to the Model R and Model B eligibility criteria, in comparison to the total numbers observed in the DH (Tables 8 and 10 and Annex 5).

4.3. Costs

4.3.1. Costs associated with No Intervention

The costs associated with the patient transportation to and from CHUSJ, from the NHS point of view, depend on his financial status – non urgent transportation is supported by the NHS for the patients who prove to have economical insufficiency. For patients who live at a distance inferior to 20 km, the law establishes that the NHS must not pay more than 10 € per patient, per visit to the hospital (Gabinete do Secretário de Estado da Saúde, 2012). According to the 2020 Annual Report concerning Access to Health Care Services in the NHS, 23 968 patients from ARS-North benefited from free non-urgent transportation to health care services (Ministério da Saúde, 2021). Given the total population of the Portuguese

northern region (3 688 037 individuals), this represents about 0,6 % of patients. Also, according to the same source, 2 393 152 Portuguese individuals (24.3 % of the total population) are exempt from the payment of fees due to economical insufficiency. It was established, for estimation purposes, that 25 % of the patients in the sample would benefit from this exemption (INE, 2021; Ministério da Saúde, 2021).

The HD has available monitoring equipment, shared among many patients.

In 2021, a DH session entitled CHUSJ to receive 324 €, in case of transfusion (ACSS et al., 2021). This payment is meant to include the transfused blood components, human resources, associated clinical care and hotel operations - laundry, cleaning, food –, electric power and beds or sofas (Table 12).

	Price/Unit	**N**	**Estimated Total Cost**
Patient Transportation	2.50 €/ patient	1 patient	2.50 €
Monitoring Equipment	324 €/ session	1 session	324 €
Hotel Operations			
Transfusion			
Nurse's Work			

Table 12 - Costs of DH session with transfusion

4.3.2. Costs associated with Intervention

The first step of the intervention is related with the transfusional decision (Table 12):

- The intervention model admits that each HT session would imply a previous home visit for blood collection.
- It was assumed that transportation costs for nurses, equipment and consumable materials are shared. According to the defined criteria for HHD, each kilometer costs 1.20 €. Transportation distance was determined according to the mean distance from the patient's home to CHUSJ, as determined by model R (8.49 km each way) and model B (8.01 km each way).
- A home visit implies an evaluation of the patient's vital signs. For a HT program to be put in place, it would be necessary to buy a thermometer, a blood pressure portable monitor and a portable oximeter. After the initial investment, the marginal cost of this equipment would be residual – 0.06 € per ear protector.
- Per year, a nurse costs 21 969.98 € to CHUSJ. A nurse works 35 hours per week and has the right to 22 working days, per year, of paid vacations. So, given that a

nurse works 47 weeks per year, his work costs 21 969.98 €/ 47 weeks/ 35 hours / 60 minutes = 0.22 €/min. It was determined that a nurse would have to be present for blood collection at the patients' home (15 minutes), plus 30 minutes to and from CHUSJ (in a total of 75 minutes).

- Before deciding to transfuse a patient, a hemogram (4.70 €) is mandatory.

Considering the eligibly criteria defined by Model R and B, a home visit for blood collection would have similar prices for both – the only difference is associated with the distance to the patients' homes (Table 13).

		Price/ Unit	N	Estimated Total Cost
Transportation	**Nurse** **Equipment** **Consumable Materials** **Waste**	1.20 €/km	R: 8.49 km x 2 B: 8.01 km x 2	R: 20.38 € B: 19.22 €
Monitoring Equipment		0.06 €/ unit	1 unit	0.06 €
Nurse's Work		0.22 €/min	75 min	16.5 €
Blood Analysis		4.7 €/ unit	1 unit	4.7 €

Table 13 - Blood Collection Session, Model R and Model B

After the decision to transfuse the patient at his home is made, there are other costs directly associated with the transfusion (Table 13):

- The same assumptions were made concerning the transportation of equipment, consumable materials, medication and the dedicated nurse to the patients' homes: they would be shared.
- In a home setting, for a single transfusion session, the costs associated with the nurse must account for the time necessary for transportation and transfusion.
- An intervention model equivalent to this is not foreseen in CHUSJ's Contract-Program; as such, the several costs associated with transfusion were considered (BC, BC infusion and blood analysis). As published in the Portuguese Official Gazette, the price of a RBC package is 104.20 €, while the price of a PD varies from 193.70 € (pooled platelets from 4 to 6 whole blood donors) to 374.20 € (platelets from a single donor, obtained by apheresis); for simplification purposes, the mean

price of a PD – 283.95 € - was used. The infusion of a blood component (BC) has a cost of 20.90 €. Before transfusion, ABO/Rh Testing (8.52 €) and, for RBCs, a compatibility cross-match (5.50 €) are mandatory (ARP, 2018).

- The minimum number of times temperature is measured during a HT session (Figure 2) depends on the transfused products: R – 7 times, P – 4 times, 2R – 12 times, RP – 9 times. The mean number of times temperature is measured during a HT session is 8.
- Blood components have special transportation necessities (RBCs must be kept at a temperature between 1 and 10 ºC; PD must be kept at a temperature between 20 and 24 ºC, in constant agitation), as does medication. Nonetheless, after the initial investment, the marginal cost of this equipment would be residual.

As for a blood collection visit, the difference in costs associated with a single HT session, considering the criteria defined for Model R and Model B, would be linked to transportation costs (Table 14).

		Price/ Unit	N	Estimated Total Cost
Transportation	**Nurse** **Equipment** **Consumable Materials** **BC** **Medication** **Waste**	1.20 €/km	R: 8.49 km x 2 B: 8.01 km x 2	R: 20.38 € B: 19.22 €
Monitoring Equipment		0.06 €/Unit	8 Units	0.48 €
Nurse's Work	**R**	0.22 € /min	180 min	39.6 €
	P		110 min	24.2 €
	2R		270 min	59.4 €
	RP		200 min	44 €
Blood Analysis		14.02 €/RBC	1 RBC	14.02 €
		8.52 € /PD	1 PD	8.52 €
BC		104.2 €/RBC	1 RBC	104.2 €
		283.95 €/PD	1 PD	283.95 €
BC Infusion		20.90 €/BC	1 BC	20.90 €

Table 14 - Blood Transfusion Session, Model R and Model B

It was not possible to determine the cost associated with the acquisition of a vehicle, or even if it would be necessary. Per session, maintenance costs associated with the automobile are accounted for in the 1.20 €/km.

4.3.3. Estimated costs per week

Per session, considering costs with transportation (2.50 €) and the DH session (324 €), the estimated total cost for a DH session is 326.50 € (Table 15).

According to the retrieved data (Table 8 and 10), model R would imply a mean of 2.85 transfusion sessions per week, while in model B this number rises to 4.98. This means that the total number of home visits, per week, would be twice as big (blood collection visit, plus transfusional session).

Weekly, a mean of 2.96 RBCs and 1.21 PD would be transfused in model R (4.17 BC), while 5.22 RBCs and 1.86 PD would be transfused in model B (7.08 BC).

For the purpose of estimating the total kilometers travelled per week, it was assumed that, for each day spent working in the HT program, transport would be from CHUSJ to the first patient's home and then to the following, before returning to the hospital (Figure 5 and Equation 3.2).

Differential costs were calculated based on the assumption that this intervention would have a different cost than the existing solution but wouldn't result in a change of health outcomes. For example, the possible impact of a reduction of nosocomial infections over patients' health was not possible to quantify. These costs were calculated according to Model R and Model B, each in comparison with no intervention, per mean week (Equation 4.1 and 4.2) and per TV (Equation 4.3 and 4.4).

