Financial Implications of Integration of GP Posts with Emergency Departments from an Holistic Point of View

Analysing and Modelling Financial Streams

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Management Summary

Integration of GP Posts and Emergency departments is highly being encouraged by various parties due to increased effectiveness of healthcare and perceived cost benefits. By integration self-referrals visiting the Emergency Department are being triaged and receive appropriate 1st or 2nd line healthcare. Generally this results in larger numbers of patients seen at the GP Post and additional labour forces have to attributed. However, since cost structures and budgeting of GP Posts and Emergency Departments are different, it is hard to quantify the financial changes occurring after a possible integration.

The research objective of this thesis is to *generate a model to determine financial implications of integration of GP Posts and Emergency Departments*

To reach this objective financial streams of both departments have been examined with respect to changes of patient streams due to integration. The delivered model uses queuing theory to determine changes in patient streams. By applying financial regulations, the implications of integration can be financially quantified with the increase of workload.

Input parameters for the model are pre-integration financial structures of GP Posts and Emergency Departments, as well as patient distribution of the visiting patients. Template parameters are based on historical data of the situation at ZGT Almelo and can be adjusted at will.

Results of the model indicate that integration at Almelo has a positive impact on the holistic costs and may save up to approximately €450.000, which is 8.5% of the combined costs of GP Post and Emergency Departments pre-integration. Extra labour costs needed at GP Posts are offset by a decrease of costs at the Emergency Department. A large part of the holistic costs savings are contributed to relatively expensive specialist remunerations.

The financial model currently delivered is a good start to examine financial implications of integration of GP Posts with Emergency Departments at peripheral hospitals. Scenarios under different financial and patient parameters can be examined. For more detailed analysis the model can be improved by looking at long term-effects of integration such as the costs of follow-up consults or refinement of self-referral characteristics.

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Preface

This thesis is written to obtain the master's degree in Financial Engineering and Management. Reflecting upon this process I would like to thank some people that were directly or indirectly involved in the completion of this thesis.

First of all, I would like to thank Manon Bruens for answering all of my questions, providing me data needed, reviewing critically and most of all: conveying her expertise and enthusiasm in healthcare policies. Thanks for being a great supervisor throughout this project.

Also I would like to thank my two university supervisors, Dr. Joosten and ir. Kroon for their continued and valuable support, professional guidance and constructive feedback on improving the quality of this thesis. Thanks for the many interesting conversations, especially the laughs about possible loopholes in healthcare systems will be deeply remembered.

Furthermore many thanks to Janke Snel from CHPA, Martin Leferink and Rik Gierveld from ZGT, who all helped me providing necessary data and clarifying practical issues in the interesting world of healthcare.

Last but definitely not least, special thanks go out to my parents for always supporting me in the best way possible, guiding me through my educational career.

Mahersh Selvakumaran

List of Abbreviations

The list below gives an overview of abbreviations and translations of the most commonly used terms in this research.

- Diagnosis Treatment Combination (DTC) = Diagnose Behandel Combinatie (DBC)
- DTCs On their way to Transparancy (DOT) = DBC's Op weg naar Transparantie (DOT)
- Emergency Department Nurse (ED Nurse) = Spoedeisende hulp verpleegkundige
- General Practitioner (GP) = Huisarts
- General Practitioners Post (GP Post) = Huisartsenpost
- General Practitioners Cooperation (GPC) = Huisartsen Cooperatie
- General Practitioners Service Structures (GPSS) = Huisartsendienstenstructuren
- General Practitioner Assistant (GP Assistant) = Doktersassistente
- Integrated Emergency Post (IEP) = Spoedpost
- Physician Assistant (PA) = Physician Assistant
- Self-Referral = Zelfverwijzer

Section 1. Introduction

In April 2010 a partnership between the emergency department of hospital ZGT Almelo and the General Practitioners Post (GP Post) Almelo (CHPA) was established in order to improve efficiency of acute healthcare. In this integrated emergency post (IEP), both services have been located in a new division of the hospital resulting in more efficient patient flow and more efficient use of resources by enabling patient care by the appropriate care provider. Various studies have shown that an integration may lead to better and potentially cheaper healthcare, especially considering so-called self-referrals (van Uden, 2006). Self-referrals are patients entering Emergency Departments (ED) without having been referred by a GP or ambulance, who often do not know that (cheaper) appropriate healthcare is also provided at GP posts. By creating a gatekeeper function, the urgency of patients entering the IEP is examined by a GP Assistant and patients are only referred to the emergency department if needed.

However, different financing models for the emergency department and the general practitioners post make it difficult to compare the financial implications of an integrated emergency post. Also looking at the different actors who are affected by the integration, there are many different (conflicting) interests, which could also result in a (non- beneficiary) resentment against integrated emergency posts.

The objective of this thesis is to generate a model to determine financial implications of integration of GP Posts and the Emergency Departments. The deliverable is a financial model which depicts various financial outcomes of integration. With this model various financial implications for the involved stakeholders can be examined for an integration with different parameters. Situations pre- and post-integration can be compared.

To reach this objective, first in Section 2, the project framework is positioned to provide the scope of the research. In Section 3, the path towards integrated emergency posts will be discussed in order to get a clear view of the development of integrated emergency posts with respect to self-referrals. In Section 4 stakeholder analysis will depict the various interests of the parties concerning the integrated emergency posts in order to address the conflicting interests. By picturing the financing of the healthcare system and analysing both the financial streams of the Emergency Department and the General Practitioners Post as a result of the integration in Section 5, the financing structure from an holistic point of view can be examined and related to the interests to the various parties. The following step is to translate restrictions and assumptions into a financial model in Section 6 which results in a better picture of the financial effects after integration for all stakeholders. In Section 7 the results and conclusions are discussed and in Section 8 possible ways in which the model can be improved are given and potential financial adaptions in the model are suggested.

Section 2. Project Framework

In this section a short overview of the research project is given. First the situation at the integrated emergency post at ZGT Almelo is depicted to understand how an IEP works. Also the research design of this study is given following the 7 steps of Verschuren & Doorewaard (2007).

2.1 Integrated Emergency Post Almelo

Patients with a need of healthcare outside-of office hours have different options to decide where to go. Even though officially a reference is needed to attend the emergency department, many patients enter the emergency department without referral. In practice many of these patients could have been treated by a general practitioner and thus this results in unnecessary overcrowding of emergency department by relatively minor medical complaints (Kool et all., 2008).
By integrating GP Posts with EDs, a gatekeeper function can be created in order to prevent unnecessary usage of specialistic (2nd line) healthcare. In the integrated situation self-referrals entering are triaged by GP assistants and referred according to the severity of the medical compliant to either the GP Post or the Emergency Department. In this way self-referrals do not choose for themselves and end up at the emergency department only when a GP assistant or GP refers them. The change in patient streams leads to changes in allocation of resources which can be financially modelled.

2.2 Research design

In order to conduct a research it is important to think about the design of the research. A research design consists of two parts: a conceptual design and a technical design. The conceptual design describes what the goal of the research is, the technical design describes how to reach this goal (Verschuren & Doorewaard, 2007).

2.2.1 Conceptual Design

A conceptual design describes what and how much there is to be researched and consists of four parts: an objective, a research model, research questions and the definition and operationalization of the main concepts.

The objective of this study is:

To generate a model to determine financial implications of integration of GP Posts and Emergency Departments.

In Figure 2.1 an overview of the research model is given on how the main objective is to be realized.

In order to generate a model to determine financial implications of integration, from the research model research questions can be determined to reach the main objective of this study.

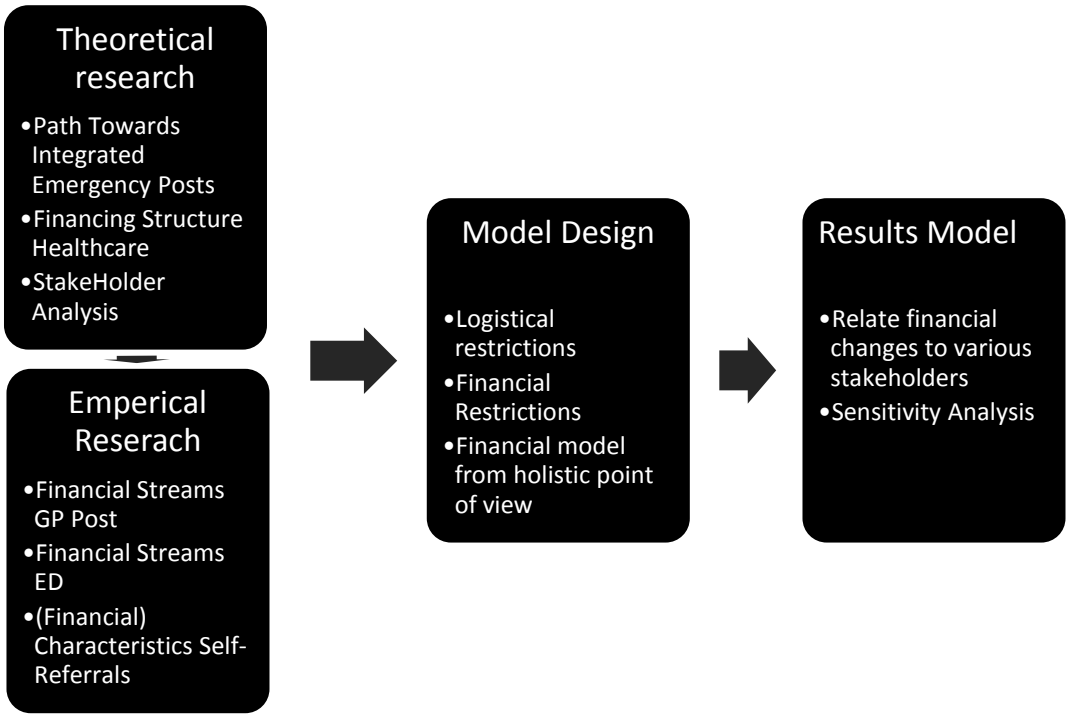


Figure 2.1 Research Model.

- How did Integrated Emergency Posts emerge in the Dutch healthcare system? (Section 3)
  - What is the historical development of IEPs?
  - What are causes that drive integration?
  - What are the benefits of integration?

- Who are the stakeholders involved with integration and what are their incentives? (Section 4)
  - What is the role of different stakeholders in the Dutch healthcare system?
  - How does the role of stakeholders coincide with the incentives towards integration?
  - What is the general picture of incentives towards integration of GP Posts with EDs?

- How are the financial streams defined and how are they affected by integration? (Section 5)
  - How is the financing system in the Dutch Healthcare?
  - How are incoming streams determined for parties providing out-of-office healthcare?
  - What are costs of out-of-office healthcare providers?
  - How does integration change the financial streams?

- How can integration of GP Posts with Emergency Departments financially be modelled? (Section 6)
  - What input data is needed for the financial model?
  - How are patient flow changes after integration?
  - What are changes of financial streams according to the integration?
  - Which assumptions are being made?

- What are financial implications of integration based on input parameters? (Section 7)
  - What parameters influence the various financial streams?
  - How can the financial changes be quantified?
  - What are the implications for the stakeholders involved?

To conclude the conceptual design, boundaries of this study have to be determined. The objective of this research is to determine the financial implications of integration. In the research we will focus on integration of acute healthcare out-of-office hours. In order to model financial implications, the situation at Almelo will be used as a blueprint for integration. In this study the short-term effects on financial streams are being taken into consideration, generating a model to compare the financial situation before and after integration. Long term financial changes (i.e. ,changes in follow-up consults/admissions) or macro-economic changes (i.e. ,lowered insurance risk) in the healthcare insurance system are not a part of this research, but can be interesting areas for further research. Also the model developed is considered to be applicable to peripheral hospitals, where specialists at Emergency Departments are operating in private ventures.

2.2.2 Technical Design

The technical design of a study determines how the conceptual design described above is being researched. It focusses on how the designed research questions are answered. In order to reach the objective of this study, a literature study needs to be performed to understand the concepts of integrated emergency posts. Also rules and regulations provided by government documents will be examined to understand financial rules. Furthermore it is important to provide a practical applicable model and more insight can be obtained by performing live interviews with related stakeholders.

Gathering quantitative data in terms of patient streams and financial streams, historical data can be obtained from data systems of both GP Post and Emergency Department. This data can be used as initial parameters of the financial model and to get better understanding on how financial streams are being affected by patient streams.

With the financial model, future studies can be done to analyse how integration between GP Posts and Emergency Departments affect financial streams of different parties for various parameters.

Section 3. Path towards Integrated Emergency Posts

In this section the development towards Integrated Emergency Posts (IEP) is being described in order to get a clear understanding of the current situation of the IEPs with respect to self-referrals.

3.1 GP Posts

Several trends and developments have shaped the current situation in (acute) primary out-of-office-hours health care. Up to the 1960s most General Practitioners took care of their own patients during out-of-office-hours periods. This resulted in GPs being on call most of the time. To overcome a constant workload GPs formed small-call rotations in which out-of-hours-care was delivered to each other's patients. Usually these call rotations were composed of 5-10 GPs (van Uden, 2006). In the 1990s almost all GPs were part of call rotations, however another reform occurred in the late 1990s. Growing dissatisfaction of GPs due to perceived excessive workload and lack of separation between work and private life led to another reform of out-of-hours care (Leibowitz et all., 2003). The small-scale call rotations were organized into larger-scale GP cooperatives, usually providing healthcare to populations ranging from 50.000 to 500.000 inhabitants. In 2013 the 122 General Practitioner posts are organized in 50 General Practitioner Service Structures (GPSS) covering more than 90% of the population (VHN, 2013). Looking at the GPSS used in this thesis for analysis, the CHPA it covers a population of 203,636 (CHPA, 2011).

Even though the out-of-office-hours healthcare established a prominent position through GPSSs, there is a new trend arising: collaboration with emergency departments of hospitals. Collaboration is greatly stimulated by government and healthcare insurers (Klink, 2008; Mastenbroek & van der Meer, 2004). Also patient organizations are supporting this new trend, facilitating the choice of the patient for the right healthcare when having an acute healthcare problem (Foekema & Hendrix, 2006).

Looking at the numbers in 2009, from a total of 124 GP posts, 47 (37%)posts have independent accommodations and 77(63%) are located in (the vicinity of) hospitals. Of the independent GP Posts, 28 of the GP Posts will remain unchanged since there is no emergency department in the near surrounding (Coenen, 2009).

In Figure 2.1 an overview of the situation of GP Posts and Emergency Departments is given, where the combined red and purple locations are GP Posts located in hospitals, orange locations are GP Posts located in hospitals without ED, red locations are independent GP Posts, green locations are private posts of GPs used for out-of-office healthcare and blue locations are independent EDs. The connecting lines indicate that the GP Posts are part of a GPSS.

Figure 3.1. Overview locations GP Posts, Emergency Departments and Integrated Emergency Posts[1].

Most important arguments in favour of integration of GP Posts with Emergency Departments are:

- The supply of healthcare is insufficiently bordered in terms of 1st and 2nd line healthcare and therefore incomprehensible. For patients with an urgent medical complaint during out-of-office-hours it is not clear which form of healthcare to contact: GPSS, ED or ambulance by making use of the emergency number (Drijver, 2006).
- Self-referrals end up at the ED with problems which are actually supposed to be treated by the GPSS (Giesen et al., 2006). Due to this increased overload of patients for the ED the quality of healthcare for the real severe cases would be decreased (Schrijvers, 2003).
- Acute healthcare is not cost efficient, due to (incorrect) use of expensive specialists on the ED by self-referrals (Balestra et al., 2004)

On the other hand there are also some disadvantages considering integration:

- In case that self-referrals with (light) traumas are directed to GP posts, it is important that the patients are sufficiently treated according to their medical needs. Practical research in Amsterdam has shown that there are big differences in competences in traumatology by both GPs as well as GP assistants (van Charante & Bindels, 2008). To overcome this problem, more training for GPs and assistants can be given and more protocol-based working can be organized.
- Cases in Maastricht showed that telephonic consults have decreased by nearly 50% while the number of consults has nearly tripled (van Charante & Bindels, 2008). This means that the shift from telephonic consults to physical consults leads to higher costs, since physical consults are approximately three times more expensive than telephonic consults (cf. Section 5).