	HT Session	**Sessions/Week**	**Estimated Total Cost**
Model R	326.50 €	2.85 Sessions	930.53 €
Model B		4.98 Sessions	1 625.97 €

Table 15 - No intervention, Weekly Cost

	Price/Unit	N	Estimated Total Cost
Transfusion Decision			
Transportation	1.20 € /km	(2.85 + 1) Sessions x 8.49 km	39.22 €
Monitoring Equipment	0.06 €/ Session	2.85 Sessions	0.18 €
Blood Analysis	4.70 €/ Session	2.85 Sessions	13.40 €
Transfusion Session			
Transportation	1.20 € /km	(2.85 + 1) Sessions x 8.49 km	39.22 €
Monitoring Equipment	0.48 € / Session	2.85 Sessions	1.37 €
Blood Analysis	14.02 € / RBC	2.96 RBC	41.50 €
	8.52 € / PD	1.21 PD	10.31 €
BC	104.2 € / RBC	2.96 RBC	308.43 €
	283.95 € / PD	1.21 PD	343.58 €
BC Infusion	20.90 € / BC	4.17 BC	87.15 €
Transfusion Decision and Session			
Nurse's Work	0.22 € /min	10.81 h = 648.6 min	142.69 €
			1027.04€

Table 16 - Model R *Intervention, week*

$$weekly\ Differential\ Cost_{R-0} = C_R - C_0 = 1\,027.04\,€ - 930.53\,€ = 96.51\,€$$

Equation 4.1 – Weekly Differential Cost for Model R

	Price/Unit	N	Estimated Total Cost
		Transfusion Decision	
Transportation	1.20 € /km	(4.98 + 1) Sessions x 8.01 km	57.48 €
Monitoring Equipment	0.06 €/ Session	4.98 Sessions	0.30 €
Blood Analysis	4.70 €/ Session	4.98 Sessions	23.41 €
		Transfusion Session	
Transportation	1.20 € /km	(4.98 + 1) Sessions x 8.01 km	57.48 €
Monitoring Equipment	0.48 €/ Session	4.98 Sessions	2.39 €
Blood Analysis	14.02 €/RBC	5.22 RBC	73.18 €
	8.52 €/PD	1.86 PD	15.85 €
BC	104.2 €/RBC	5.22 RBC	543.92 €
	283.95 €/PD	1.86 PD	528.15 €
BC Infusion	20.90 €/BC	7.08 BC	147.97 €
		Transfusion Decision and Session	
Nurse's Work	0.22 €/ min	18.19 h = 1091.4 min	240.11 €
			1690.24 €

Table 17 - Model B Intervention, Week

$$weekly\ Differential\ Cost_{B-0} = C_B - C_0 = 1\,690.24\,€ - 1625.97\,€ = 64.27\,€$$

Equation 4.2 – Weekly Differential Cost for Model B

	Model R	Model B
HT Sessions 2018-2019, n	296 HT Sessions	506 HT Sessions
Total Estimated Cost 2018-2019 (€)	*1 027.04 €/week x 104 weeks* = 106 812.16 €	*1 690.24 €/week x 104 weeks* = 175 784.96 €
Total Estimated Cost / HT Session (€)	360.85 €	347.40 €

Table 18 - Total Estimated Cost per Session, Model R and B

$$TV: Differential\ Cost_{R-0} = C_R - C_0 = 360.85\ € - 326.50\ € = 34.35\ €$$

Equation 4.3 – Differential Cost per TV, Model R

$$TV: Differential\ Cost_{B-0} = C_B - C_0 = 347.40\ € - 326.50\ € = 20.90\ €$$

Equation 4.4 – Differencial Cost per TV, Model B

In table 19, the impact of HT over the total budget, in the two considered years, is calculated.

	Model R	Model B
HT Sessions 2018, n	72 HT Sessions	158 HT Sessions
HT Sessions 2019, n	224 HT Sessions	348 HT Sessions
Differencial Cost/ TV	*34.35 €*	*20.90 €*
Budget Impact 2018	2 473.2 €	3 302.20 €
Budget Impact 2019	7 694.40 €	7 273.20 €

Table 19 - Budget Impact, Model R and Model B

For Model B and R, the influence of each cost-driver of the intervention (transportation, transfusion, nurse's work and monitorization and analysis) over total cost was also determined (Figure 8).

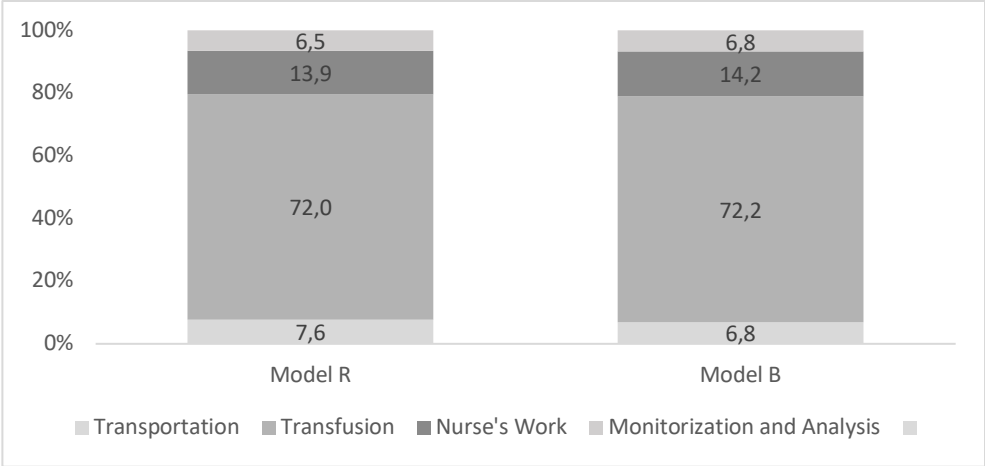

Figure 8 - Cost Drivers for Model R and B

4.3.4. Year 2020

Given the wide variability in the number of DH sessions (and hypothetical HT sessions) between 2018 and 2019, an analysis of the reproducibility of these findings was performed for the year 2020 (Annex 6) – this analysis is merely indicative and not to be interpreted without noticing the possible existing bias produced by the COVID pandemic (which goes beyond the scope of this work). If the same eligibility criteria for Model B were used for the patients that were transfused in the DH during 2020 and that lived at less than 20 km from CHUSJ, 63 patients would benefit from this service. The mean number of HT visits would per week would vary between 0 and 12 visits – mean of 6.80 visits (SD 2.298).

In comparison to the obtained data from Model R and Model B in 2018 and 2019, 20 weeks (38.5 %) in 2020 would have the exact same need for transfusional visits (Annex 7). According to the total necessary time for BC visits and transfusion in HT, 14 weeks in 2020 would require more than 30 weekly hours (versus 13 for Model B in 2018-2019). In 2020, 363 RBCs (mean 7.04/ week; SD 2.94) and 166 PD (mean 3.01 /week; SD 1.36) might had been transfused through the proposed HT program.

Considering the existing unpredictability of the total number of patients with TD, and their acute needs, it is plausible to admit that the transfusional activity in the DH wasn't as negatively affected by the COVID pandemic as other health care services. In fact, for many of these patients, DH was their main point of access to health care providers. As previously stated, the year 2020 was left out of the evaluated period given the impact of this pandemic over health care providers – in fact, had a HT program been in place at that time, its epidemiological safety to patients and nurses would be highly debatable.

5. Discussion

5.1. Impact of HT over patients' QoL

Patients with hematological malignancies are known to have high transfusional needs, with an important associated burden to their quality of life (QoL). These patients often require regular and predictable transfusional sessions, that are typically restrained to an outpatient setting. Patients and caregivers must travel frequently to the hospital and spend numerous hours waiting before starting transfusion, with a negative impact over their QoL. This burden has proven to be particularly heavy for older patients and for those who have more severe illness (Ademokum et al., 2005; Benson, 2006).

HT has been recognized as a more comfortable alternative for the typical transfusion in a hospital setting, as it allows the patient to be with friends or family during the procedure, in its own home and without a significative impact in his daily life (Benson, 2016). HT also has clinical advantages as the nurse is fully dedicated to only one patient during the procedure – identification errors are less probable and, in the event of an acute NIATR, the nurse will have complete availability to address it – and the risk for nosocomial infections also significantly diminishes, as the patients spends less time in the hospital (Charron et al., 2019). Previous studies clearly state that, besides initial fears, once a patient has the possibility to be transfused at home, his preference for this service is conquered (Havet et al., 2011b). The model of intervention proposed in this work implies that an eligible patient to HT would still go to the DH at least once every two weeks. This model hopes to anticipate the anxiety that patients, caregivers and doctors might experience in face of diminishing contacts between each other (Barki-Harrington et al., 2021).

TD is common among frail patients. In this study, about 27 % of the eligible patients to HT (26.9 % in Model R and 26.7 % in Model B) would have benefited from this service at least once on the month before their death. In the end-stage of disease progression, this treatment has an important palliative intent and, as such, the benefit of HT for this patient would be clear, as demonstrated in previous studies (Charron et al., 2019; Barki-Harrington et al., 2021).

5.2. Impact of HT on DH Activity

Outpatient services have managed to avoid hospitalization rates by providing the necessary resources to accommodate treatments that must be done in a hospital setting but that don't take longer than 12 hours per session. CHUSJ's DH accommodates 26 different

medical specialties and, as such, any measure to reduce DH's occupancy rate by a single procedure would have a systemic impact over hospital's global activity.

Considering the period between 2018-2019 and the 224 patients transfused in the DH that lived at less than 20 km from the hospital, their DH sessions with transfusion represented 20.4 % of all Hematology DH sessions in those years Contract-Programs for CHUSJ.

An intervention like the one designed, in Model R would represent 19.9 % of this sample's transfusional sessions, while in Model B would have an impact of 33.3 %. Considering all contractualized DH Hematology sessions, Model R and Model B would reach 4 % and 6.8 % of them, respectively. Because transfusion is a highly time-demanding procedure, this intervention would have an important impact over DH's availability for other treatments. Considering that the Hematology DH has scheduled activity every working day of the year (504 days in the chosen time frame), 12 hours per day, 636.33 hours (Model R) represent that a treatment chair would be made available for other treatments on 53.03 working days (10.6 % of activity time of the DH), whereas 1083 hours (Model B) would represent a free chair during 90.25 working days (17.9 % of the working time during the considered timeframe). The reduction in nurse's workload in the DH, generated by HT, would be absorbed by the treatments that would substitute transfusion.

5.3. How to maximize HT capacity?

Considering both eligibility criteria designed for this intervention, HT would not always require a nurse to work full time. HT would require more than 30 hours (out of the 35 weekly working hours) in only 1 of the weeks as defined by Model R and 13 weeks for Model B. On the remaining weeks, HT capacity – mainly, human resources – would have to be allocated elsewhere. One of the possible options, and probably the most well accepted and easily manageable, would be to integrate the HT nurse in the DH activity and help expedite their services. Patients at more than 20 km from CHUSJ still should not benefit from this program, as it is important to assure that patients are near an emergency room, in case of need.

On the other hand, to accommodate more patients per week, a hybrid intervention model could be used – the patient would collect the pre-transfusion blood samples at the DH and, if indicated, the transfusion would take place at his home. In Model B, if the hybrid intervention was put in place, then only 4 weeks would need an additional solution.

The Karnovsky performance status score is a standard assessment tool used to evaluate functional impairment in cancer patients (O'Toole et al., 1991). This score ranges from 0 (death) to 100 (no signs or symptoms of disease). If there was a need to select patients that would benefit more from HT, patients with a lower score could be preferred.

Retrieved data showed that a HT program like the one designed would have a highly variable activity – both models show that the number of HT sessions would raise considerably from 2018 to 2019 (Table 19). This does not have an obvious explanation, as the total number of Hematology DH sessions decreased 15 % from 2018 to 2019, but it is an important clue to one of the issues that may arise in the management of this service – it would have to be flexible and account for this variability. Even if TD in patients with hematological diseases is fairly predictable, the number of patients with TD may vary indiscriminately – as seen through the years 2018 to 2020.

The management of a HT program would benefit if it was to be part of an existing service (for example, the DH).

5.4. Cost and cost-effectiveness

As previously stated, HT does not intend to change the course of the disease for the eligible patients (despite possible advantages for transfusional safety and the reduction of hospital infections), but to bring them, and their caregivers, comfort, and reduce the time burden of their visits to the hospital. From the NHS point of view, this intervention would then have to be weighted with the existing option (transfusion in the DH) based on a differential costs analysis.

Considering the estimated cost of a transfusion session in the DH (from the NHS point of view, 324 €), in comparison with the predicted costs of a HT session (364.16 € for Model R and 350.58 € for Model B), the incremental cost of this intervention is not as high as one could suppose. In fact, the impact of HT over the total budget, in the two considered years, would be overcome if this service would manage to avoid at least 4 hospitalizations (the cost of a medical inpatient treatment is defined by the ACSS as 2 759 €) (ACSS, 2021b). If there was an increased availability in the DH, the number of patients treated there would raise and impact global hospital's activity. It is safe to say that a raise in the DH availability might prevent patients from being hospitalized to receive treatments that, despite being urgent, could be done in an outpatient facility. Also, as their accessibility to medical care and treatment would be guaranteed by the DH, patients could be discharged sooner from hospitalization.

Nonetheless, initial costs related to a transport vehicle and to monitor equipment have not been accounted for.

If an intervention like this was to be included in the activity of CHUSJ, its value would have to be negotiated with ACSS and ARS-North. Given the interest that ACSS has demonstrated in the development of home care services, CHUSJ might have a good possibility to establish a fair value for HT.

6. Conclusions

Other works have proven HT to be a safer and more comfortable alternative to outpatient transfusion. In fact, this service also presents clinical benefits, as it is prone to reduce nosocomial infections and clerical errors related with transfusion. Overcome the initial doubts and fears, patients demonstrate great interest in this service.

Given the results obtained with this work, a primary model for a HT program in CHUSJ may be proposed. If HT was available to patients with TD that predictably would have to be transfused within the one to two weeks following their previous DH transfusional session (Model R and B), an initial investment would have to account for a transportation service, monitorization equipment (portable blood pressure monitor and oximeter, and a thermometer) and for transportation equipment (bags for adequate transport of blood components and medication). CHUSJ would also have to allocate a nurse to HT, preferably with a driver's license and, optimally, with experience in home care. This nurse would be a part of the DH team – primarily, he would secure HT activity, but he would participate in the DH activity whenever possible. In exchange, during this nurse's vacation periods and on the weeks that HT would require more than one nurse, a nurse from the DH would secure HT tasks. As determined in Table 21, the expenditure of this program, per session, would be of about 360.85 € for Model R (differential cost of 34.35 € in comparison with no intervention) to 347 € for Model B (differential cost of 20.90 € versus a DH session).

If, over time, HT proved to be well accepted by patients and medical staff, eligibility Model R might definitely be substituted by Model B and, eventually, by even a broader one. Also, the range of offered services might increase and this home service might be developed to reach other necessities. If proven to be successful, HT hopefully could have even broader eligibility criteria, reach more patients and develop into a more complex service. To guarantee a feeling of safety both to patients and doctors, his service would benefit from a gradual development strategy.

The costs calculated in this work rely on the values determined by ACSS as appropriate to each service or product. The real cost of each one of these services or products for CHUSJ was not evaluated and, going forward, future steps would have to be taken in that direction.

This work could be further developed by evaluating the impact this increased availability in the DH would have over the number of hospitalizations in CHUSJ. A real quantification of the impact of a HT program over global NHS budget would be an important step to its implementation.