As can be seen, a key factor of inefficient out-of-office-hours healthcare is the problem of self-referrals. Looking more in detail in the literature an overview of motives and costs of self-referrals is given in the next section.

[1] Source: Rijksinstituut voor Volksgezondheid en milieu: Nationale Atlas Volksgezondheid.

3.2 Self-Referrals

In order to use hospital services in the Dutch health care system, patients are required to have a referral from their general practitioner (Kulu-Glasgow et al., 1998). However, in seeing the emergency department a referral is not required, but of course recommended. Various evaluations have shown that large numbers of patients skip the referral step and attend the ED on own beliefs (van Charante et al., 2007; Giesen et al., 2007). People who skip the referral step and attend the ED by themselves are considered to be self-referrals.

Self-referrals are considered to be a problem from a healthcare financing point of view, since a large portion of them could be treated by cheaper primary care (Giesen et al., 2007). Numbers of self-referrals range from 30 up to 70 per cent differing for region and country.

In Figure 3.2 an overview is given of the total visits at emergency departments. Explanations for differences in visits are contributed to urbanization in terms of extra availability of hospitals. Also the fact that in rural areas there is more intensive GP contact contributes to a difference (Giesbers et al., 2011; Kingma, 2004).

Province	Absolute	per 100 citizens	Index Neth.=1
Groningen	75.000	13,0	103
Friesland	63.000	9,8	78
Drenthe	38.000	7,9	63
Overijssel	127.000	11,3	90
Flevoland	38.000	10,2	81
Gelderland	207.000	10,5	83
Utrecht	128.000	10,7	85
Noord Holland	406.000	15,5	123
Zuid Holland	479.000	13,9	110
Zeeland	30.000	7,9	63
Noord Brabant	333.000	13,8	109
Limburg	136.000	12,1	96
Netherlands	**2.060.000**	**12,6**	**100**

Table 3.1 Total number of ED visits per province in Netherlands 2007[2].

[2] Source: “Capaciteitsplan 2008 Voor medische vervolgopleiding spoedeisende geneeskunde” by Capaciteitsorgaan 2008

According to numbers of Schrijvers et al. (2008), during the *National Measuring Week* 45% of the patients on the emergency department is a self-referred patient. This corresponds with nearly 1 million patient contacts on year basis. If the numbers are extrapolated, the percentage of self-referrals is about 20% of admitted patients.

There are several reasons for self-reference by patients. Convenience and the vicinity of emergency departments, lack of timely access to primary care providers, belief that the medical complaint was very urgent and the belief that radiography is necessary are motives for self-referral (Lee et al., 2000). Also people are not aware of the possibility of accessing the GP post and perceive to receive the best care at ED's (Jaarsma-Van Leeuwen et al., 2000). Another reason shown by surveys is that higher dissatisfaction with the GP cooperations over own GPs results in accessing the ED (van Charante et al., 2007). Significant statistical data prove that characteristics of self-referrals are in general mainly young adults with minor injuries or sports injuries who live close to the hospital (Jaarsma-Van Leeuwen et al., 2000).

On the other side there are also patients who rightfully refer themselves to the ED. By directly choosing for the ED, costs and time of the GP post are saved. Two experiments in Maastricht and Haarlem where the ED was closed for self-referrals led to an increase of 45% of the referrals, resulting in double consultations and extra costs (van Uden et al., 2005)

Looking with more detail into difference of costs of ED and GP post, Giesbers et. all (2011) examined self-referring patients visiting the ED of the UMC St.Radboud in Nijmegen. In a period of two months the medical paths of all 253 self-referrals were observed and analysed. It appeared that 203 (80.2%) of these patients could have been treated by a GP. Analysing the medical paths of the patients and specific pricing for the medical treatments, this resulted in an average cost of 256.50 euro on the Emergency Department. Similarly if these patients would have visited the GP Post with the same medical complaints the average cost would have been 78.80 euro. It is likely that the differences in costs are even larger considering that in the case of a visit of the GP Post less additional medical research is needed (Giesbers et al., 2011). Considering the ratio of patients which could have been helped by the GP is constant throughout various emergency departments, an average declarable amount per emergency department patient outside of office hours can be established if patients are treated according to their severity. As can be seen in Figure 3.2, a higher ratio of self-referrals results in lower average costs for patients out-of-office hours from a holistic point of view, since a larger amount of self-referrals could be treated at the cheaper GP post. Based on the average cost of treatments of Giesbers et al. (2011), in Figure 3.2 the average savings in declarable amounts related to the percentage of self-referrals is pictured. However, considering a shift of staffing costs from a holistic point of view, a more sophisticated model will have to be established in order to understand changes in cost and revenues structures from different parties.

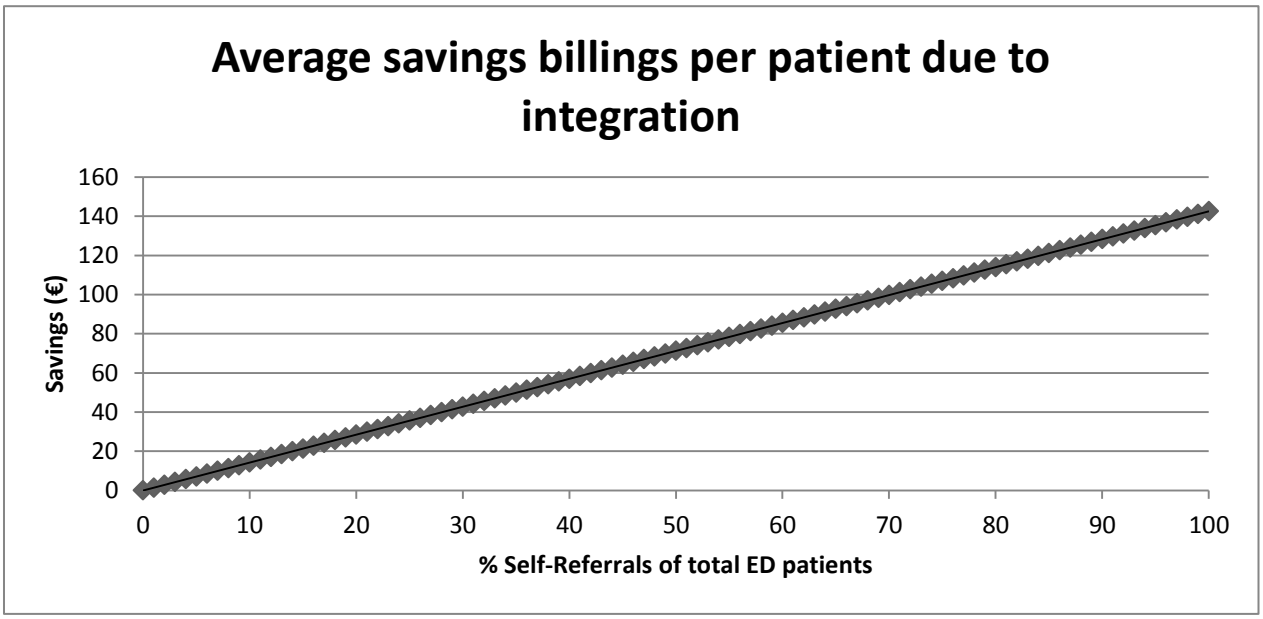


Figure 3.2 Average savings per emergency department patient if appropriate healthcare is served to self-referrals related to % Self-referrals at the emergency department[3].

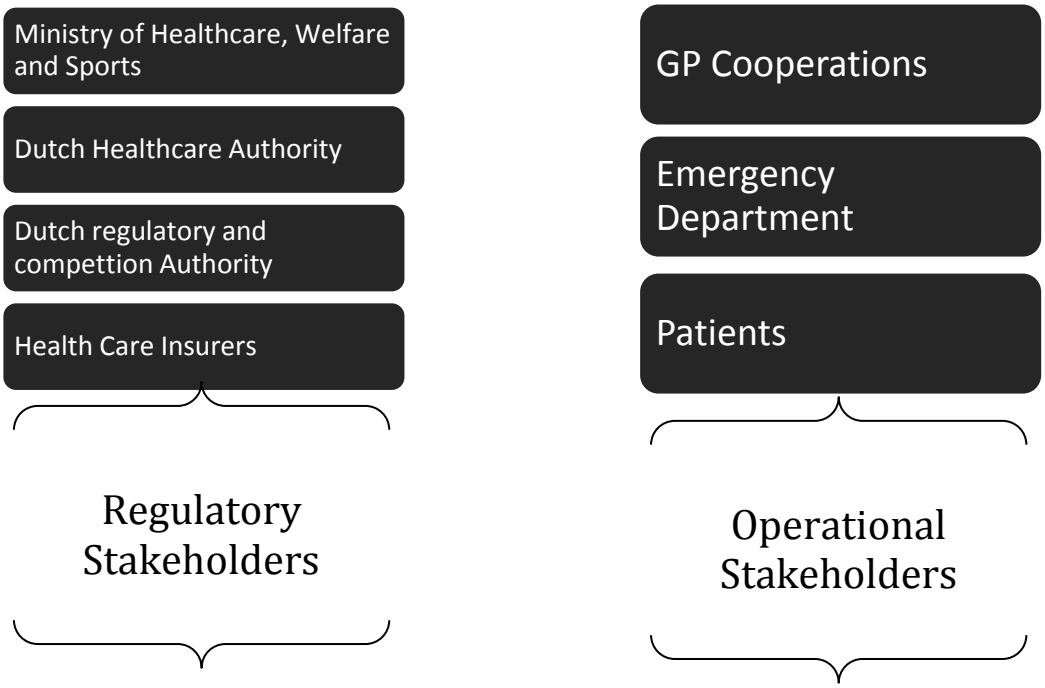
[3] Based on data of Giesbers, Smits, & Giesen(2011).

Section 4. Stakeholders

In this section, the various stakeholders which contribute to the healthcare system and specifically their role towards integration of acute healthcare are examined. Based on the role of the stakeholders, in this thesis we distinguish regulatory stakeholders and operational stakeholders.

4.1 Stakeholders

Looking more in detail to the stakeholders in the healthcare system we consider regulatory stakeholders to be the entities which are responsible for the rules, regulations and financing in healthcare. Operational stakeholders on the other hand are the healthcare givers and healthcare receivers. In terms of the focus of this thesis the following stakeholders are will be pictured:



4.2.1 Ministry of Healthcare, Welfare and Sport (VWS)

The ministry of Healthcare, Welfare and Sports (Dutch: *Ministerie van Volksgezondheid, Welzijn en Sport (VWS)*) determines the legal boundaries for the healthcare system. The ministry is publicly and politically responsible for good execution of the healthcare system. In terms of financing healthcare the ministry aims to lower the growth of healthcare expenditures for the next few years (Schippers, 2011).

Considering the integration of acute healthcare the ministry has proposed several initiatives in order to stimulate quality and efficiency. In 2008 the minister tried to improve the system by planning meetings with the various acute healthcare parties in order to establish the EDs and GP Posts on one location (Klink, 2008).

Also the (ex-)minister stated in an interview to investigate possibilities of flexible budgeting of emergency departments towards GPSS to enable efficient first line emergency care (Klink 2010).

4.2.2 Dutch Regulatory and Competition Authority (NMa)*(since 1st of April 2013 ACM)*

To ensure enforcement of the competition law (Mededingingswet) the ministry of economic affairs has established the Dutch Regulatory and Competition Authority (Dutch: Nederlandse Mededingings Autoriteit (NMa)). Since healthcare is also considered to be a competitive market, the NMa has some guidelines (*richtsnoeren voor de zorgsector*) on how collaborations are allowed in the healthcare market provided they are not creations of cartels. Considering the specific case of integration of acute healthcare, although there is no concrete collaboration example, the guidelines tend to lead towards favourable integration. According to Subsection 233 of Section 6.3 of the Guidelines for Healthcare *"Collaborations can provide important contributions on improving the quality and efficiency of healthcare. Collaboration can be focused on the coordinating of healthcare towards the needs of healthcare of clients. Collaboration can furthermore be a way to spread risks, save costs, realize efficiency advantages, utilize common knowhow and can be a basis for innovation. (…) The NMa is positive towards collaboration, if institutions are able to work efficiently, innovate more and provide better quality."* (NMa, 2010).

Also according to Subsection 302 of Section 6.3 a favourable intention of collaboration is stated:

"Multidisciplinary collaborations are intended to ensure easier patientflow from one healthgiver to another, or to improve quality of healthcare. (…) Collaboration in the healthcare chain is beneficial for patients."

4.2.3 Dutch Healthcare Authority (NZa)

In order to regulate the liberalization of the healthcare system and create an increased efficiency, better quality, accessibility and transparency in healthcare, the independent Dutch Healthcare Authority (Dutch: Nederlandse Zorgautoriteit (NZa)) was founded in 2006 (Nederlandse Zorgautoriteit, 2013).

The Nza regulates the healthcare market by cooperating with the market itself. Due to the market liberalization, healthcare suppliers and healthcare insurers are ensured to have more freedom and responsibility. The NZa monitors the liberalized markets to ensure the interests of the consumers of healthcare and determines rules, budgets and rates for the part of healthcare which is regulated.

Concerning acute healthcare the NZa proposed a new way of financing in 2009. Instead of budgeting on basis of the supplier of care, the budgeting is performed according to the medical acts performed. This implies that the NZa assumes both the ED as well as the GPSS provide the same acute healthcare (Nederlandse Zorgautoriteit, 2009).

4.2.4 Healthcare Insurers

Since the liberalization of the healthcare market in 2006, healthcare insurers are encouraged to buy in healthcare competitively to increase both quality of healthcare as well as reduce healthcare costs. However studies prove that the initial plan of liberalization has not shown a significant decrease in healthcare costs yet, since there is still a long transition phase (Halbersma et al., 2012). Looking at integration of acute healthcare, healthcare insurers have high incentives to decrease costs. By Dutch law it is constituted that every individual has to be treated and insured (Rijksoverheid, 2006). Considering that GP healthcare and emergency healthcare are elementary needs, all healthcare insurers have obligations to provide this healthcare and are benefited if costs can be reduced in

these particular fields. Healthcare insurers seem to be very willing towards integration and have even commenced several collaborations (Coenen, 2009).

4.3.1 General Practitioners Cooperations

As stated in Section 2, General Practitioners Cooperations have been established in order to make it possible for GPs to offer primary healthcare outside office hours efficiently. Effective use of both physical and material assets is one of the key drivers in order for General Practitioners Cooperations to integrate with emergency departments. Looking into more detail of the various players at the GPC it shows that mainly the general practitioners are reluctant considering integration when it affects their obligation of working more hours at the cooperations. It appears that GPs do not prioritize shifts at the GPCs and actually prefer selling these shifts to so-called "Observants" (*Waarnemers*), for mainly two reasons (Coenen, 2009):

-Shifts are considered to be a strain on the rhythm of routine and the compensation is insufficient[4].

-(Private) General Practitioners have more monetary benefits when they spend hours working at their own practice instead of being on shift for the GPC.

These motives are supported by a survey conducted to analyse the experiences of GPs at GPCs (Smits et al., 2012). It turns out that 75.6% considers free time and holidays as an important factor to outsource shifts. Also the workload during the day (70.7%) is considered to be a primary reason to consider selling shifts. Furthermore the high peak strains as well as the high number of patient contacts are considered to be main strains of GPC shifts.
From this point of view, an increase of patient visits due to integration is not favourable for GPs and does not contribute to the willingness to cooperate on integration with emergency departments. This may prove to be a bottleneck in successful integration with emergency posts in areas with high numbers of self-referrals.