Appendix 1

District	Municipality	*ACES*	Hospitals	*ULS*
Aveiro	*Arouca**	*Feira/ Arouca*	-	-
	*Santa Maria da Feira**		*CHEDV*	
	Castelo de Paiva	*Vale do Sousa Sul***	-	
	*Espinho**	*Gaia e Espinho/ Gaia*	*CHVNG/E*	
	*Oliveira de Azeméis**	*Aveiro Norte*	*CHEDV*	
	*São João da Madeira**		-	
	*Vale de Cambra**			
Braga	*Amares*	*Gerês/ Cabreira*	-	
	Póvoa de Lanhoso			
	Terras de Bouro			
	Vieira do Minho			
	Vila Verde			
	Barcelos	*Barcelos/ Esposende***	*HSMM*	
	Esposende		-	
	Braga	*Braga*	*HB*	
	Cabeceiras de Basto	*Alto Ave***	-	
	Fafe			
	Guimarães		*HSOG*	
	Vizela		-	
	Celorico de Basto	*Baixo Tâmega***	-	
	Famalicão	*Ave***	*CHMA*	
Bragança				ULS Nordeste
Porto	*Amarante*	*Baixo Tâmega***	*CHTS*	
	Baião		-	

	Marco de Canaveses			
	*Gondomar**	*Gondomar*	-	
	*Maia**	*Maia/Valongo*	**-**	
	*Valongo**		*CHUSJ*	
	*Matosinhos**		-	ULS Matosinhos**
	Paços de Ferreira	*Vale do Sousa Norte*	-	
	Lousada			
	Felgueiras			
	*Paredes**	*Vale do Sousa Sul***	-	
	Penafiel		*CHTS*	
	*Porto**	*Porto Ocidental e Porto Oriental***	***CHUSJ,*** *CHUP, IPO-Porto, HML*	
	*Póvoa de Varzim**	*Póvoa de Varzim/ Vila do Conde***	*CHPVVC*	
	*Vila do Conde**			
	*Santo Tirso**	*Santo Tirso/ Trofa***	*CHMA*	
	*Trofa**		-	
	*Vila Nova de Gaia**	*Gaia e Espinho/ Gaia*	*CHVNG/E*	
Viana do Castelo	-			ULS Alto Minho**
Vila Real	*Alijó*	*Marão e Douro Norte*	-	
	Mesão Frio			
	Murça			
	Peso da Régua		*CHTMAD*	
	Sabrosa		-	
	Santa Marta de Penaguião			
	Vila Real		*CHTMAD*	
	Boticas		-	

	Chaves	*Alto Tâmega e Barroso*	*CHTMAD*	
	Montalegre		-	
	Ribeira de Pena			
	Valpaços			
	Vila Pouca de Aguiar			
	Mondim de Basto	*Alto Ave***	-	
Viseu	*Armamar*	*Douro Sul*	-	
	Lamego		*CHTMAD*	
	Moimenta da Beira		-	
	Penedono		-	
	São João da Pesqueira		-	
	Sernancelhe		-	
	Tabuaço		-	
	Tarouca		-	
	Cifães	*Baixo Tâmega***	-	
	Resende			

ARS-North municipalities and public health providers organization (Neto et al., 2017)*; *Porto Metropolitan Area; **May be referred to CHUSJ for treatment of malignant hematological diseases, according to RNEHR for Clinical Hematology (Miranda et al., 2016);* CHEDV – Centro Hospitalar Entre Douro e Vouga, EPE; CHVNG/E – Centro Hospitalar de Vila Nova de Gaia/ Espinho, EPE; HSMM – Hospital de Santa Maria Maior, EPE; HB – Hospital de Braga, EPE; HSOG – Hospital Senhora da Oliveira Guimarães, EPE; CHMA – Centro Hospitalar do Médio Ave, EPE; CHTS – Centro Hospitalar Tâmega e Sousa, EPE; CHUP – Centro Hospitalar Universitário do Porto; IPO – Instituto Português de Oncologia; HML – Hospital Magalhães Lemos, EPE; CHPVVC - Centro Hospitalar Póvoa de Varzim/ Vila do Conde, EPE; CHTMAD - Centro Hospitalar de Trás-os-Montes e Alto Douro, EPE.

Appendix 2

ACES	Parish	Population
Porto Ocidental e Porto Oriental	*Aldoar, Foz do Douro, Nevogilde**	*29 156*
	*Bonfim**	*22 989*
	*Campanhã**	*29 684*
	Cedofeita, Ildefonso, Sé, Miragaia, Nicolau, Vitória	*37 436*
	Lordelo do Douro, Massarelos	*27 968*
	*Paranhos**	*45 871*
	Ramalde	*38 860*

Porto Municipality Population (Instituto Nacional de Estatística, 2021)

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Annex 1

	2018				2019			
	R	**P**	**2R**	**RP**	**R**	**P**	**2R**	**RP**
1	-				1	-		1
2	2	-			3	1	1	2
3	1	-			4	-	1	1
4	-				2	-	1	3
5	-		1	-	-		1	1
6	1	-			3	-	1	-
7	-		1	-	1	-		2
8	1	-	2	-	-		1	1
9	-					-		3
10	1	-			2	1	-	
11	-				-	1	-	1
12	3	-			1	1	-	1
13	-				3	-		2
14	-				1	1	-	2
15	-		1	-	1	2	-	1
16	-		2	-	2	1	1	2
17	-				2	-	1	3
18	-		1	-	4	-	2	3
19	-				2	3	1	2
20	-					-		2
21	2	-			2	1	-	3
22	2	-				-		4
23	2	-			3	1	1	2
24	-			1	-		1	2
25	1	-			2	-	1	2
26	-				7	-		1
27	-				-	1	-	1
28	2	-			1	-	2	2
29	1	2	-		3	1	-	2

30	1		-		1		-	2		2		-
31	-		2		-				-			2
32	2			-				2		-	2	2
33	1			-				-		4	-	1
34	2		-			1		1		-	1	-
35		-			1		1	2		-		3
36	1		-		2		-	1		-	2	1
37				-					-		1	1
38	1		1		-		1	2		1	-	1
39		-			1		1			-		
40	3		-		2		1	-		1	-	1
41	1			-				3		-		1
42	1			-				-		2	-	
43	1		-		3		-	2		-		1
44	2		-		3		1		-			1
45	1			-				3		1	-	1
46	1		-		1		-	1		-		1
47	2			-				2		2	-	
48		-			1		-	3		2	-	
49	3			-				2		-		2
50	2		-			1		1		2	1	1
51	1		-			1		1		1	-	
52	3		-			1		2		-		2

Weekly HT visits according to Model R

Annex 2

R	P	2R	RP	HT Sessions, n	BC (h)	Transfusion (h)	Weekly Schedule (h)	Hybrid Model (h)	N Weeks
-				**0**	0	0	-	-	*13*
-			1	**1**	1.25	3.5	D1: 1.25 D2: 3.5	-	*2*
-			2	**2**	2	6.2	D1: 2 D2: 6.2	-	*2*
-			3	**3**	2.75	9	D1: 2.75 D2: 9	-	*1*
-			4	**4**	3.5	~~11.8~~ 6.2 + 6.2	D1: 3.5 D2: 6.2 D3: 6.2	-	*1*
-		1	-	**1**	1.25	4.5	D1: 1.25 D2: 4.5	-	*5*
-		1	1	**2**	2	7.3	D1: 2 D2: 7.3	-	*5*
-		1	2	**3**	2.75	10.2	D1: 2.75 D2: 10.2	-	*1*
-		2	-	**2**	2	8.5	D1: 2 D2: 8.5	-	*1*
-	1	-	1	**2**	2	4.7	D1: 2 D2: 4.7	-	*3*
-	2	-	-	**2**	2	3.2	D1: 2 D2: 3.2	-	*2*
1		-		**1**	1.25	3	D1: 1.25 D2: 3	-	*8*
1		-	1	**2**	2	5.8	D1: 2 D2: 5.8	-	*3*
1		-	2	**3**	2.7	8.7	D1: 2.7 D2: 8.7	-	*1*
1	-	1	-	**2**	2	7	D1: 2	-	*3*

							D2: 7		
1	-	2	-	**3**	2.75	11	D1: 2.75 D2: 11	-	*2*
1	-	2	1	**4**	3.5	~~13.8~~ 7 + 7.3	D1: 3.5 D2: 7 D3: 7.3	-	*1*
1	-	2	2	**5**	4.25	~~16.7~~ 11 + 6.2	D1: 4.25 D2: 11 D3: 6.2	-	*1*
1	-	3	-	**4**	3.5	~~15~~ 11 + 4.5	D1: 3.5 D2: 11 D3: 4.5	-	*1*
1	1	-		**2**	2	4.3	D1: 2 D2: 4.3	-	*1*
1	1	-	1	**3**	2.75	7.2	D1: 2.75 D2: 7.2	-	*2*
1	1	-	2	**4**	3.5	10	D1: 3.5 D2: 10	-	*1*
1	2	-	-	**3**	2.75	5.7	D1: 2.75 D2: 5.7	-	*1*
1	2	-	1	**4**	3.5	8.5	D1: 3.5 D2: 8.5	-	*1*
1	2	1	1	**5**	4.25	~~12.5~~ 7.2 + 5.8	D1: 4.25 D2: 7.2 D3: 5.8	-	*1*
2	-			**2**	2	5.5	D1: 2 D2: 5.5	-	*7*
2	-		1	**3**	2.75	8.3	D1: 2.75 D2: 8.3	-	*3*
2	-		2	**4**	3.5	9.5	D1: 3.5 D2: 9.5	-	*2*
2	-		3	**5**	4.25	~~14~~ 9 + 5.5	D1: 4.25 D2: 9 D3: 5.5	-	*1*

2	-	1	2	**5**	4.25	~~15.2~~ 9.5 + 6.2	D1: 4.25 D2: 9.5 D3: 6.2	-	*1*
2	-	1	3	**6**	5	~~18~~ 7 + 6.2 + 5.8	D1: 5 D2: 7 D3: 6.2 D4: 5.8	-	*2*
2	-	2	2	**6**	5	~~19.2~~ 7 +7 + 6.2	D1: 5 D2: 7 D3: 7 D4: 6.2	-	*1*
2	-	3	1	**6**	5	~~20.3~~ 7 + 7 + 7.3	D1: 5 D2: 7 D3: 7 D4: 7.3	-	*1*
2	1	-	-	**3**	2.75	6.8	D1: 2.75 D2: 6.8	-	*1*
2	1	-	1	**4**	3.5	9.7	D1: 3.5 D2: 9.7	-	*1*
2	1	-	3	**6**	5	~~15.3~~ 9 + 6.8	D1: 5 D2: 9 D3: 6.8	-	*1*
2	1	1	2	**6**	5	~~16.5~~ 10.2 + 6.8	D1: 5 D2: 10.2 D3: 6.8	-	*1*
2	2	-		**4**	3.5	8.2	D1: 3.5 D2: 8.2	-	*2*
2	3	1	2	**8**	6.5	~~19.2~~ 5.8 + 7.2 + 7.2	D1: 6.5 D2: 5.8 D3: 7.2 D4: 7.2	-	*1*
3	-			**3**	2.75	8	D1: 2.75 D2: 8	-	*2*
3	-		1	**4**	3.5	10.8	D1: 3.5	-	*2*

							D2: 10.8		
3	-		2	**5**	4.25	~~13.7~~ 8 + 6.2	D1: 4.25 D2: 8 D3: 6.2	-	*1*
3	-	1	-	**4**	3.5	~~12~~ 5.5 + 7	D1: 3.5 D2: 5.5 D3: 7	-	*1*
3	-	2	1	**6**	5	~~18.9~~ 7 + 7 + 5.8	D1: 5 D2: 7 D3: 7 D4: 5.8	-	*1*
3	1	-	1	**5**	4.25	~~12.2~~ 6.9 + 5.8	D1: 4.25 D2: 6.9 D3: 5.8	-	*1*
3	1	-	2	**6**	5	~~15~~ 8 + 7.5	D1: 5 D2: 8 D3: 7.5	-	*1*
3	1	2	1	**7**	5.75	~~20.2~~ 7.2 + 7 + 7	D1: 5.75 D2: 7.2 D3: 7 D4: 7	-	*2*
3	2	-		**5**	4.25	10.6	D1: 4.25 D2: 10.6	-	*1*
4	-		1	**5**	4.25	~~13.3~~ 8 + 5.8	D1: 4.25 D2: 8 D3: 5.8	-	*1*
4	-	1	1	**6**	5	~~17.3~~ 7 + 5.8 + 5.5	D1: 5 D2: 7 D3: 5.8 D4: 5.5	-	*1*
4	-	2	3	**9**	7.25	~~27~~ 11 + 5.8 + 5.8 + 5.8	D1: 7.25 D2: 11 D3: 5.8 D4: 5.8	D1: 11 D2: 5.8 D3: 5.8 D4: 5.8	*1*

							D5: 5.8		
7	-	-	1	8	6.5	~~20.9~~ 10.5 + 10.8	D1: 6.5 D2: 8 D3: 8 D4: 5.8		*1*

Hours dedicated to a HT program, per week (Model R); BC – Blood Collectio; Lines in grey – HT would exceed the capacity of one nurse

Annex 3

	2018				2019			
	R	**P**	**2R**	**PR**	**R**	**P**	**2R**	**PR**
1	-				3	-		1
2	2	-		1	4	1	1	4
3	2	-			3	-	1	3
4	2	-			6	-		4
5	-		1	-	-			1
6	2	-			4	-	1	3
7	-				5	-		2
8	3	-	2	-	2	-		2
9	3	-			2	-		3
10	1	-	1	-	3	1	-	4
11	3	-	2	-	3	-		2
12	2	-			2	-		2
13	1	-			2	1	-	1
14	2	1	5	-	2	1	-	3
15	1	1	1	-	2	2	-	3
16	5	-	2		5	2	1	3
17	1	-	1	-	4	-	2	3
18	1	-	1	-	4	1	2	2
19	-				3	5	2	5
20	1	-			3	-	2	6
21	3	-			-			4
22	1	-			2	-	2	5
23	2	-			3	2	4	2
24	2	-		1	1	-	4	3
25	-				4	-	1	1
26	2	-		1	9	-	1	2
27	3	-			2	1	1	3
28	2	-	1	-	-	1	-	4
29	3	2	1	-	4	1	-	3

30	2	2	1	-	2	3	-	1
31	-	1	1	-	4	-	1	1
32	2	-		1	1	1	2	3
33	4	-		1	2	4	1	1
34	2	-		1	5	-	1	5
35	-		1	2	2	-	2	-
36	1	-	2	-	3	1	2	1
37	2	-	1	-	1	-	1	3
38	3	1	-		2	1	3	-
39	2	-	1	1	1	-	2	2
40	2	-		2	3	1	-	
41	2	-		1	3	-		1
42	1	-		2	-	2	2	1
43	1	-	3	1	2	-	1	1
44	3	-	2	1	1	-	1	1
45	3	1	-		4	1	-	1
46	2	-	1	-	1	-	1	4
47	1	-			3	3	1	-
48	1	-	1	-	3	2	1	1
49	3	-	1	-	2	-		3
50	1	-	1	1	3	2	1	1
51	4	-	1	2	1	1	1	-
52	2	-	1	1	3	-	1	2