4.3.2 Emergency Department

The Emergency Department is the division of the hospital which has the obligation to provide acute healthcare 24 hours a day throughout the year. In the Netherlands every citizen should be able to reach an emergency department within 45 minutes (Donner, 2005). Also since the hospital has an acute healthcare obligation, all patients visiting the emergency department have to be treated regardless the severity of the medical complaints. A patient can arrive at the ED by ambulance, by referral by a GP or by the aforementioned self-referral. In the healthcare system, the emergency department is considered to be the only supplier of both primary as well as secondary healthcare unlike the GPCs which provide only primary healthcare, or other hospital departments which provide only secondary healthcare.
The emergency department acts as a portal of specialistic healthcare provided in hospitals and has an important role in the financial position of the hospital. Not only the treatments on the ED, but also referrals to other departments and after-care contribute to a large stream of revenues for hospitals. Because of this, hospitals do not mind the (invalid) self-referrals, also since they generate relatively easy revenues for specialists (Mastenbroek & van der Meer, 2004).

Especially this last point proves to be a bottleneck considering the integration of ED with GPCs. Specialists are reluctant towards integration if it affects their revenues.

[4] Confirmed by personal Interviews with General Practitioners at CHPA on 7 January 2013

4.3.3 Patient

For patients the most important thing is the quality and expertise of providers of healthcare. Furthermore ease of access, waiting times and increasingly more important financial aspects of healthcare are considered to be important reasons for patients (Andén, 2005).

The increased insurance risk *(eigen risico)* imposed by the government, increases healthcare expenses for patients. Since primary healthcare (which is provided by the GP Posts) is excluded from insurance risk, patients would benefit from integration when they are correctly referred from EDs, where patients are to be paid insurance risk. Patients will benefit of integration due to the fact that possible cheaper healthcare can be provided by GPCs. If the effects on long term would be significant, this could cut health insurance premiums, since overall healthcare costs are going down as can be seen in the financing streams of the healthcare system. Furthermore integration can provide patients to receive more adequate healthcare, which improves the quality of healthcare received.

4.2 Overall picture incentives towards integration

From the overview, it seems that the regulatory stakeholders seem to encourage integration of EDs with GPCs. Some important players from the operational side however have some conflicting interests. Looking more in detail in what is causing this conflicting interests it appears that a part of acute healthcare patients (outside-office-hours) can be treated both by GP Posts and EDs. However GP Posts are imposed by regulations to be considered to be non-profit, whereas EDs generate (indirect) profits for hospitals.

To rephrase the problem in other terms, consider patients needing out-of-office healthcare to be hungry people wanting to buy hamburgers in order to satisfy their hunger. They have two options, one is buying hamburgers at the ED where their hunger will always be satisfied, except for the fact that hamburgers are much more expensive here. Also they are produced by specialist hamburger makers, who generate more revenues if they sell more hamburgers, since they make a private margin on these hamburgers. The other option is to buy hamburgers at the GP Posts where hamburgers are in general cheaper and produced by GP hamburger makers. Unfortunately for GP hamburger makers they are forced to be employed by GP Posts out-of-office times and are actually earning more money at their daily snack bar over day. Since the hungry customer is not fully aware of the two options, people are buying too expensive burgers compared to their hunger level (self-referrals). By locating and integrating both out-of-office snackbars together, a valid hunger level of the customers can be determined and the appropriate hamburger can be delivered. This will cause a shift of hungry customers towards the GP snackbar, which may result in an average lower price of hamburgers sold. All snack bar authorities think that improving hunger satisfaction effectively should always be considered However, the problem will be unsatisfied hamburger producers, since the specialist hamburger makers lose revenues by selling less hamburgers and the GP hamburger makers have to produce more hamburgers for the same monetary amount and in some cases even would have to work longer at a snack bar which is less profitable than at their own daily snack bar.In order to understand the effects of this change of self-referrals, the logistical conditions, constraints and financial streams will be examined in more detail. In this way changes can be quantified financially.

Section 5. Financial Streams GPSS and ED

In this section first the healthcare financing system in the Netherlands is briefly discussed to understand the implication of possible cost savings by integration. Furthermore the financial streams of a General Practitioners Service Structure (GPSS) and Emergency Departments (EDs) are evaluated and analysed according to the integration .

5.1 Financing Structure Dutch Healthcare system

In Figure 5.1 an overview of the financial streams in the Dutch healthcare system is given. Looking at health care expenditures, the majority of expenditures are being paid directly by Health Care Insurers (HCIs). HCIs pay the Health Care Providers (HCPs) which have given medical services to insured patients. A part of health care expenditures is being paid by the Healthcare Insurance Fund; mainly expenditures which are not beneficial to be contributed to HCIs such as education expenditures or availability expenditures.

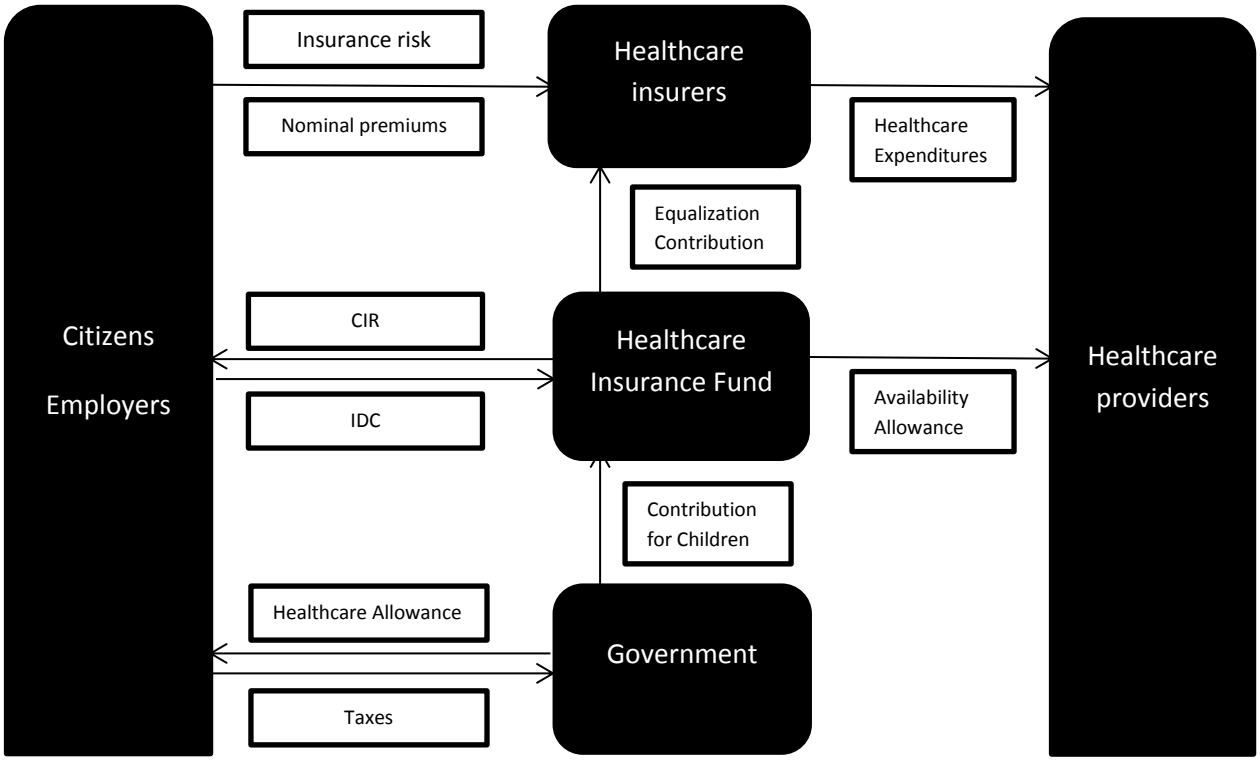


Figure 5.1 Overview Financial Streams Healthcare System[5].

HCIs receive their funds by nominal premiums, insurance risk and own contributions paid by citizens. Furthermore HCIs receive an equalization contribution of the Healthcare Insurance Fund in order to cover a part of the insurance risk.

Looking at the Healthcare Insurance Fund, it receives its funds by government contributions for children (in order to ensure that children are not attributed to nominal premiums) and by income dependant contributions (IDC) of citizens and employers. In return it pays patients compensation for insurance risk (CIR). The government receives taxes and pays healthcare allowance to compensate lower income citizens for nominal premiums.

[5] Source: Rijksbegroting 2013

According to the healthcare insurance law, an increase of healthcare expenditures has to be covered by 50% of the income dependent contributions and 50% by nominal premiums (Rijksoverheid, 2006). Considering this healthcare insurance law, it is evident that decreasing the costs in the healthcare expenditures leads to overall lower expenditures by all parties: Healthcare Insurers cut down on their expenditures, resulting in lower nominal premiums and lower equalisation contributions. This overall affects citizens and employers in the amount of tax paid to cover healthcare costs. Looking from an holistic point of view it can be seen that indirectly all healthcare costs are being paid by citizens and employers.
To model the effect of integration on healthcare expenditures the financial streams of out-of office healthcare providers in this scenario will be examined.

5.2 Determining financial streams GPSS

5.2.1 Budget GPSS

Until the 1st of January 2005 the ministry of Healthcare, Welfare and Sport financed the GP cooperatives through an open-end financing; no fixed budget was allocated and there was no maximum posed on the costs of GP cooperatives. In order to be more cost efficient this has changed to a budget allocation.

The budget of the GPSS is determined by the agreed amount per citizen multiplied by the number of served citizens in covering area of the GPSS (NZA, 2011).

The agreed fixed amount per citizen consists of three components:

- (fixed) Base amount.
- Module rural area.
- Module Healthcare consumption.

A GPSS in a rural area can receive extra budget in the form of the module rural ares. Data of the CBS (*Centraal Bureau voor de Statistiek*) are used to determine the rural area factor. The number of citizens living in rural area (<70.000 citizens in a habitant cluster) as a ratio of the total served citizens of the GPSS determine the rural area factor (NZA, 2011).

Also a GPSS can receive extra budget per citizen based on the amount of healthcare consumption. The number of consult units, calculated by a sum of: the telephone consults multiplied by 0.5, the number of consults multiplied by 1.0 and the amount of visitations multiplied by 1.5, determines the amount of healthcare consumption. A GPSS receives this module if the healthcare consumption is at least 14 consult units per 100 citizens (NZA, 2011).

5.2.2 Revenues GPSS

General Practitioners Service Structures (GPSS) can generate revenues through performance of medical acts through three ways of medical acts:

- Telephone Consults;
  A telephone consult is considered to be the case, when a patient receives a solution for a new medical complaint through telephonic contact. The patient is not examined, after elaboration of the complaint a solution is given by doctors' assistants under the supervision of a general practitioner
- Consult at General Practitioners Post;
  If a patient cannot receive a telephonic solution for the medical compliant, the patient must be examined in order to provide a possible solution. The patient visits the GPSS for a consult. This consult is performed by a GP or Physician Assistant.
- Visitation at patient;
  If a patient cannot receive a telephonic solution for the medical compliant, the patient must be examined in order to provide a possible solution. However when the patient is not able to visit the GPSS , the GP visits the patient for a consult.

A more detailed overview of how exactly the tariffs are determined according to the Nederlandse Zorg Autoriteit can be found in Appendix A.

5.2.3 Costs GPSS

Looking at the costs of general practitioner service systems, it appears that there are several (large) cost posts:

- Salary costs GPs;
  In order to provide healthcare, the use of GPs and extra nurse practitioners contribute to approximately 40% of the total GPSS costs. Also external visitations are considered to be Salary costs. Salary costs are per time unit.
- Personnel /management costs;
  This post consists of the assisting personnel as well as the management. Also the board of supervisors contributes to this post. These costs contribute to approximately 30% of the total GPSS costs.
- Accommodation, Transportation, PR and information and other costs;
  The GPSS has costs in terms of accommodation, transportation costs of the visitations, costs to maintain the website and call centre and other costs like expenditures on medical supplies.

5.2.4 Financial Motives GPSS

GPSS have been established to provide primary healthcare out-of-office hours and are not intended to generate profits. In order to make the primary out-of-office healthcare more efficient on the cost side the NZa imposes the GPSS to have a financial post of Reserve Acceptable Costs *(Reserve Aanvaardbare Kosten (RAK))*on the balance sheet (NZA, 2011). This post allows GPSS to over/underspend up to margins of 10% of the annual revenues. If the RAK exceeds this amount, the excess will be discounted in the tariffs two years after.

5.3 Determining financial streams EDs

5.3.1 Budget EDs

In 2005 the hospital budgeting system switched from a fixed budget model to a case-based fund funding by introduction of the Diagnosis Treatment Combinations (DTC). A case-based system is a funding scheme where all health services provided to a patient are bundled and classified into a group according to medical costs (Jegers et al. 2002). The advantages of DTCs are that within a given case, there are no incentives to provide unnecessary services and there is cost-control per case. However there are some downsides such as making unnecessary cases, or choosing the most lucrative treatment (SIlverman & Skinner, 2001).

Also the DTC system has been considered to be too complex. Since the level of detail of treatments is so high a problem is that there are too many DTCs while only a small portion of the DTCs are used in practice (Hasaart, 2011). Furthermore DTCs are not harmonized across specialities resulting in different costs for similar treatments performed by different medical specialists. To overcome these problems per 2012 a new system is introduced: DTCs on their way to Transparency (DOT).
The goal of DOT is to increase transparency, medical recognisability, stability and openness to innovation and to reduce the aforementioned complexity of the DTC system.

Furthermore, since the 1st of January 2012 hospitals do not receive fixed DTC budgets as before, but the budget is being negotiated in terms of quality, price and volume with healthcare insurers. The NZa has enforced this performance based budgeting in order to ensure good market competition in the healthcare market (NZA, 2012).

Looking specifically at the ED, the minister budgets healthcare mainly by the liberalized segment and partly by a fixed segment. This means that if the costs of an ED cannot be covered by the generated DTCs, the government will cover the excess of costs to ensure availability of the ED (Schippers, 2011).

5.3.2 Revenues EDs

The emergency department acts as a very important gateway for the hospital: ED visits generate 18 per cent of hospital admissions (Blank et al., 2013). However in practice the revenues generated at the ED are generally contributed to medical specialism of the performer of DTCs. This is the main reason why EDs are considered to be a cost-only division.

To allocate the revenues of patients the Dutch healthcare system uses DTCs to determine the price of a treatment of patients. This is considered to be so-called healthcare products which comprise all medical acts to treat the patient with a healthcare demand. The qualification of DTC is based on the performed medical acts in combination with the diagnosed healthcare demand (DBC Leergang, 2013). There are two types of DOTs: the regulated A-segment DTCs and liberalized B-Segment DTCs. Within the DTCs there are two components, a hospital component and a fee component to be paid to the medical specialists. For both types of DTCs fees of medical specialists are centrally regulated by the NZa. Due to the general scarcity of medical specialists, liberalization could result in a cost explosion (Nederlandse Zorgautoriteit, 2011). For the A-segment DTCs the hospital component is fixed and determined by the NZa, for the liberalized B-Segment prices are negotiable with healthcare insurers to provide more competition.

5.3.3 Costs EDs

Looking at the cost structure of EDs we can determine the following posts:

- Salary Nurses;
  In order to provide healthcare, the use of Nurses are the largest cost post and contribute to approximately 60% of the total ED costs.
- Supporting Staff;
  This post consists of the assisting personnel such as secretaries as well as the management.
- Materials;
  This post considers costs which are allocated using medical materials. Materials can be instrumentation materials (i.e gloves) or patient related materials (i.e bandages)
- General Costs;
  Costs under this post are expenses such as office supplies, food and beverages and general operational costs

Costs of specialists are being covered by the revenues generated by DTCs and therefore are not attributed as costs of the emergency department.