Weekly HT visits according to Model B

Annex 4

R	P	2R	RP	HT Sessions, n	BC (h)	Transfusion (h)	Weekly Schedule (h)	Hybrid Model (h)	N Weeks
-				**-**	0	-	-	-	*4*
-	-	-	1	**1**	2	3.5	D1: 2 D2: 3.5	-	*1*
-	-	-	4	**4**	3.5	~~11.8~~ 6.2 + 6.2	D1: 3.5 D2: 6.2 D3: 6.2	-	*1*
-	-	1	-	**1**	2	4.5	D1: 2 D2: 4.5	-	*1*
-	-	1	2	**3**	2.75	10.2	D1: 2.75 D2: 10.2	-	*1*
-	1	-	4	**5**	4.25	~~13.2~~ 7.5 + 6.2	D1: 4.25 D2: 7.5 D3: 6.2	-	*1*
-	1	1	-	**2**	2	5.8	D1: 2 D2: 5.8	-	*1*
1		-		**1**	1.25	3	D1: 1.25 D2: 3	-	*4*
-	2	2	1	**5**	4.25	~~14~~ 7.2 + 7.3	D1: 4.25 D2: 7.2 D3: 7.3	-	*1*
1	-	-	2	**3**	2.75	8.7	D1: 2.75 D2: 8.7	-	*1*
1	-	1	-	**2**	2	7	D1: 2 D2: 7	-	*4*
1	-	1	1	**3**	2.75	9.8	D1: 2.75 D2: 9.8	-	*2*
1	-	1	3	**5**	4.25	~~15.5~~ 7.3 + 8.7	D1: 4.25 D2: 7.3 D3: 8.7	-	*1*

1	-	1	4	**6**	5	~~18.3~~ 7 + 6.2 + 6.2	D1: 5 D2: 7 D3: 6.2 D4: 6.2	-	*1*
1	-	2	-	**3**	2.75	11	D1: 2.75 D2: 11	-	*1*
1	-	2	2	**5**	4.25	~~16.7~~ 11 + 6.2	D1: 4.25 D2: 11 D3: 6.2	-	*1*
1	-	3	1	**5**	4.25	~~17.8~~ 11 + 7.3	D1: 4.25 D2: 11 D3: 7.3	-	*1*
1	-	4	3	**8**	5.75	~~27.5~~ 11 + 7.3 + 4.5 + 6.2	D1: 5.75 D2: 11 D3: 7.3 D4: 4.5 D5: 6.2	D1:11 D2: 7.3 D3: 4.5 D4: 6.2	*1*
1	1	1	-	**3**	2.75	8.3	D1: 2.75 D2: 8.3	-	*2*
1	1	2	3	**7**	5.75	~~20.9~~ 7.2 + 7.3 + 7.3	D1: 5.75 D2: 7.2 D3: 7.3 D4: 7.3	-	*1*
2	-	-	-	**2**	2	5.5	D1: 2 D2: 5.5	-	*5*
2	-	-	1	**3**	2.75	8.3	D1: 2.75 D2: 8.3	-	*6*
2	-	-	2	**4**	3.5	9.5	D1: 3.5 D2: 9.5	-	*3*
2	-	-	3	**5**	4.25	~~14~~ 8.3 + 6.2	D1: 4.25 D2: 8.3 D3: 6.2	-	*2*
2	-	1	-	**3**	2.75	9.5	D1: 2.75 D2: 9.5	-	*3*

2	-	1	1	**4**	3.5	~~12.3~~ 7 + 5.8	D1: 3.5 D2: 7 D3: 5.8	-	*3*
2	-	2	-	**4**	3.5	~~13.5~~ 7 + 7	D1: 3.5 D2: 7 D3: 7	-	*1*
2	-	2	5	**9**	7.25	~~27.7~~ 11 + 5.8 + 6.2 + 6.2	D1: 7.25 D2: 11 D3: 5.8 D4: 6.2 D5: 6.2	D1: 11 D2: 5.8 D3: 6.2 D4: 6.2	*1*
2	1	-	1	**4**	3.5	9.7	D1: 3.5 D2: 9.7	-	*1*
2	1	-	3	**6**	5	~~15.3~~ 7.5 + 8.3	D1: 5 D2: 8.3 D3: 7.5	-	*1*
2	1	1	3	**7**	5.75	~~19.3~~ 10.2 + 4.7 + 5.5	D1: 5.75 D2: 10.2 D3: 4.7 D4: 5.5	-	*1*
2	1	3	-	**6**	5	~~18.8~~ 11 + 7.2	D1: 5 D2: 11 D3: 7.2	-	*1*
2	1	5	-	**8**	6.5	~~26.8~~ 11 + 7 + 7.3 + 4.5	D1: 6.5 D2: 11 D3: 7 D4: 7.3 D5: 4.5	D1: 11 D2: 7 D3: 7.3 D4: 4.5	*1*
2	2	-	3	**7**	5.75	~~16.7~~ 8.3 + 8.8	D1: 5.75 D2: 11 D3: 6.2	-	*1*
2	2	1	-	**5**	4.25	~~12.2~~ 5.8 + 6.8	D1: 4.25 D2: 5.8 D3: 6.8	-	*1*

2	3	-	1	**6**	5	~~12.3~~ 6.8 + 6	D1: 5 D2: 6.8 D3: 6	-	*1*
2	4	1	1	**8**	6.5	~~17.7~~ 9 + 7.2	D1: 6.5 D2: 9 D3: 7.2	-	*1*
3	-			**3**	2.75	8	D1: 2.75 D2: 8	-	*3*
3	-	-	1	**4**	3.5	10.8	D1: 3.5 D2: 10.8	-	*2*
3	-	-	2	**5**	4.25	~~13.7~~ 8 + 6.2	D1: 4.25 D2: 8 D3: 6.2	-	*1*
3	-	1	-	**4**	3.5	~~12~~ 5.5 + 7	D1: 3.5 D2: 5.5 D3: 7	-	*1*
3	-	1	2	**6**	5	~~17.7~~ 8 + 10.2	D1: 5 D2: 10.2 D3: 8	-	*1*
3	-	1	3	**7**	5.75	~~24~~ 7.3 + 6.2 + 8	D1: 5.75 D2: 7.3 D3: 6.2 D4: 8	-	*1*
3	-	2	-	**5**	4.25	~~16~~ 8 + 8.5	D1: 4.25 D2: 8 D3: 8.5	-	*2*
3	-	2	1	**6**	5	~~18.9~~ 7 + 7 + 5.8	D1: 5 D2: 7 D3: 7 D4: 5.8	-	*1*
3	-	2	6	**11**	8.75 *or* 8 + 1.25 *or*	33 11 + 6.2 + 3.3 + 6.2 + 5.8	D1: 5 D2: 11 D3: 6.2	D1: 11 D2: 6.2 D3: 6.2 D4: 6.2	*1*

					5 + 4.25		D4: 3.3 + 3.75 D5: 6.2 D6: 5.8	<u>D5: 3</u>	
3	1	-	-	**4**	3.5	9.3	D1: 3.5 D2: 9.3	-	*3*
3	1	-	4	**8**	6.5	~~20.7~~ 10.3 + 5.8 + 5.5	D1: 6.5 D2: 10.3 D3: 5.8 D4: 5.5	-	*1*
3	1	2	1	**7**	5.75	~~20.2~~ 11 + 5.5 + 4.7	D1: 5.75 D2: 11 D3: 5.5 D4: 4.7	-	*1*
3	2	1	-	**6**	5	~~14.7~~ 8 + 7.2	D1: 5 D2: 8 D3: 7.2	-	*1*
3	2	1	1	**7**	5.75	~~17.5~~ 8.3 + 9.7	D1: 5.75 D2: 11 D3: 7	-	*2*
3	2	4	2	**11**	8.75 *or* 8 + 1.25 Or 5.75 + 3.5	~~32.3~~ 11 + 7 + 4.7 + 5.8 + 5.8	D1: 5.75 D2: 11 D3: 7 D4: 4.7 + 3 D5: 5.8 D6: 5.8	D1: 11 D2: 5.8 D3: 5.8 D4: 5.8 <u>D5: 5.8</u>	*1*
3	3	1	-	**7**	5.75	~~16~~ 9.7 + 6.8	D1: 5.75 D2: 9.7 D3: 6.8		*1*
3	5	2	5	**15**	8 + 4.25	~~36.8~~ 11 + 7.5 + 4.5 + 5.8 + 4.7 + 5.8	D1: 7.25 D2: 11 D3: 7.5	D1: 11 D2: 7.5 D3: 7.2 D4: 7.2	*1*

							D4: 4.5 + 3 D5: 5.8 D6: 4.7 + 1.5 D7: 5.8	D5: 6	
4	-	-	1	**5**	4.25	~~13.3~~ 8 + 5.8	D1: 4.25 D2: 8 D3: 5.8	-	*1*
4	-	1	1	**6**	5	~~17.3~~ 9.8 + 8	D1: 5 D2: 9.8 D3: 8	-	*2*
4	-	1	2	**7**	5.75	~~20.2~~ 10.2 + 5.5 + 5.5	D1: 5.75 D2: 10.2 D3: 5.5 D4: 5.5	-	*1*
4	-	1	3	**8**	6.5	~~23~~ 10.5 + 7.3 + 6.2	D1: 6.5 D2: 10.5 D3: 7.3 D4: 6.2	-	*1*
4	-	2	3	**9**	7.25	~~27~~ 11 + 5.8 + 5.8 + 5.8	D1: 7.25 D2: 11 D3: 5.8 D4: 5.8 D5: 5.8	D1: 11 D2: 5.8 D3: 5.8 D4: 5.8	*1*
4	1	-	1	**6**	5	~~14.7~~ 7.2 + 8	D1: 5 D2: 7.2 D3: 8		*1*
4	1	-	3	**8**	6.5	~~20.3~~ 7.2 + 8 + 6.3	D1: 6.5 D2: 7.2 D3: 8 D4: 6.3		*1*

4	1	1	4	**10**	8 *or* 6.5 + 2	~~27.2~~ 10.2 + 8 + 4.3 + 6.2	D1: 6.5 D2: 10.2 D3: 8 D4: 4.3 + 1.5 D5: 6.2	D1: 10.2 D2: 8 D3: 4.3 D4: 6.2	*1*
4	1	2	2	**9**	7.25	~~25.5~~ 11 + 8 + 7.5	D1: 7.25 D2: 11 D3: 8 D4: 7.5		*1*
5	-	-	2	**7**	5.75	~~18.7~~ 5.75 + 8 + 5.8 + 5.8	D1: 5.75 D2: 8 D3: 5.8 D4: 5.8		*1*
5	-	1	5	**11**	8.75 *or* 8 + 1.25 *or* 5.25 + 3.5	~~31.2~~ 10.8 + 7.3 + 3.3 + 5.8 + 5.8	D1: 5.25 D2: 10.8 D3: 7.3 D4: 3.3 + 3 D5: 5.8 D6: 5.8	D1: 10.8 D2: 7.3 D3: 5.8 D4: 5.8 D5: 3.3	*1*
5	-	2	-	**7**	5.75	~~21~~ 11 + 5.5 + 5.5	D1: 5.75 D2: 11 D3: 5.5 D4: 5.5		*1*
5	2	1	3	**11**	8.75 *or* 8 + 1.25 *or* 6.5 + 2.75	~~28.2~~ 11 + 6.2 + 3 + 8	D1: 6.5 D2: 11 D3: 6.2 D4: 3 + 2.25 D5: 8	D1: 11 D2: 6.2 D3: 3 D4: 8	*1*
6	-	-	4	**10**	8 *or* 6.5 + 2	~~26.9~~ 10.5 + 5.5 + 6.2	D1: 6.5 D2: 10.5 D3: 6.2	D1: 10.5 D2: 6.2 D3: 5.5	*1*

							D4: 5.5 + 1.5 D5: 6.2	D4: 6.2	
9	-	1	2	**12**	9.5 *or* 8 + 2	~~32.7~~ 10.4 + 8 + 5.5 + 6.2 + 4.5	D1: 8 D2: 10.8 D3: 8 D4: 8 D5: 2 D6: 7.3	D1: 10.8 D2: 8 D3: 8 D4: 7.3	*1*

Hours dedicated to a HT program, per week (Model B); Underlined hours would imply supplementary work.

Annex 5

		2018			2019		
		R	**B**	**T**	**R**	**B**	**T**
1	**R**	-	-	*16*	2	4	*14*
	P	-	-	-	1	1	*2*
2	**R**	2	3	*10*	7	10	*22*
	P	-	1	*1*	3	5	*7*
3	**R**	1	2	*15*	7	8	*21*
	P	-	-	*3*	1	3	*5*
4	**R**	-	2	*11*	7	10	*19*
	P	-	-	-	3	4	*7*
5	**R**	2	2	*8*	3	1	*11*
	P	-	-	-	1	1	*3*
6	**R**	1	2	*7*	5	9	*15*
	P	-	-	-	-	3	*6*
7	**R**	2	-	*15*	3	7	*16*
	P	-	-	*1*	2	2	*3*
8	**R**	5	7	*18*	3	4	*17*
	P	-	-	*1*	1	2	*5*
9	**R**	-	3	*8*	3	5	*15*
	P	-	-	-	3	3	*6*
10	**R**	1	3	*8*	2	7	*16*
	P	-	-	-	1	5	*6*
11	**R**	-	5	*11*	1	4	*12*
	P	-	-	-	2	3	*4*
12	**R**	3	2	*11*	2	4	*17*
	P	-	-	-	2	2	*7*
13	**R**	-	1	*4*	5	3	*17*
	P	-	-	-	2	2	*7*
14	**R**	-	2	*13*	3	5	*16*

	P	-	-	*1*	3	4	*8*
15	**R**	2	3	*9*	2	5	*19*
	P	-	1	*2*	3	5	*6*
16	**R**	2	3	*14*	6	10	*20*
	P	-	-	-	3	5	*6*
17	**R**	-	3	*10*	7	11	*32*
	P	-	-	*2*	3	3	*8*
18	**R**	2	3	*9*	9	10	*30*
	P	-	-	-	3	3	*6*
19	**R**	-	-	*7*	6	12	*18*
	P	-	-	*1*	5	10	*10*
20	**R**	-	1	*10*	2	13	*21*
	P	-	-	-	2	6	*8*
21	**R**	2	3	*9*	5	4	*20*
	P	-	-	*3*	4	4	*10*
22	**R**	2	1	*10*	4	11	*24*
	P	-	-	*2*	4	5	*8*
23	**R**	2	2	*12*	7	13	*23*
	P	-	-	-	3	4	*6*
24	**R**	1	3	*13*	4	12	*24*
	P	1	1	*1*	2	3	*4*
25	**R**	1	-	*8*	6	7	*21*
	P	-	-	*1*	2	1	*5*
26	**R**	-	3	*12*	8	13	*20*
	P	-	1	*2*	1	2	*3*
27	**R**	-	3	*12*	1	7	*20*
	P	-	-	*5*	2	4	*5*
28	**R**	2	4	*13*	7	4	*20*
	P	-	-	*4*	2	5	*7*
29	**R**	1	5	*15*	5	7	*19*
	P	2	2	*2*	3	4	*6*