5.3.4 Financial Motives EDs

Different from most other European countries, hospitals in the Netherlands with profit-incentives have never existed due to regulations until 2006. However in order to ensure more market competition profits generated by hospitals are tolerated although distribution of profits is still a sensitive discussion (Jeurissen, 2010). From a general point of view it is important for hospitals to attract capital for financing. Therefore financial attractiveness is important especially considering the increased liberalized competition in the healthcare market. As stated before, EDs are considered to be a cost-well since revenues are not allocated. The aim of ED management is to operate as cost-efficient as possible, while still being able to provide the availability function (Roos & Kreemers, 2008).

5.4 Financial Regulations due to integration

When a GPSS post would form a collaboration with an emergency department this would result in changes in the financial streams. Since the NZa realizes integration results in extra patient streams and which could potentially mean that the estimated budget will be exceeded by 110%. For a GPSS post it is allowed to exceed the budget if the following conditions are met (NZA, 2011):

- The GPSS has an agreement with the ED/hospitals health care insurer where the transfer of patient streams from the 2nd line towards the 1st line is recorded.
- The GPSS has no other option than to commit extra GPs in order to moderate extra patient streams.
- In consultation with ED-hospital the GPSS can prove the representing healthcare insurance that the extra costs coinciding with the transfer of patients from the 2nd line results in at least a same decrease of costs on the self-referrals on the 2nd line.
- The GPSS has bounded its own participating GPs contractually to the number of out-of-office hours GP care. This amount covers at least the out-of-office care which is provided to patients of the corresponding GP and has not shown a declining trend last years. The supplementary healthcare to be provided will be the patient stream from the 2nd line.

- The GPSS has an agreement with the preferent (*largest contracted*) healthcare insurer about the volume and tariffs for the additional GP healthcare. For this additional GP healthcare an extra rate of maximal €15 upon the out-of-office care rate of €65 can be agreed on. The GP can only account for this raise if there is an agreement with the representing healthcare insurers concerning the volume and tariff.
- The representing healthcare insurers monitor the enforcement of the above conditions.

5.5 Change of financial streams due to integration

Looking at the patient flow change after integration, the following changes will occur due to the shift of self-referrals:

- The GP post will have an increased number of patients for consultation and may have to allocate additional labour in order to meet time terms.
- The emergency department will have a decreased amount of patients and may possibly reduce labour.
- The extra number of patients at the GP Post generates a different revenue stream depending on the number of patients and the consult tariff based on the new cost-structure.

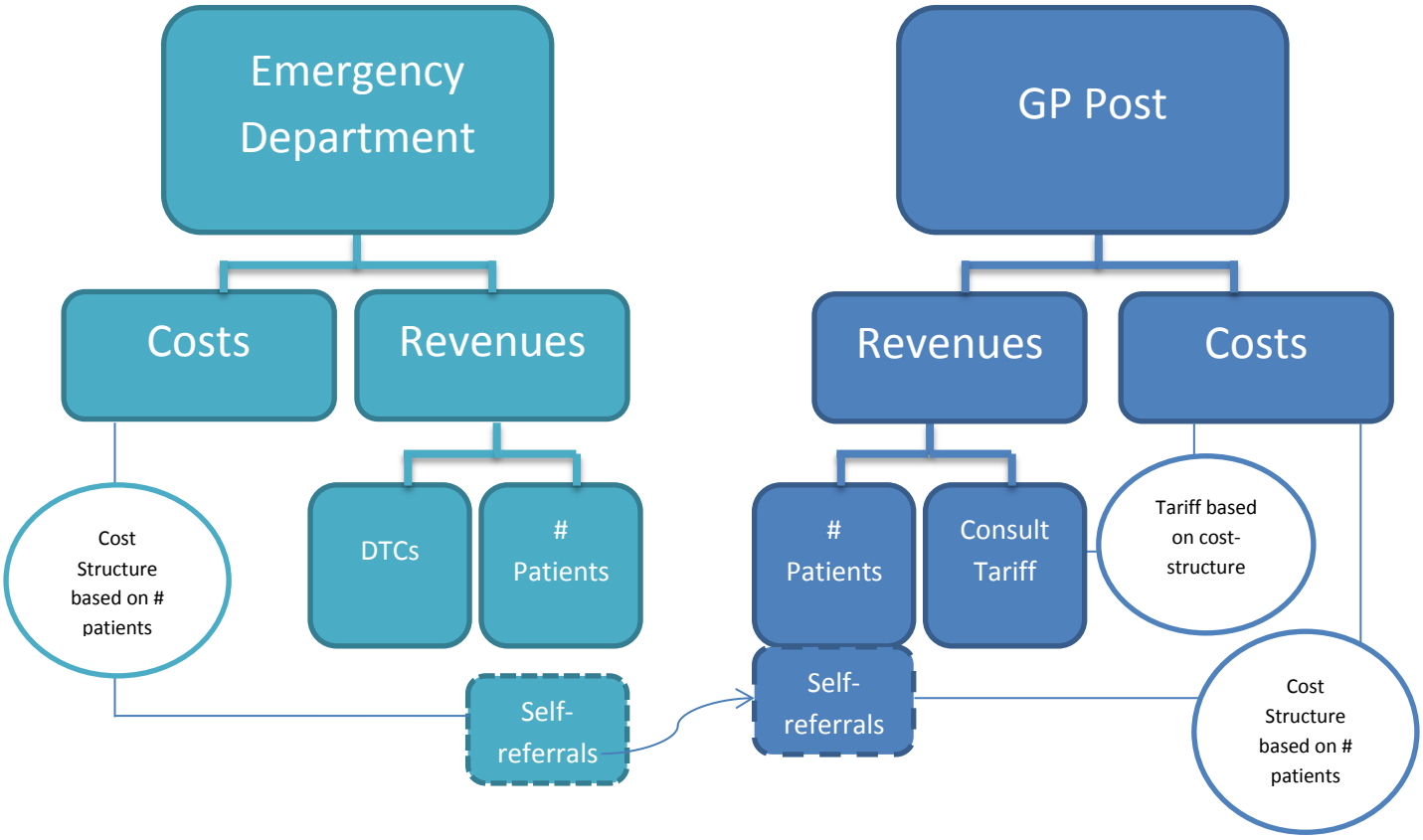


Figure 5.2 Schematic overview changes financial streams due to integration.

Translating this to financial streams it is important to model the following changes more in detail:

- Qualify and quantify the various patient paths and linking the patient paths to revenues generated.
- Quantify the increase/decrease in labour force according to the logistical restrictions of the various parties.
- Quantify the change in revenues of GP Posts according to changed cost structure and changed revenue streams accordingly.
- Quantify the prices of DTCs as function of different patient groups so that the model can be applied according to different self-referral (patient) populations.

Section 6. Financial model for Integration Acute healthcare

In this section, the patient paths in integrated emergency posts will be pictured and the logistical conditions required for integration are examined. Furthermore the foundations of the model assumptions based on both regulatory as well as empirical boundaries are being discussed to give an insight on how financial changes are modelled. Input for the model can be adjusted by users, however to provide a basic template all examples given are based on (historical) data of the situation at CHPA/ZGT Almelo.

Looking at the patient flow change after integration, the following financial changes will occur:

- The GP post will have an increased amount of patients for consultation and has to allocate additional labour in order to meet time terms.
- The emergency department will have a decreased amount of patients and can reduce labour.

To quantify these changes, a financial model has to be build considering the restrictions taking the increase of self-referrals into account. In this thesis we will distinguish the changes in financial effects for both the GP Post as well as the ED to be able to compare effects from an holistic point of view.

Depending on the various parameters, financial streams may be altered after integration. As input for the model it is important to understand the current patient parameters for both the GP Post and the ED to understand the patient streams. In terms of understanding the logistical effects, the current GP Post roster have to be inserted to examine the logistical restrictions. Furthermore the financial structures pre-integration are affected and thus have to be modelled as inputs as well.

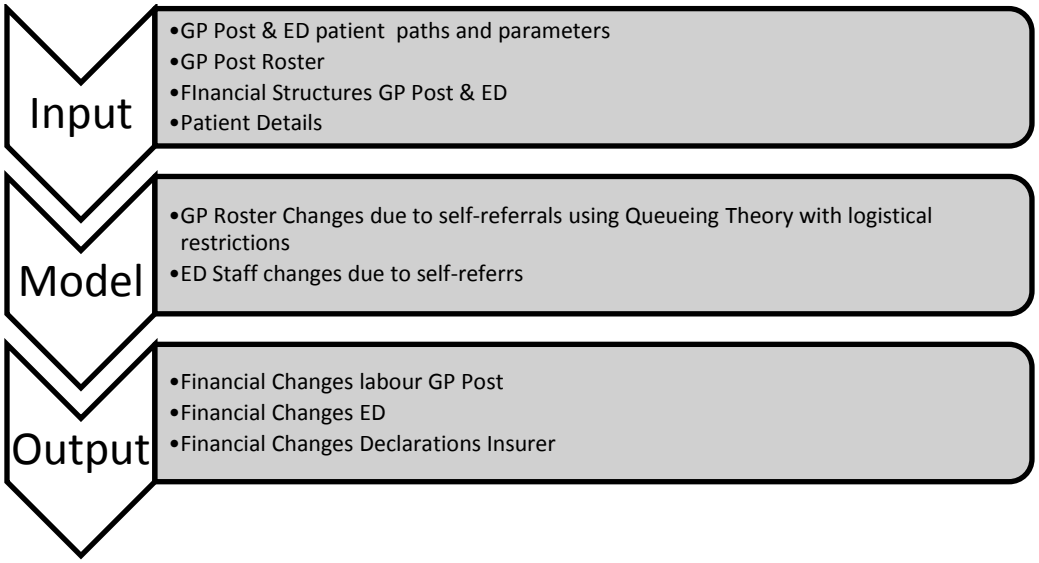


Figure 6.1 Schematic Model.

6.1 Patient paths

The most important logistic change of integration is that self-referrals are triaged at the GP Post and only are being referred to the ED if needed. Also by integration the travel distance is being minimized in case of referral to ED since both organizations are located together (Bruens et al., 2013).

After integration, different patient paths are possible in the IEP (Mes & Bruens, 2012). Figure 6.2 depicts possible patient paths d the financial differences after integration can be examined. The situation of integration is depicted where the situation of Almelo is considered for integration.

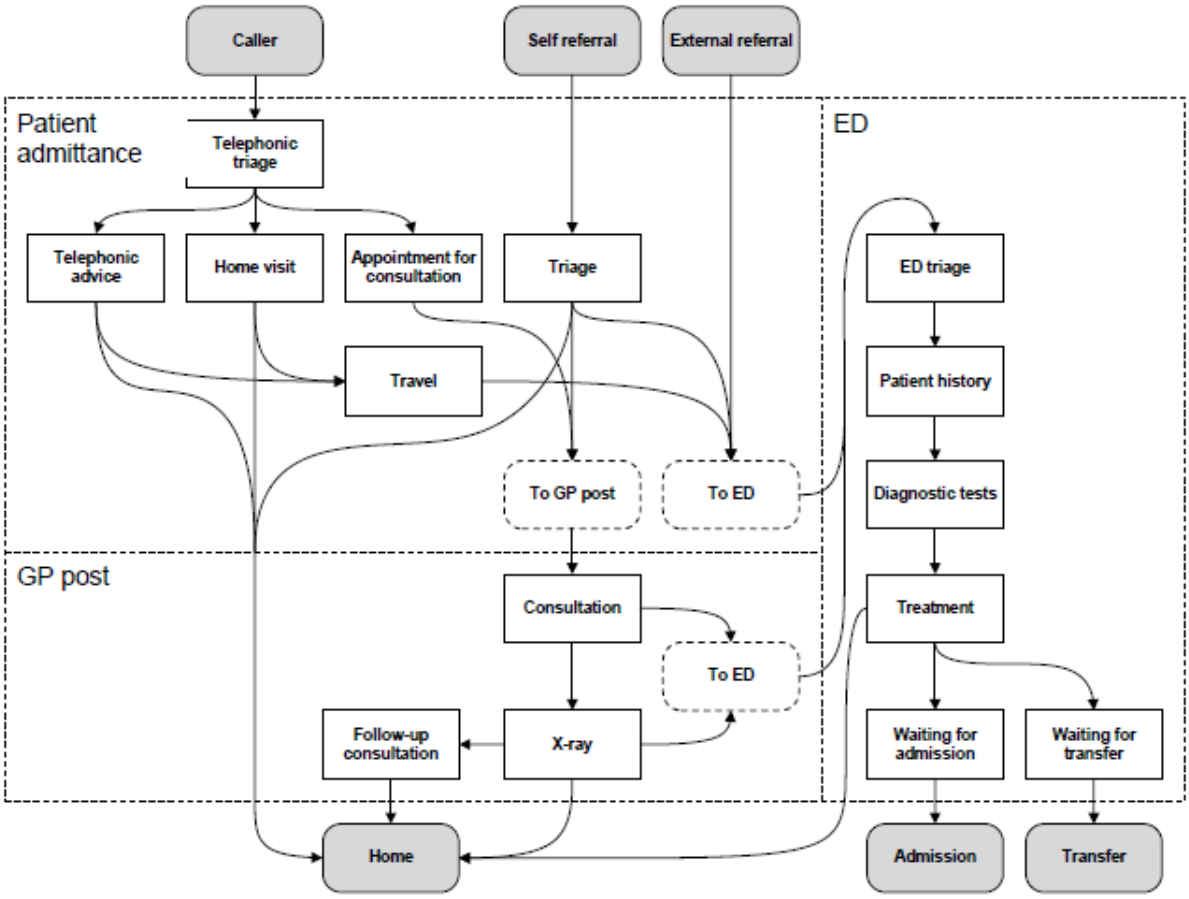


Figure 6.2 Flowchart of patient paths for an Integrated Emergency Post (Mes & Bruens, 2012).

In Table 5.1 an example of patient distribution is given for the situation in Almelo. The total number of patients is the number of patients arriving either by self-referral or patients who have called to the GP Post. The external referrals are left out of consideration since they are not affected by integration.

	Patient Path	Relative Percentage patients[6]
A1	Self-Referral – Triage - ED	0.1%
A2	Self-Referral – Triage - Home	0.5%
A3	Self-Referral – Triage – Consultation at GP Post	5.2%
A4	Celler – Telephonic Triage – Telephonic Advice - Home	39.4%
A5	Celler –Telephonic Triage – Telephonic Advice- ED	1.2%
A6	Celler – Telephonic Triage – Visit - Home	11.5%
A7	Celler – Telephonic Triage – Visit - ED	0.5%
A8	Celler – Telephonic Triage – Consultation at GP Post	41.6%
		100.0%

Table 6.1 Patient paths with relative percentages IEP.

Considering these paths it can be easily seen that path A3 will be the path that shows the increased consults at the GP Post due to integration, assuming that self-referrals would have visited the ED else. In terms of the model, it is thus important to generate the expected distribution of self-referrals to understand how many extra triages and extra GP consults are to be performed.
Self-referrals who are triaged and sent home (A2) are financially considered to have gotten a GP consult and this will be taken into consideration concerning financial streams.

Expected Distribution Self-referrals		**%**	***Absolute number***[7]
A1	Self-referrals to ED after triage	2.0	54
A1	Self-referrals to home after triage	8.0	216
A1	Self-referrals to GP consult after triage	90.0	2430

Table 6.2 Example of Expected Distribution Self-Referrals (Almelo Case 2011).