30	**R**	3	4	*7*	2	3	*8*
	P	-	2	*5*	2	4	*4*
31	**R**	-	2	*17*	2	7	*21*
	P	2	1	*2*	2	1	*4*
32	**R**	2	3	*7*	8	8	*21*
	P	-	1	*1*	2	4	*12*
33	**R**	1	5	*14*	1	5	*16*
	P	-	1	*1*	5	5	*5*
34	**R**	3	3	*8*	3	12	*20*
	P	1	1	*1*	-	5	*5*
35	**R**	3	4	*23*	5	6	*15*
	P	1	2	*3*	3	-	*4*
36	**R**	5	5	*11*	6	8	*19*
	P	-	-	*2*	1	2	*7*
37	**R**	-	4	*12*	3	6	*17*
	P	-	-	*2*	1	3	*3*
38	**R**	2	3	*17*	3	8	*18*
	P	2	1	*3*	2	1	*2*
39	**R**	3	5	*18*	-	7	*10*
	P	1	1	*3*	-	2	*2*
40	**R**	8	4	*11*	1	3	*9*
	P	1	2	*3*	2	1	*4*
41	**R**	1	3	*11*	4	4	*15*
	P	-	1	*1*	1	1	*2*
42	**R**	1	3	*19*	-	5	*12*
	P	-	2	*6*	2	3	*3*
43	**R**	7	8	*21*	3	5	*16*
	P	-	1	*2*	1	1	*2*
44	**R**	9	8	*14*	1	4	*16*
	P	1	1	*2*	1	1	*8*
45	**R**	1	3	*10*	4	5	*20*

	P	-	1	*2*	2	2	*6*
46	**R**	3	4	*9*	2	7	*15*
	P	-	-	-	1	4	*4*
47	**R**	2	3	*6*	2	5	*14*
	P	-	-	*1*	2	3	*4*
48	**R**	2	3	*10*	3	6	*15*
	P	-	-	*3*	2	3	*6*
49	**R**	3	5	*15*	4	5	*21*
	P	-	-	*3*	2	3	*7*
50	**R**	3	4	*15*	4	6	*12*
	P	1	1	*3*	3	3	*7*
51	**R**	2	8	*15*	1	3	*16*
	P	1	2	*6*	1	1	*3*
52	**R**	4	5	*15*	4	7	*13*
	P	1	1	*2*	2	2	*5*

RBCs and PDs transfused in HT (according to Model R *and Model B), versus the total transfused products in the DH*

Annex 6

	2020			
	R	**P**	**2R**	**PR**
1	-			
2	-			
3	1	-	1	3
4	3	2	-	1
5	1	1	1	2
6	3	2	3	2
7	-	2	3	1
8	2	1	-	1
9	-	2	1	3
10	3	3	3	-
11	1	2	1	3
12	3	2	1	1
13	-	2	2	1
14	4	1	1	3
15	2	-	1	1
16	1	-	1	3
17	1	-	2	3
18	2	1	4	3
19	3	1	1	3
20	2	-	-	1
21	1	1	1	2
22	4	1	1	3
23	3	-	1	5
24	3	1	-	4
25	2	1	3	5
26	9	-	1	2
27	6	-	2	2
28	2	-	1	2
29	1	2	1	2

30	2	-	4	3
31	4	-	2	1
32	2	1	2	1
33	3	-	1	1
34	2	-	1	2
35	3	2	2	2
36	2	-	2	5
37	2	2	-	1
38	5	-	-	3
39	3	-	1	3
40	1	2	2	2
41	4	-		5
42	3	1	1	2
43	2	-	4	3
44	4	-	1	3
45	3	1	1	3
46	1	-	1	4
47	2	-	-	1
48	3	1	1	1
49	4	-	1	3
50	2	-	-	3
51	1	-	-	3
52	2	-	1	4

Weekly HT visits in 2020

Annex 7

R	P	2R	RP	HT Sessions, n	BC (h)	Transfusion (h)	Weekly Schedule (h)	Hybrid Model (h)	N Weeks
-				**0**	0	0	-	-	*2*
-	2	1	3	**6**	5	14			*1*
-	2	2	1	**5**	4.25	~~14~~ 7.2 + 7.3	D1: 4.25 D2: 7.2 D3: 7.3		*1*
-	2	3	1	**6**	5	18			*1*
1	-	-	3	**4**	3.5	11.5			*1*
1	-	1	3	**5**	4.25	~~15.5~~ 7.3 + 8.7	D1: 4.25 D2: 7.3 D3: 8.7		*2*
1	-	1	4	**6**	5	~~18.3~~ 7 + 6.2 + 6.2	D1: 5 D2: 7 D3: 6.2 D4: 6.2		*1*
1	-	2	3	**6**	5	16			*1*
1	1	1	2	**5**	4.25	14			*2*
1	2	1	2	**6**	5	15.3			*1*
1	2	1	3	**7**	5.75	18.2			*1*
1	2	2	2	**7**	5.75	19.3			*1*
2	-	-	1	**3**	2.75	8.3	D1: 2.75 D2: 8.3	-	*2*
2	-	-	3	**5**	4.25	~~14~~ 9 + 5.5	D1: 4.25 D2: 9 D3: 5.5		*1*
2	-	1	1	**4**	3.5	~~12.3~~ 7 + 5.8	D1: 3.5 D2: 7 D3: 5.8		*1*
2	-	1	2	**5**	4.25	~~15.2~~ 9.5 + 6.2	D1: 4.25 D2: 9.5		*2*

							D3: 6.2		
2	-	1	4	**7**	5.25	20.8			*1*
2	-	2	5	**9**	7.25	~~27.7~~ 11 + 5.8 + 6.2 + 6.2	D1: 7.25 D2: 11 D3: 5.8 D4: 6.2 D5: 6.2	D1: 11 D2: 5.8 D3: 6.2 D4: 6.2	*1*
2	-	4	3	**9**	7.25	30			*2*
2	1	-	1	**4**	3.5	9.7	D1: 3.5 D2: 9.7		*1*
2	1	2	1	**6**	5	17.7			*1*
2	1	3	5	**11**	8.75	33			*1*
2	1	4	3	**10**	8	31.3			*1*
2	2	-	1	**5**	4.25	11			*1*
3	-	1	1	**5**	4.25	14.8			*1*
3	-	1	3	**7**	5.75	~~24~~ 7.3 + 6.2 + 8	D1: 5.75 D2: 7.3 D3: 6.2 D4: 8		*1*
3	-	1	5	**9**	7.25	26.2			*1*
3	1	-	4	**8**	6.5	~~20.7~~ 10.3 + 5.8 + 5.5	D1: 6.5 D2: 10.3 D3: 5.8 D4: 5.5		*1*
3	1	1	1	**6**	5	16.2			*1*
3	1	1	2	**7**	5.75	19			*1*
3	1	1	3	**8**	6.5	21.8			*2*
3	2	-	1	**6**	5	13.5			*1*
3	2	1	1	**7**	5.75	~~17.5~~ 8.3 + 9.7	D1: 5.75 D2: 11 D3: 7	-	*1*
3	2	2	2	**9**	7.25	24.3			*1*
3	2	3	2	**10**	8	28.3			*1*
3	3	3	-	**9**	7.25	24			*1*

4	-	-	5	**9**	7.25	30.7			*1*
4	-	1	3	**8**	6.5	~~23~~ 10.5 + 7.3 + 6.2	D1: 6.5 D2: 10.5 D3: 7.3 D4: 6.2		*2*
4	-	2	1	**7**	5.75	21.3			*1*
4	1	1	3	**9**	7.25	24.3			*2*
5	-	-	3	**8**	6.5	21.5			*1*
6	-	2	2	**10**	8	29.2			*1*
9	-	1	2	**12**	9.5 *or* 8 + 2	~~32.7~~ 10.4 + 8 + 5.5 + 6.2 + 4.5	D1: 8 D2: 10.8 D3: 8 D4: 8 D5: 2 D6: 7.3	D1: 10.8 D2: 8 D3: 8 D4: 7.3	*1*

Hours dedicated to a HT program, per week, in 2020