Apart from the self-referrals who are sent to the ED direct after triage, also patients who are sent to the ED after a GP consult have to be considered. After a Consult there are 4 different possible paths:

	Patient Path	Relative Percentage patients
B1	Consultation at GP Post - Home	76.5%
B2	Consultation at GP Post – X-ray – Follow-up consult GP -Home	8.8%
B3	Consultation at GP Post – X-ray - ED	5.7%
B4	Consultation at GP Post - ED	9.0%
		100.0%

Table 6.3 Example of Expected follow-up Distribution of GP consults (Almelo Case 2011).

This percentage may vary per location depending on various factors such as ease of access of making x-ray photo's. In Almelo the percentage of patients visiting the ED after a GP consult is 14.7% (Visser, 2011). For the self-referrals who end up at the ED after a GP consult, double billings are made since in the non-integrated situation they would not have received a GP consult.

It appears there are no changes in types of patients entering the ED after integration, although there is a rising trend of increased referrals by GPs towards the ED (Bruens et al., 2013).

[6] Based on data CHPA 2011
[7] Historical numbers over 2011 Almelo

6.2 Logistical realizations

From the number of self-referrals and the expected distribution of self-referrals the increase of GP consults can be determined. In the model it is assumed that the distribution of arrival times of the self-referrals is similar to the current patient arrival distribution. In Appendix A an example of a patient arrival distribution is given.

In order to understand how many extra labour must be allocated at the GP Post to ensure healthcare to be effective, a sound understanding of the waiting times for patients has to be established.

Looking at the situation of the GP post, it can be assumed that none of the patients will be rejected and that in case all GPs and PAs are occupied the patients will be queued. Using theory of the Erlang Delay System (Cooper, 1981) the average waiting times of consults can be determined for different GP Post and patient parameters.

The Erlang –C function describes queuing situations where people are never rejected and do not leave by themselves. The probability of queuing of a patient is given by:

$$C(s,a) = \frac{a^s}{(s-1)!\,(s-a)}\left[\sum_{j=0}^{s-1}\frac{a^j}{j!} + \frac{a^s}{(s-1)!\,(s-a)}\right]^{-1} \qquad (1)$$

Where *s* is the number of agents and *a* is the so-called total system load. The system load *a* can be described as the ability of the system to deal with incoming requests (treatments) which can be expressed by the expected treatment time of patients, *E (T)*, multiplied by the expected number of patients for one agent, *E(N)*. In the model we assume GPs and PAs are treating patients similarly and take 10 minutes for every consult. The expected number of patients is given by the arrival distribution.

By using the Erlang-C function the probability of a particular waiting time can be determined for the patients (Cooper, 1981).

$$P(W_q \le t) = 1 - C(s,a) * e^{-(a-\lambda)\frac{t}{T_s}} \qquad (2)$$

Where λ is the patient treatment intensity given by treatments/time unit multiplied by the estimated duration of the treatment and T_s is estimated treatment time.

In order to compare the increased load in the model we will use the expected waiting time of patients which is given by:

$$E(W_q) = \frac{C(s,a)}{sa-\lambda} \qquad (3)$$

Important is that the arrival times of patients assumed to follow a Poisson distribution. Furthermore we assume each hour the average number of patients arriving differs, especially considering differences between weekdays and weekends. Also all weeks of the year are considered to be equal so abnormal patterns of arrivals due to holidays or unexpected events (pandemics) are excluded. An example of a patient arrival distribution can be found in Appendix B.

Combining patient distribution and the according number of agents based on the GP roster, adjusted expected waiting times can be simulated for integrated situations. In Figure 6.3 a model example is given of the increased average waiting time for patients needing a GP consult.

Saturday	Consults per hour(old situation)	Consults per hour (new)	Consult Intensity old (per hour)	Consult Intensity new (per Hour)	GP+PA Occupancy (old)	GP+PA Occupancy (new)	Erlang C old	Erlang C new	Average Waiting time patient(old) in minutes	Average Waiting time patient (new) in minutes	Adjusted Waiting times (extra GP)	Adjusted Waiting Time Increase (minutes)
0:00	1,987	2,330	0,331	0,388	0,166	0,194	0,442	0,503	15,890	18,723	18,723	2,834
1:00	1,432	1,680	0,239	0,280	0,119	0,140	0,324	0,380	11,032	13,247	13,247	2,215
2:00	1,345	1,578	0,224	0,263	0,112	0,131	0,303	0,357	10,234	12,340	12,340	2,107
3:00	0,960	1,126	0,160	0,188	0,080	0,094	0,204	0,248	6,638	8,197	8,197	1,559
4:00	0,888	1,042	0,148	0,174	0,074	0,087	0,184	0,225	5,964	7,405	7,405	1,441
5:00	0,811	0,951	0,135	0,159	0,068	0,079	0,163	0,201	5,246	6,556	6,556	1,309
6:00	1,273	1,493	0,212	0,249	0,106	0,124	0,285	0,338	9,570	11,584	11,584	2,014
7:00	3,881	4,552	0,647	0,759	0,323	0,379	0,695	0,750	30,827	36,272	24,181	-6,646
8:00	11,690	13,711	1,948	2,285	0,649	0,762	0,904	0,943	51,557	79,153	47,492	-4,065
9:00	15,274	17,913	2,546	2,986	0,636	0,746	0,896	0,937	36,951	55,420	36,947	-0,004
10:00	16,527	19,383	2,754	3,230	0,551	0,646	0,851	0,898	22,731	30,454	25,378	2,648
11:00	13,960	16,372	2,327	2,729	0,465	0,546	0,794	0,848	17,813	22,393	22,393	4,581
12:00	12,805	15,017	2,134	2,503	0,356	0,417	0,682	0,749	10,582	12,844	12,844	2,263
13:00	11,998	14,072	2,000	2,345	0,333	0,391	0,653	0,722	9,788	11,856	11,856	2,068
14:00	10,977	12,874	1,829	2,146	0,305	0,358	0,611	0,684	8,790	10,650	10,650	1,860
15:00	10,664	12,506	1,777	2,084	0,296	0,347	0,597	0,671	8,483	10,287	10,287	1,804
16:00	11,090	13,006	1,848	2,168	0,308	0,361	0,616	0,689	8,900	10,782	10,782	1,881
17:00	11,018	12,922	1,836	2,154	0,367	0,431	0,702	0,765	13,305	16,129	16,129	2,824
18:00	10,417	12,217	1,736	2,036	0,434	0,509	0,773	0,828	20,497	25,309	25,309	4,812
19:00	9,498	11,139	1,583	1,857	0,396	0,464	0,739	0,797	18,340	22,316	22,316	3,976
20:00	7,999	9,381	1,333	1,564	0,333	0,391	0,670	0,734	15,063	18,076	18,076	3,013
21:00	6,982	8,189	1,164	1,365	0,291	0,341	0,611	0,679	12,916	15,468	15,468	2,552
22:00	5,211	6,112	0,869	1,019	0,217	0,255	0,475	0,550	9,102	11,067	11,067	1,965
23:00	3,584	4,203	0,597	0,700	0,299	0,350	0,666	0,723	28,503	33,390	33,390	4,887

Figure 6.3 Model snapshot of Erlang-C Average Patient Waiting times

By modelling the new expected waiting times for the increased patient stream, an indication for extra “agents” can be determined by putting restrictions on the maximum waiting time. Looking at the various patient streams, there are four categories of patient severity with specific treatment procedures. The four categories are (Giesen & Mokkink, 2005):

- U1: **Life threatening**, vital functions of the patient are in (extreme) danger. Patient needs to be seen as soon as possible, patient target treatment time: 15 minutes.
- U2: **Urgent**, complaints of patients where there is a high probability that the situation of patient deteriorates and condition of vital functions may be at risk, patient target treatment time: 60 minutes.
- U3: **Pressing**, Time may have a potentially negative role due to medical or emotional grounds. Patient target treatment time: 180 minutes.
- U4 **Routine,** no time pressure, no patient target treatment time.

Based on historical data we can look at the urgency distribution of self-referrals to get a sense of extra patient distribution. In Table 5.3 an overview is given of the urgency distribution of self-referrals receiving a GP Consult.

Urgency Distribution Self-Referrals Consult	Percentage urgencies (%)	Absolute number
U1	0,23	12
U2	6,79	352
U3	42,82	2220
U4	50,16	2600
		5184

Table 6.4 Urgency Distribution Self-Referrals receiving GP Consults on yearly base[8].

In order to provide efficient healthcare, the urgency at arrival of a patient determines treatment preference trying to meet target treatment times of patients. Therefore it is important to know how the extra patient streams due to integration affect the average waiting times of GP consults.

Practice simulation models (such as Mes & Bruens (2012)) may be used to determine precise allocation of extra labour according to waiting times based on urgency, but to generally approach the financial implications for different integrations we will make use of the Erlang-C function.

The extra allocation of GP workload can be adjusted according to preferences of the user, for analysis of the different financial streams for different patient parameters we assume that GP Posts are practically meeting target times of the different patient arrivals. Assuming the expected treatment time of a GP consult is 10 minutes, the threshold for additional labour is set at an absolute amount of 5 minutes extra waiting time based on the increased patient streams.

To simulate the change in cost structure in the model hypothetically the GP Post and the ED have not integrated yet and integration will show a change in cost structure. As by the regulatory rules the amount of GP labour hours will be charged at €65/hour, only in the first year after integration the tariff will be at €80/hour in case extra hours GP labour are needed due to integration.

At the ED there are no regulatory restrictions in terms of minimum occupancy of nurses/personnel, provided that healthcare can be provided at all times. However there is a rule of thumb SEH managers use to determine the amount of labour which is that for every 1000 patients on yearly basis, 1 FTE is allocated.[9] In the model this decrease is taken into consideration.

As stated before, the revenues are contributed to the medical specialists performing the DTCs, therefore the remuneration costs of these specialists are also contributed by amount of DTCs in this thesis. We consider all specialists performing DTCs at the ED to be independent practitioners. The effect of a SEH specialist on financial streams will be covered in the financial results in Section 7.

[8] Data CHAP 2011; Absolute numbers based on Almelo simulation: 18.000 ED visits and 32% self-referrals
[9] Interviews operational and business Managers SEH Almelo/Hengelo 28th May 2013

To determine the remuneration of specialists per DTC at the emergency department, the average remuneration percentage is calculated based on the average of DTCs in the A-Segment given by the NZa. Furthermore there are another two factors influencing the financial effect of DTCs:

- Patient population may vary resulting in different DTCs declared by self-referrals.
- Negotiable prices in the liberalized B-segment may also lead to different prices of DTCs declared by self-referrals.

In order to quantify the DTC tariffs of self-referrals can be analysed, however due to confidentiality issues no patient data are provided yet. Therefore for the average DTC price we use the amount of €256,50 found by Giesbers et al. (2011). Important is to note that these numbers are generated in an academic hospital. To overcome potential discrepancies in DTC tariffs for peripheral hospitals, in the model users can adjust patient details to refine DTC tariffs. However since DTc prices are based on national regulated A-segment tariffs in this research we do not expect much difference in location specific DTC tariffs.

In Figure 6.4 an overview is given on how the above mentioned data is applied towards integration.

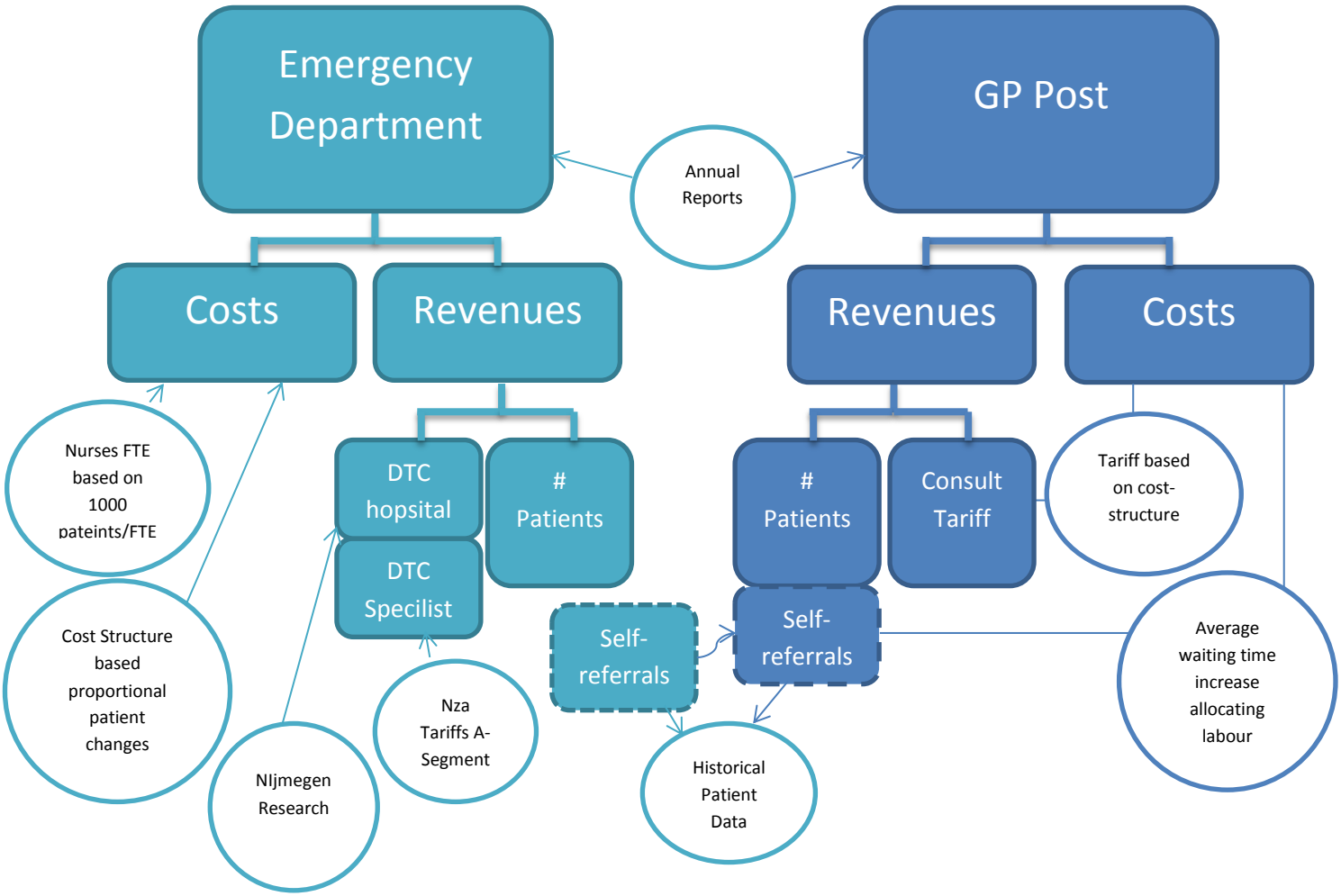


Figure 6.4 Overview of data input for model.

6.3 Model Description

To generate insights and results in the financial streams with the above mentioned restrictions and regulations due to integration, an according model is developed. The model can be used to examine financial effects due to shift in patient streams. Specific synergy advantages due to integration are not taken into consideration. Microsoft Excel has been used as a software tool to generate the model. Looking at the model, there are 8 tabs:

- Generic Overview
- Roster GP Post
- Salary Nurses
- Remuneration Specialists
- Patient Details
- Structure GP Post
- Structure ED
- Holistic Effects

The first 5 tabs contain user-input parameter cells and the remaining 3 tabs generate output only. In the model all navy-coloured cells are adjustable as input and will result in coinciding changes in other cells. A short summary is given in how the model translates logistical restrictions into financial output streams and how the user can apply changes in the input tabs. With given input, output is generated based on rules and regulations discussed in Section 5.

Generic Overview

In the generic overview tab, general patient parameters can be filled in the navy-blue Cells and adjusted accordingly. Patient numbers are inserted on yearly basis. In order to examine the extra workload considering GP Consults the patient arrival rates per hour have to be inserted. Data for patient arrival dates can be found in the patient monitoring database systems. A screenshot of the patient parameters can be seen in Figure 6.5.

The standard template are parameters based on empirical historical data of the case in Almelo.

Patient Parameters

Parameters Before Integration		
Number of patients Emergency Department	18000	
		Absolute number
Percentage Self-referrals (%)	32	5760

Expected Distribution Selfreferrals in %		*Absolute number*
Self-referrals to ED after triage (A1)	2	115
Self-referrals to home after triage (A2)	8	461
Self-referrals to GP consult after triage (A3)	90	5184

Expected Urgency Distribution Self-Referrals Consult in %	*Percentage urgencies (%)*	*Absolute number*
U1	0,23	12
U2	6,79	352
U3	42,82	2220
U4	50,16	2600
		5184

Expected Distribution Patients after GP Consult		
GP Consults needing X-ray and visiting ED (B3)	5,7	295
GP Consults visiting ED (B4)	9	467
Percentage of GP consults to ED (B3&B4) in %	14,70	762

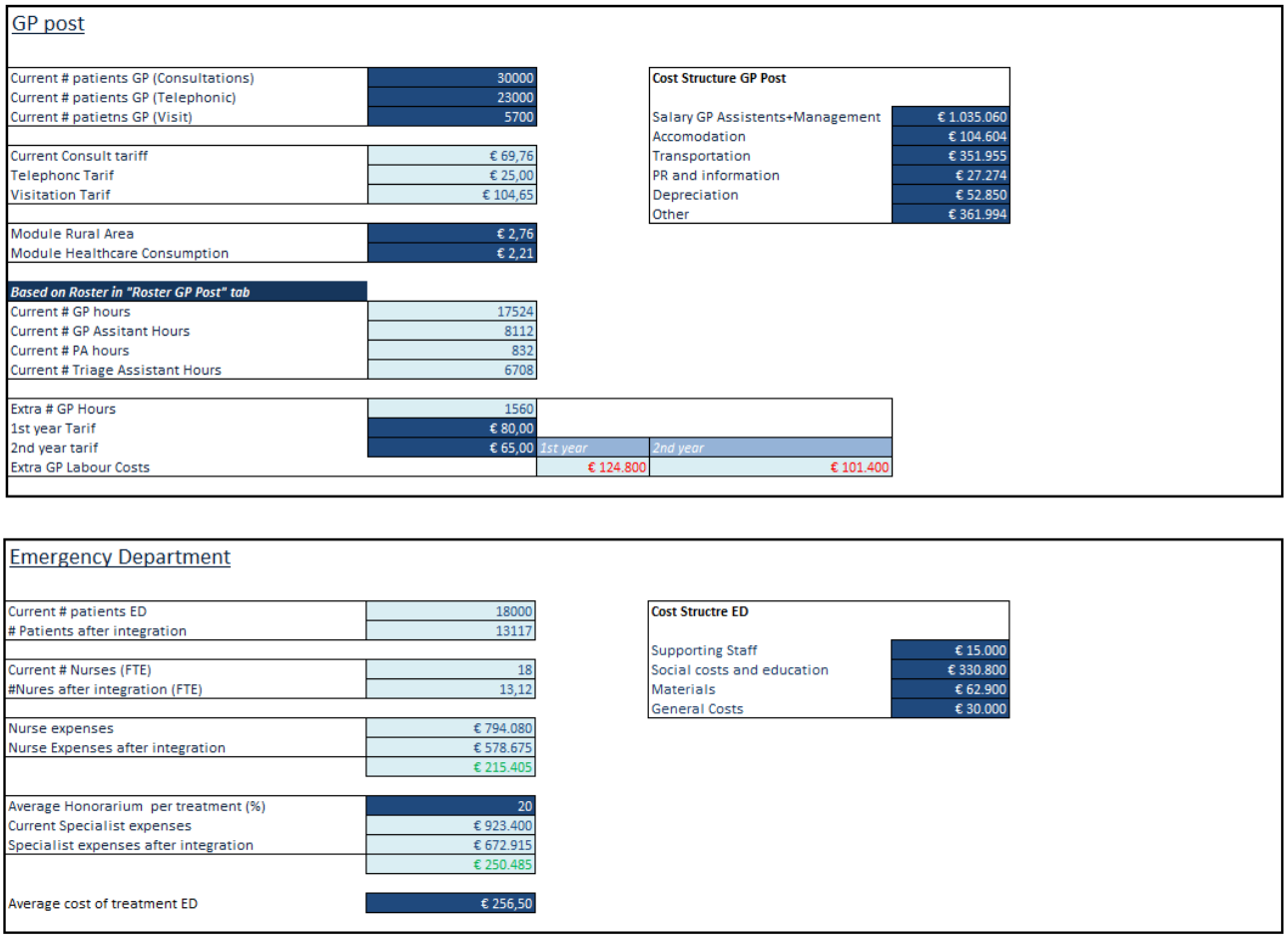
Patient Arrival Rates per hour

	Weekdays	Saturday	Sunday
0:00	3,13	3,87	4,29
1:00	2,37	2,79	3,9
2:00	1,9	2,62	3,33
3:00	1,67	1,87	2,75
4:00	1,33	1,73	2,19
5:00	1,29	1,58	2,71
6:00	1,27	2,48	2,56
7:00	1,34	7,56	6,56
8:00	-	22,77	15,75
9:00	-	29,75	22,12
10:00	-	32,19	23,41
11:00	-	27,19	24,42
12:00	-	24,94	23,1
13:00	-	23,37	20,73
14:00	-	21,38	16,87
15:00	-	20,77	14,62
16:00	-	21,6	16,21
17:00	13,41	21,46	16,33
18:00	15,89	20,29	16,79
19:00	14,91	18,5	14,77
20:00	12,65	15,58	12,73
21:00	11,17	13,6	10,9
22:00	8,16	10,15	8,15
23:00	5,15	6,98	5,29

Figure 6.5 Patient Parameters in the model.

To examine the effect of integration, it is important to understand the current financial structures of both entities. Therefore the financial structures have to be inserted accordingly. For financial data, annual reports can be used to determine numbers of patients and the various cost posts. For the Emergency Department annual budgets can be used to allocate the various cost posts.

In order to calculate the consult tariff, the extra allowances which vary per region can be inserted as well. The module Rural Area and Module Healthcare consumption can be found in the tariff requests issued by the NZa.



GP post

Current # patients GP (Consultations)	30000
Current # patients GP (Telephonic)	23000
Current # patietns GP (Visit)	5700
Current Consult tariff	€ 69,76
Telephonc Tarif	€ 25,00
Visitation Tarif	€ 104,65
Module Rural Area	€ 2,76
Module Healthcare Consumption	€ 2,21
Based on Roster in "Roster GP Post" tab	
Current # GP hours	17524
Current # GP Assitant Hours	8112
Current # PA hours	832
Current # Triage Assistant Hours	6708
Extra # GP Hours	1560
1st year Tarif	€ 80,00
2nd year tarif	€ 65,00
Extra GP Labour Costs	1st year: € 124.800 / 2nd year: € 101.400

Cost Structure GP Post	
Salary GP Assistents+Management	€ 1.035.060
Accomodation	€ 104.604
Transportation	€ 351.955
PR and information	€ 27.274
Depreciation	€ 52.850
Other	€ 361.994

Emergency Department

Current # patients ED	18000
# Patients after integration	13117
Current # Nurses (FTE)	18
#Nures after integration (FTE)	13,12
Nurse expenses	€ 794.080
Nurse Expenses after integration	€ 578.675
	€ 215.405
Average Honorarium per treatment (%)	20
Current Specialist expenses	€ 923.400
Specialist expenses after integration	€ 672.915
	€ 250.485
Average cost of treatment ED	€ 256,50

Cost Structre ED	
Supporting Staff	€ 15.000
Social costs and education	€ 330.800
Materials	€ 62.900
General Costs	€ 30.000

Figure 6.6 Financial parameters GP Post and Emergency Department.

Roster GP Post

In this tab, the GP Roster as depicted in Appendix E can be filled in to determine the occupancy of the various actors pre-integration. Since as a results of self-referrals only GP consults are considered, the effect of extra consults is generated using Erlang-C to determine the time implications for patients. Using the patient distributions and number of self-referrals Average waiting times for GP consults can be depicted. The column *"Average Waiting Time patient (old)"* indicates the average waiting time of patients for a GP Consult pre-integration. The column *"Average Waiting Time Patient (new)"* indicates the average waiting time of patients for a GP Consult ante-integration without additional GP labour. Finally the *"Adjusted Waiting times (extra GP) "* column depicts the waiting time in case extra GP labour is added to overcome additional waiting times.

In the coloured *"Adjusted Waiting Time Increase (minutes)"* the effect of extra waiting time for GP consults is shown according to the total amount of available actors performing GP consults.

By examining the *"Adjusted Waiting time Increase"* users can allocate additional GP labour accordingly based on (practical) preferences in the column *"Extra GP labour"*. The colour scheme is an indication of how severe average waiting times for patients are affected based on the available actors. Furthermore user can also allocate extra PA Labour in the column *"Extra PA labour".* Also the extra GP Assistant hours can be allocated according to preferences in the *"Extra GP ass. Labour".* In Figure 6.7 an example of a possible allocation of extra labour based on patient streams is given. In order to calculate the financial effects of the total number of hours, a timeframe of 52 weeks is being considered. User can define different allocation for Weekdays, Saturdays and Sundays based on workload.

Saturday	GP	PA	Extra GP labour	Average Waiting time patient(old) in minutes	Average Waiting time patient (new) in minutes	Adjusted Waiting times (extra GP)	Adjusted Waiting Time Increase (minutes)	Adjusted Waiting time increase (%)
0:00	2	0	0	15,890	18,723	18,723	2,834	17,83%
1:00	2	0	0	11,032	13,247	13,247	2,215	20,08%
2:00	2	0	0	10,234	12,340	12,340	2,107	20,58%
3:00	2	0	0	6,638	8,197	8,197	1,559	23,49%
4:00	2	0	0	5,964	7,405	7,405	1,441	24,17%
5:00	2	0	0	5,246	6,556	6,556	1,309	24,96%
6:00	2	0	0	9,570	11,584	11,584	2,014	21,04%
7:00	2	0	1	30,827	36,272	24,181	-6,646	-21,56%
8:00	3	0	2	51,557	79,153	47,492	-4,065	-7,88%
9:00	4	0	2	36,951	55,420	36,947	-0,004	-0,01%
10:00	4	1	1	22,731	30,454	25,378	2,648	11,65%
11:00	4	1	0	17,813	22,393	22,393	4,581	25,72%
12:00	5	1	0	10,582	12,844	12,844	2,263	21,38%
13:00	5	1	0	9,788	11,856	11,856	2,068	21,13%
14:00	5	1	0	8,790	10,650	10,650	1,860	21,16%
15:00	5	1	0	8,483	10,287	10,287	1,804	21,26%
16:00	5	1	0	8,900	10,782	10,782	1,881	21,14%
17:00	4	1	0	13,305	16,129	16,129	2,824	21,22%
18:00	4	0	0	20,497	25,309	25,309	4,812	23,48%
19:00	4	0	0	18,340	22,316	22,316	3,976	21,68%
20:00	4	0	0	15,063	18,076	18,076	3,013	20,00%
21:00	4	0	0	12,916	15,468	15,468	2,552	19,76%
22:00	4	0	0	9,102	11,067	11,067	1,965	21,59%
23:00	2	0	0	28,503	33,390	33,390	4,887	17,14%

Figure 6.7 Example of adjusted Waiting times based on extra GP labour.

Salary Nurses

In this tab distribution of nurses at the Emergency Department can be filled in. In the template parameters, nurse distribution is considered to be uniform, but can be adjusted by weighting percentages in corresponding salary scales. The basic template is based on Appendix C. The monthly wages are based on *CAO ziekenhuizen 2011-2014*.

Functiongroup 55			
Salary scale	Percentage Nurses in scale	Gross Salary	Weighted Average
0	7,69%	€ 2.492	€ 191,69
1	7,69%	€ 2.616	€ 201,23
2	7,69%	€ 2.746	€ 211,23
3	7,69%	€ 2.873	€ 221,00
4	7,69%	€ 3.007	€ 231,31
5	7,69%	€ 3.132	€ 240,92
6	7,69%	€ 3.264	€ 251,08
7	7,69%	€ 3.325	€ 255,77
8	7,69%	€ 3.387	€ 260,54
9	7,69%	€ 3.457	€ 265,92
10	7,69%	€ 3.520	€ 270,77
11	7,69%	€ 3.600	€ 276,92
12	7,69%	€ 3.664	€ 281,85
			€ 3.160,23
	Holiday allowance	8,00%	€ 252,82
	Endyear payment	8,33%	€ 263,25
	Total Weighted monthly Salary		€ 3.676,30
Average 1 FTE on yearly basis	€ 44.116		

Figure 6.8 Example of Salary distribution nurses.

Remuneration Specialists

Here average remuneration of the specialists can be determined based on DTCs in the A-Segment given by the NZa. In case refined patient data is available from self-referrals, this can be inserted instead to determine refined remuneration fees of specialists.

Patient Details

In order to quantify the average DTC billings of self-referrals, historical patient data can be analysed. Due to confidentiality issues no patient data are provided. Therefore for the average DTC price we use the amount of €256,50 found by Giesbers et al. (2011). Important is to note that these numbers are generated in an academic hospital. To overcome potential discrepancies in DTC billings for peripheral hopsitals, in the model users can adjust patient details to refine DTC billings. Users can change the patient distribution as well as the average DTC tariff for a particular patient group.

Self-Referral Patient complaint category			
	Percentage patients in complaint category	Average DTC	Weighted Average
Tractus Digestivus	13,00%	€ 256,50	€ 33,35
Urinary Passages	3,00%	€ 256,50	€ 7,70
Eye complaints	6,00%	€ 256,50	€ 15,39
Tractus Circulatorius	11,00%	€ 256,50	€ 28,22
Mobility complaints	18,00%	€ 256,50	€ 46,17
Nervous system	5,00%	€ 256,50	€ 12,83
Nose Complaints	4,00%	€ 256,50	€ 10,26
Tractus Respiratorius	8,00%	€ 256,50	€ 20,52
Skin and Subcutis	2,00%	€ 256,50	€ 5,13
General not specified complaints	30,00%	€ 256,50	€ 76,95
	100,0%		€ 256,50
	Total Weighted self-referral DTC tariff		€ 256,50

Figure 6.9 Example of Patient details.

Section 7 Results Model

In the previous sections we have analysed the financial streams and the logistical changes due to integration and have developed a model to capture the financial streams. In this section we will take a look the results and implications of different changes in financial streams and what this means for the various stakeholders.

7.1 Financial Results GP Post

In order to understand the extra workload of GPs according to the extra consults, with the model a sensitivity analysis can be performed to ensure proper average waiting times discussed in Section 6. Looking at the total amount of extra patients needing GP Consults after integration depends on the following Emergency Department parameters:

X The number of patients entering Emergency Department

X The percentage of patients entering the Emergency Department as Self-Referrals

X The percentage of self-referrals possibly diverted to GP Consults

---

Total amount of extra patients needing a GP Consult

From equations in Section 6 not only the incoming treatments determine the systemload, moreover the number of GPs and PAs (agents) determine the systemload. The ability to handle extra treatments is dependent of the current GP roster.

Depicting this for the situation in Almelo we can consider the following input parameters as seen in Table 7.1.

Parameters Before Integration		
Number of patients Emergency Department	18000	
		Absolute number
Percentage Self-referrals (%)	32	5760
Expected Distribution Selfreferrals in %		***Absolute number***
Self-referrals to ED after triage (A1)	2%	115
Self-referrals to home after triage (A2)	8%	461
Self-referrals to GP consult after triage (A3)	90%	5184

Table 7.1 Parameters Integration

Important is to relate patient path type to the healthcare insurer declarations. For patients visiting the ED after triage (*A1)* the according DTCs are being billed. Patients who are sent home after triage *(A2)* practically do not get a GP consult however a GP consult is billed. Patients seeing a GP after triage *(A3)* are billed as a GP consult.

With the original GP Roster of Appendix E, the extra workload to meet the 5 minute waiting time increase can be calculated. Converting these extra workload in financial terms, we can determine how the percentage self-referrals affects the GP Consult tariffs. Since we discovered that GP consults are dependent on the number of consults as well as the cost-structure, it is a good measure to describe the cost-efficiency of the GP Post. It can be noticed that when a GP Post has a relatively

larger quantity of telephonic consults, more of the costs can be covered by “fixed revenues”. Telephonic consults are considered to be fixed since the telephonic consult tariff is determined by the NZa and the quantity of telephonic consults is independent of self-referrals.

Furthermore, the extra allocated GP labour is directly dependent on the server load of GP Posts being able to handle the demand of extra GP Consults. Good availability of agents, translated in a practical sufficient GP Roster results in relative lower allocated extra labour to meet average waiting times of patients. Conceptually this can be comprehended practically: if GPs/PAs are more occupied in the pre-integration situation, post-integration the effect on waiting times will be even more increased.

As can be seen in Figure 7.1 the long term GP Consult tariffs are determined for different percentages of self-referrals. Long term GP consult tariffs are assumed to be the balanced tariffs where revenues generated by billings, cover the total costs of the GP Post. An expected distribution of Table 7.1 is assumed, thus in the Almelo case, 90% of the self-referrals will be referred to a GP consult and the initial situation comprises 18000 yearly ED visits. The GP Post is currently having 30000 consults on yearly base. By varying the percentage of self-referrals in the Financial Model and allocating additional GP labour the model can generate GP Consult tariffs.

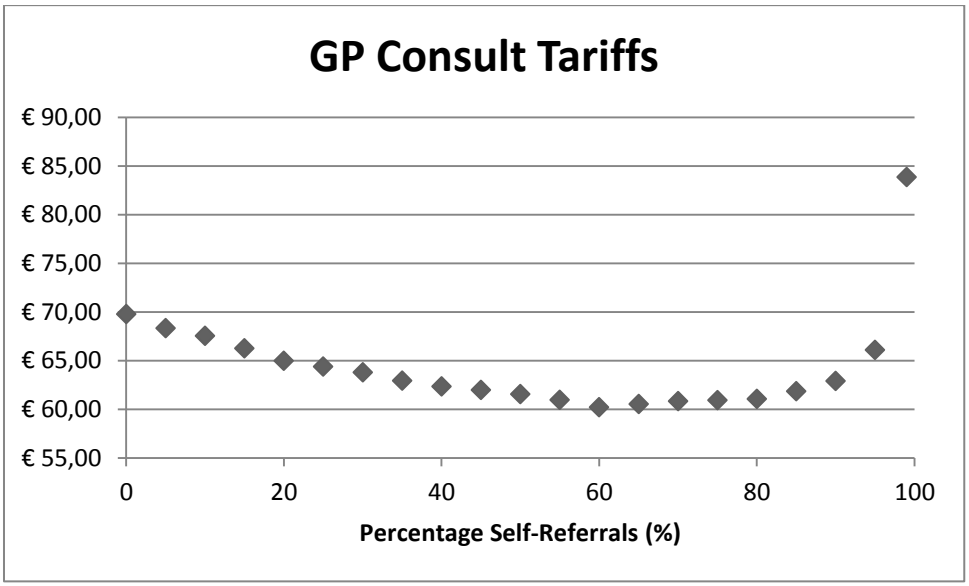


Figure 7.1 GP Consult Tariffs after integration under different percentages of Self-referrals.

From the graph it can be seen that a percentage of 60% self-referrals (9720 extra GP Consults) is the most cost efficient number for GP Consult costs. For higher numbers of self-referrals the increase in extra workload to meet the average waiting time condition does not outweigh the extra revenues generated from these consults.

More interesting to notice is that under current input parameters, the long term consult tariffs for a “real” percentage of 32% self-referrals, the GP Post can operate more cost-efficient related to the number of medical acts, i.e. ,the long term consult tariffs will decrease compared to the 0% self-referrals situation (non-integrated situation). For percentages higher than 60% with the given cost structure of the GP Post and the current labour force, integration will not lead to cost efficiency at the GP Post.

Since the GP Consult tariffs are dependent on the cost structure and the number of all revenues generated, it is interesting to see how the extra numbers of patients affect the cost structure of the GP Post.

Using the input parameters of Almelo[10] it seems that in with an increase of GP Consults due to self-referrals, in the first year after integration the total costs will increase by 4.1% compared to the situation without integration. This is allocated to extra allocated GP labour which in the first year has a higher tariff than in the following years to compensate for extra workload due to integration (see Section 5.4). We consider the Second year figures to be a long term situation where the budgets allocated by healthcare insurers are balanced to outweigh the RAK-allocations.

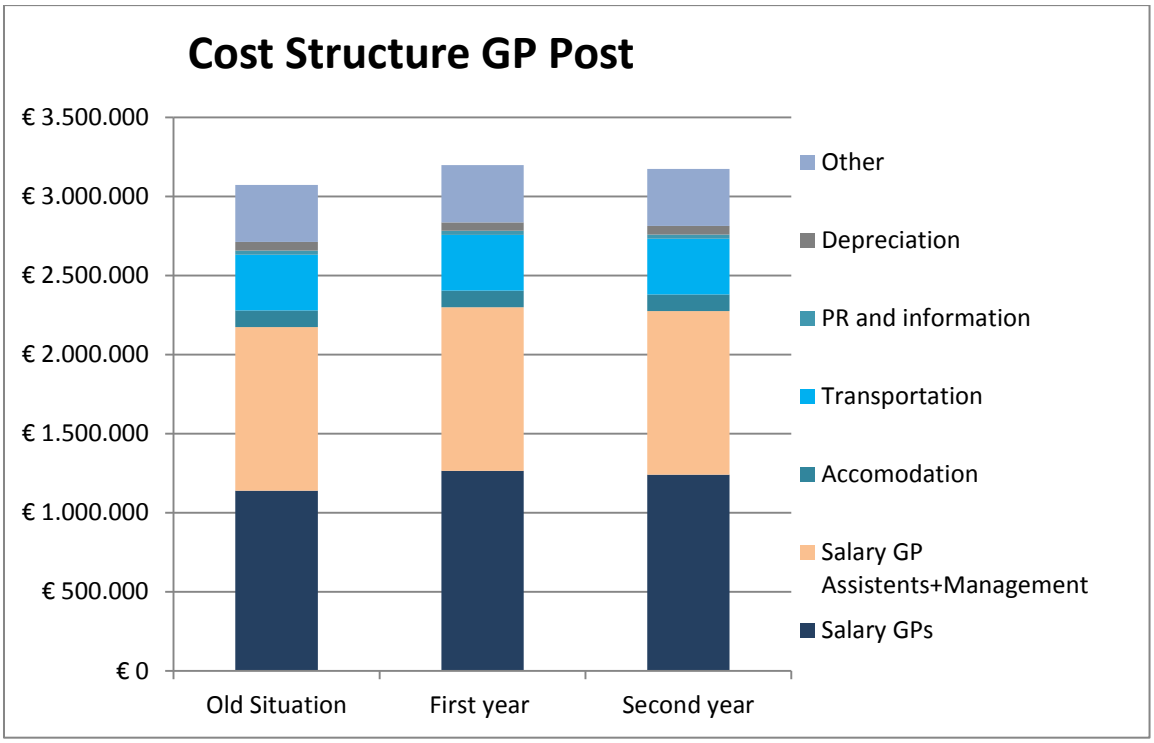


Figure 7.2 Cost Structure GP Post ante- and post integration (Based on Almelo Case numbers).

Integration also affects the billing amounts for both GP Consults as well as visits, telephonic consults are considered to be fixed revenues as stated above. In Figure 7.3 an overview is given of the change in declarable amounts for the GP Post after integration. The number of telephonic consults and visitations are considered to be independent of the increased GP consults by self-referrals and are thus constant. However a lower consult tariff due to higher net results also lowers the visitation prices on the long term, explaining the decline in visitation billings

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[10] Almelo case, 18000 ED visits with 32% Self-referrals

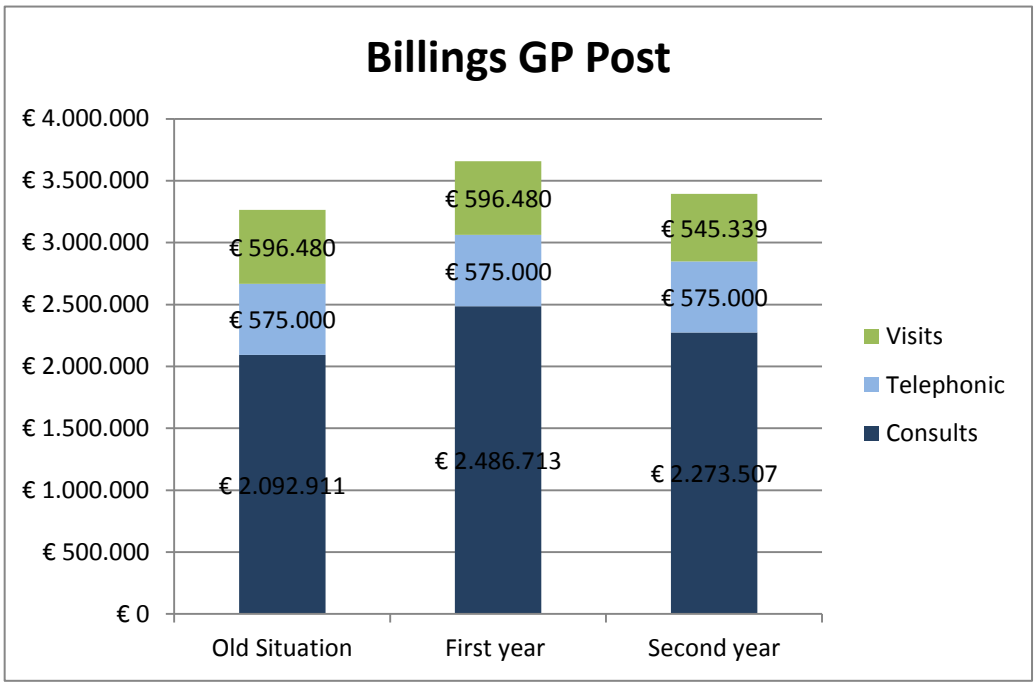

Figure 7.3 Billings GP Post ante- and post integration (Based on Almelo Case numbers).

7.2 Financial Results Emergency Department

Change in patient streams after integration results in an adapted cost structure of the ED as well. Using the financial restrictions and logistical restrictions of Section 5 and 6 the new cost structure of the ED can be modelled. In Figure 7.4 the change in cost structure is depicted. Note that the remuneration of the specialists is not considered to be part of the fixed costs of the emergency department, but is included to show the effect of overall costs at the Emergency Department. Assumed is that Social costs, educational costs are proportional to the amount of fulltime-equivalents of nurses. Material costs are based on the number of patient visits at the ED.

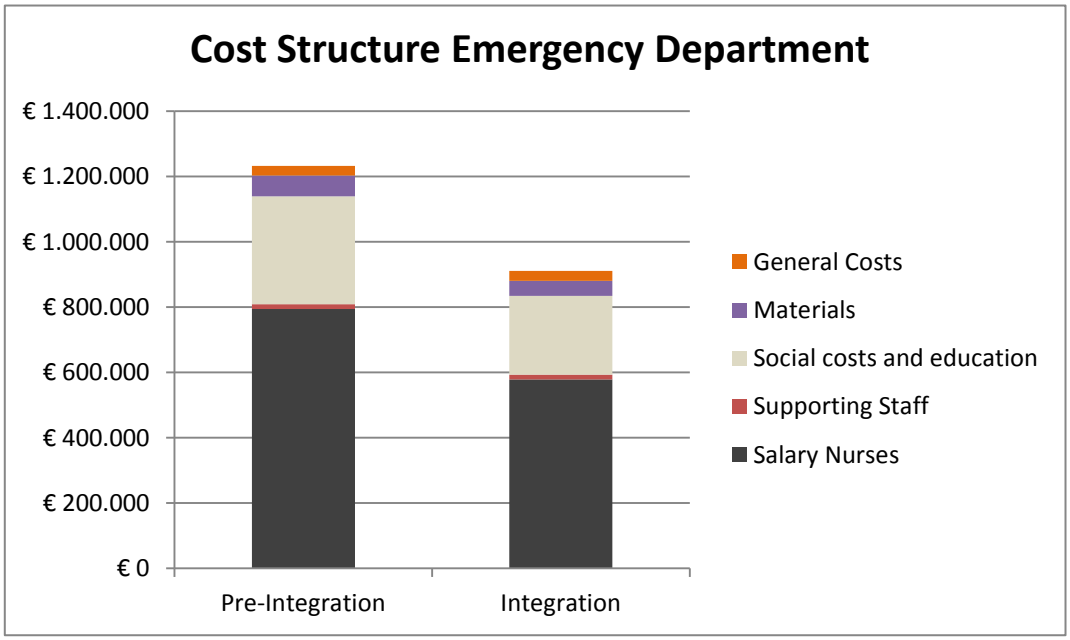

Figure 7.4 Cost Structure Emergency Department pre- and post-integration (Almelo Numbers).

When considering the change in revenues generated due to the loss of self-referrals we can see that the emergency department generates a lower result since fewer patients are being treated. As can be seen in Figure 7.5 the DTC revenues are reduced by the amount of self-referrals who are being treated at the GP Post.

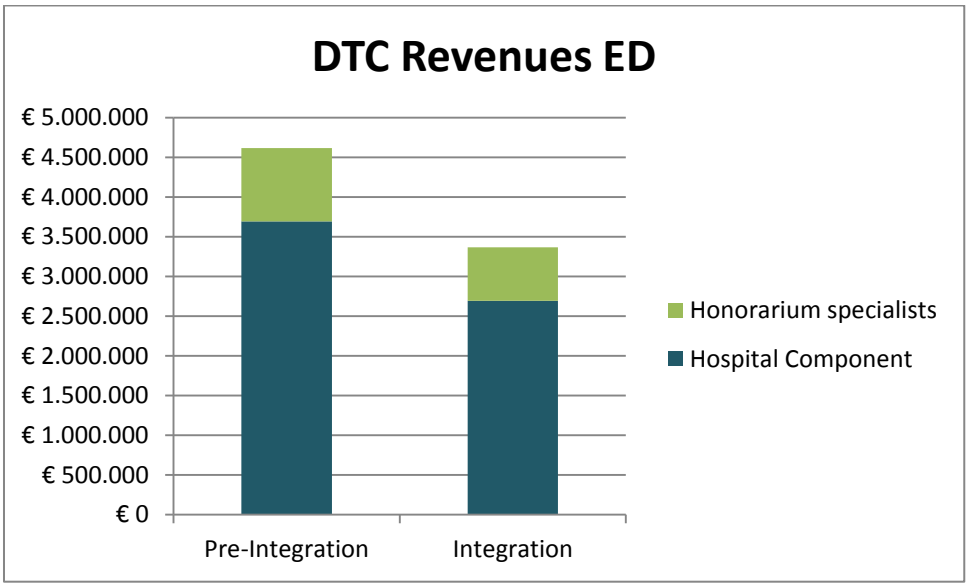

Figure 7.5 Change of DTC Revenues due to integration

7.3 Implications for stakeholders

In the next section results of the model are being related to the different stakeholders.

Government

The minister aims of to lower the growth of healthcare expenditures for the coming years (Schippers, 2011). Looking from an holistic point of view, it is important to know how integration affects the costs of acute healthcare and whether integration is favourable. Therefore in the model the various cost posts are holistically added in order to examine effects. Based on the input parameters it can be seen that the increase in GP Post costs is offset by decreased ED expenditures as well as reduced remuneration of specialists. Integration is favourable according to the government if holistic costs can be reduced. From the financing structure in healthcare it is evident that in the end, all costs are paid by citizens and employers through, nominal premiums, income dependent contributions, insurance risks and taxes (Ministerie van Volksgezondheid Welzijn en Sport, 2013). Looking at the holistic costs of GP Posts and EDs, financial effects of integration can be determined. In the Almelo scenario, cost savings are €447.887 under the abovementioned parameters and thus are favourable.

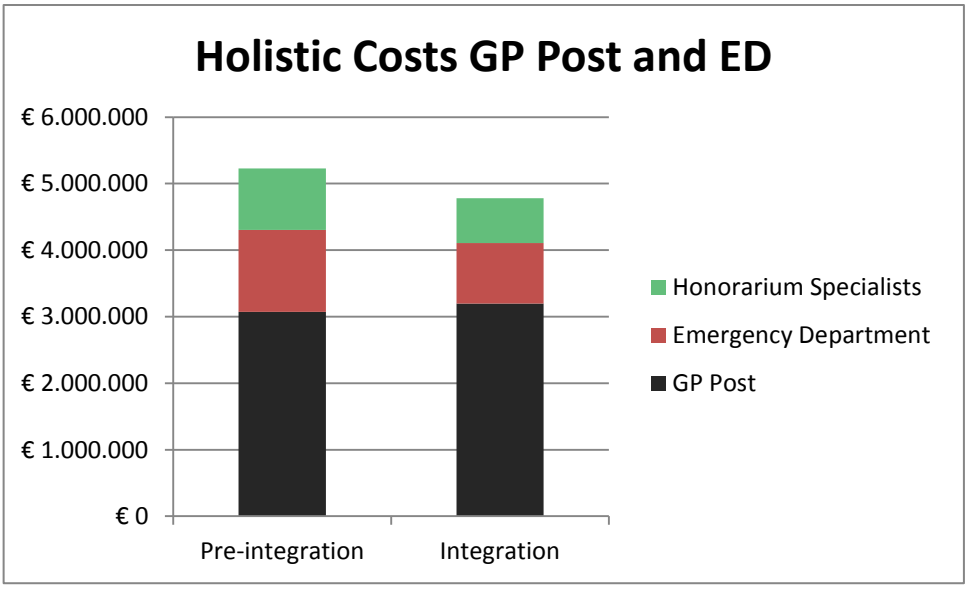

Figure 7.6 Holistic Costs GP Post and ED Before and after Integration.

Healthcare Insurers

Looking at the competitive interests of healthcare insurers, it is important to provide qualitative healthcare at a competitive rate. Self-referrals have been considered to be using unnecessary expensive 2nd line healthcare, in case treatment could have been performed by GPs. To compare the billings of self-referrals we have to determine the patient paths and the according declarable amounts as discussed in Section 5. In Table 7.2 Almelo parameters are depicted.

		Pre-integration		**Integration**
Billings Self-Referrals	*#Patients*	*Pre-integration*	*#Patients*	*Integration*
Emergency Department	5760	€ 1.477.440	115	€ 29.549
GP Post			5645	€ 360.038
ED after GP Consult			762	€ 195.465
Total		**€ 1.477.440**		**€ 585.052**

Table 7.2 Billings of Self-referrals according to patient counts.

Looking at the situation before and after integration it is clear that only the self-referrals cause a change in declarable amounts, since they are either seen by GPs after triage, sent to ED after triage or enter the ED after a GP Consult where case they cause "double billings" which is described by *ED after GP Consult* visits. In Figure 7.7 the declarable amount of self-referrals is depicted. From this perspective it is highly favourable for healthcare insurers to persue integration. The double billings are dependent on how often GP consults refer self-referrals to the ED. Note that the billings of GP visits are under tariffs after integration *(GP Consult Tariff before integration: €70,79, after integration: €64,68).*

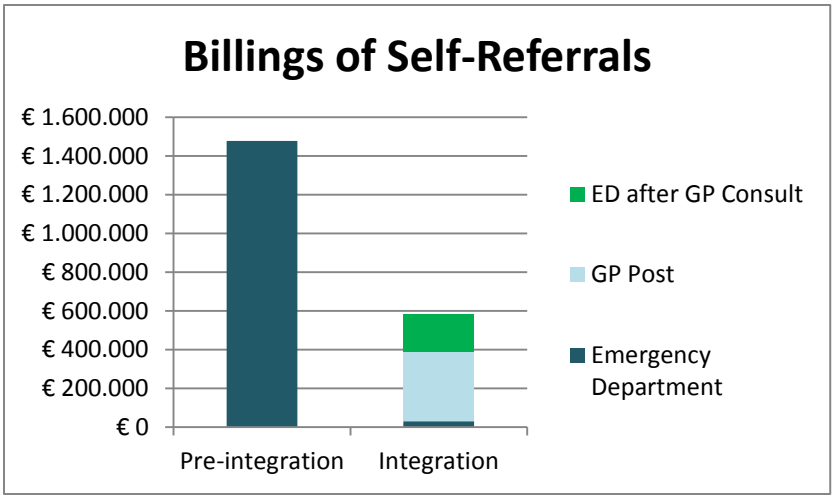

Figure 7.7 Billings of Self-referrals[11].

Emergency Department

The shift in patient streams affects specialists. The remunerations of specialists are determined by the NZa by determining the average length of labour for a DTC (Nederlandse Zorgautoriteit, 2011). By doing so the specialists cannot use their scarcity power to increase wages. The income of specialists is therefore highly dependent on the number of patient contacts. Furthermore, decreased patient number may cuts nurse hours provided availability function. In the Almelo scenario, specialists lose €250.485 on remunerations due to self-referrals. Apart from specialists, adjusted patient streams also affect nursing hours.

GPC

For GPs the increased number of consults leads to slight financial benefits in the first year after integration, provided that the GPs need to run extra hours to meet the extra demand. For the extra needed hours, GPs are paid an additional €15/hour in the first year after integration. After the first transition year, GPs effectively work more hours under the same rate per hour before integration, resulting in lower costs of GPCs compared to the first year after integration. In the Almelo scenario a total amount of €101.400 is paid to GPs due to extra hours. In the first year an additional of €23.400 is being paid to cover first year expenses since According to GPs the tariff to provide first line healthcare out-of-offices is too low to attract extra capacity (Nederlandse Zorgautoriteit, 2012).

Looking at the revenues generated at GPC due to integration more medical acts are being performed due to the increased patient stream. Depending on the cost structure tariffs may be adjusted.

Patients

In the first place, overall reduction of healthcare expenditures is beneficial for patients, since indirectly all healthcare costs are paid by contributions, nominal premiums and taxes. Shift from 2nd line care to 1st line care is furthermore beneficial for patients, since own contributions are avoided considering the “insurance risk” policy. In order to understand whether nominal premiums are being reduced by integration a macroeconomic analysis has to be done to determine exact amounts of own contribution.

[11] Almelo case 18000 ED visits with 32% Self-referrals

7.4 General Effects Integration

With the model developed, financial implications can be determined of integration of GP Posts with Emergency Departments. Looking at possible scenarios of integration, depending on input parameters three options can occur:

1. Holistic Costs increase, in this case increase of GP Posts' costs are not offset by a decrease in costs at the Emergency Department.

2. Holistic Costs decrease, in this case increase of GP Posts' costs are offset by a larger decrease in costs at the Emergency Department.

3. Holistic Costs remain (practically) equal, in this case increase of GP Posts' costs are offset by a same decrease in costs at the Emergency Department.

Considering the various interests of stakeholders, advice in favour of integration may be given if there are evident financial benefits.

In the first scenario, integration does not seem to be a feasible option, since from all points of view there is resentment of the various stakeholders and there are no holistic financial benefits.

In the second scenario type, it is beneficial to persue integration however operational stakeholders should be incentivised to cooperate accordingly since they are the major bottleneck considering integration. Specialists are cut down on income due and GPs are urged to work more hours, under lower rates compared to their on practices. A possible solution could be incorporating operational stakeholders with the financial benefits of integration. GPs may be rewarded higher wages and specialists may be compensated for loss of income.

Looking at scenarios where holistic costs remain (practically) equal it is interesting to understand what implications integration would have from a financing point of view. From the financing structure in healthcare it is evident that in the end, all costs are paid by citizens and employers through, nominal premiums, income dependent contributions, insurance risks and taxes (Ministerie van Volksgezondheid Welzijn en Sport, 2013). Assuming that average treatments are €256,50 and the insurance risk is €350 (*€360 in 2014)* we can consider all ED treatments to be paid by patients themselves directly. Knowing that integration causes patients shifts from ED treatments to GP Post treatments, integration causes an increased leverage on nominal premiums, income dependent contributions and taxes. In order to quantify these effects precisely, a macro-economic analysis considering potential beneficial integrations can be considered.

Section 8 Discussion and Conclusion

The goal of this thesis is to understand and model financial implications of integration of GP Posts with emergency departments. To reach this goal the following research questions were answered.

- How did Integrated Emergency Posts emerge in the Dutch healthcare system?
- Who are the stakeholders involved with integration and what are their incentives?
- How are the financial streams defined and how are they affected by integration?
- How can integration of GP Posts with Emergency Departments financially be modelled?
- What are the financial implications of integration based on input parameters?

In Section 3 the path towards integrated emergency posts is given in order to get a clear understanding of the reasoning behind integration. Furthermore characteristics and motives of self-referrals have been discussed. In Section 4 a stakeholder analysis has been performed to examine the role of various actors towards integration. By analysing the financing system in the Netherlands and more specifically the financial streams of both the GP Post and Emergency department the fundamentals of the financial model have been established. The various budgets, costs and revenues are compared as well as financial regulations concerning integration.

Using the financial streams and regulations as a starting point, in Section 6 patient logistics have been discussed and the logistical restrictions are based using Erlang-C queuing equations. Combining the aforementioned factors, a financial model has been developed to analyse financial implications of integration. Finally in Section 7 the results and implications of the model using the Almelo case a template have been described as well as the role on the various stakeholders.

Reflecting on the process, the different financing structures of both departments made it hard to compare financial results, but looking from an holistic point of view the model can describe financial changes according to the parameters of both departments.

As we found out, the major factors determining financially successful integration is the system load of the GP post in accordance with the extra patient streams of self-referrals. Furthermore the financial structure of the GP Post determines the consult tariffs which affect declarable amounts.

Based on the input parameters of Almelo, integration was financially favourable since from an holistic point of view there was a cost reduction of €447.887. Main contributions for positive integration effects are the ability of the GP Post to adapt to increased patient streams accordingly: an increase in GP labour costs will be offset by savings at the emergency department, resulting in holistic positive effects.

Integration decreases patient visits at the ED, since self-referrals end up at the GP Post. Coinciding with this, income of specialists will decrease and the shift in patient streams causes extra workload at GP Posts. A possible solution to overcome this is to make use of specialists at the GP Posts. Apart from shifting workload to places where it is needed, another benefit is that the availability of specialist expertise may decrease the amount of referrals to emergency departments after a GP consult.

Another interesting possibility is to introduce DTCs at GP Posts in order to declare medical acts in the same way. This could encourage ease of purchase of healthcare, however it may also create (unfair) competition between GP Posts en Emergency Departments. The DTCs which are introduced at the GP Post should of course be medical acts which the GP is authorized and able to perform. Healthcare insurers can play an important role in overcoming competition between divisions by purchasing healthcare in an integrated form for healthcare out-of-office hours for an integrated location.

Also introducing a billable tariff for basic healthcare at EDs may be a possibility. In this case, lower tariffs than “traditional” DTCs are being encouraged en should be more in line with primary healthcare tariffs. It is important that there is a proper separation between the various healthcare areas in order to prevent up-coding.

Apart from encouraging integration from the supply side, there are also possibilities to increase awareness at the demand side. Patients may be encouraged to seek the appropriate healthcare provider by for example imposing private contributions on using emergency departments.

In the end, integration of GP posts and EDs may lead to holistic financial benefits which can be simulated by the developed model. Looking at the model, there are still some aspects to be improved. In the model we have only taken the extra GP Consults into consideration, with logistical restrictions based on Erlang-C. In practice, various parameters may extend or delay waiting times in case of integration. Simulation models can be used to further examine more precise extra labour hours and can be plugged into the model.

Financial input data of self-referrals is based on the research of Giesbers et al. (2011), patient data may vary throughout various scenarios. Further refinement of patient distribution may increase accuracy of the model. Historical patient characteristics should be analysed more in detail per integration to determine more precise costs of self-referrals.

Moreover, several long-term effects may occur: changes of costs of follow-up consults are not taken into consideration. Another trend which could occur is that by cutting down nursing hours, the younger and thus in general cheaper) nurses will be cut due to labour conditions. This can be adjusted by filling in the expected distribution of nurses in order to determine more precise implications of an integration.

Overall, users can use the financial model developed throughout this thesis to examine financial effects of integration of GP Posts with Emergency Departments and determine possible benefits.

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Appendices

Appendix A: Determining declarable amounts GP Post

Since GPSS' main purposes are to deliver health care outside of ordinary hours, GPSS are allowed of declaring medical acts only during (Nederlandse Zorg Autoriteit, 2012):

- Working days from 18:00 till 08:00
- Weekend days from 00:000 till 24:00
- Holidays from 00:00 till 24:00

The amounts of declaration per medical acts are fixed for each specific GPSS based on a set of rules by the NZA (Nederlandse Zorg Autoriteit) (NZA, 2011)

- The fixed amount for telephone consults are €25
- The amount for a consult is 1.0 times the fixed rate per consult unit
- The amount for a visitation is 1.5 times the fixed rate per consult unit

In order to determine the fixed rate per consult unit, first the total of estimated budgets of acceptable infrastructural costs of the GPSS in the specific year are determined. These are the costs as stated in the estimated budget with the approval of the preferent healthcare insurer. After deducting the estimated telephonic consult revenues, the remaining budget is divided by the estimated consults. This results in the fixed rate per consult unit which can be declared by the GPSS.

Appendix B: Patient Arrival rates at GP Post

The table below shows an example of the average number of patients entering the GP Post Almelo in the period of 14-4-2010 till 13-4-2011. In the excel model arrival frequencies can be adjusted and the relative frequencies will be calculated in order to determine the absolute number of patient visits.

Time	Weekdays	Saturday	Sunday
0:00	3,13	3,87	4,29
1:00	2,37	2,79	3,9
2:00	1,9	2,62	3,33
3:00	1,67	1,87	2,75
4:00	1,33	1,73	2,19
5:00	1,29	1,58	2,71
6:00	1,27	2,48	2,56
7:00	1,34	7,56	6,56
8:00	-	22,77	15,75
9:00	-	29,75	22,12
10:00	-	32,19	23,41
11:00	-	27,19	24,42
12:00	-	24,94	23,1
13:00	-	23,37	20,73
14:00	-	21,38	16,87
15:00	-	20,77	14,62
16:00	-	21,6	16,21
17:00	13,41	21,46	16,33
18:00	15,89	20,29	16,79
19:00	14,91	18,5	14,77
20:00	12,65	15,58	12,73
21:00	11,17	13,6	10,9
22:00	8,16	10,15	8,15
23:00	5,15	6,98	5,29

Appendix C: Salary Scale Nurses Emergency department[12]

This table shows the salary scales in the model according to the CAO. In the model the weighted salary scales can be adjusted to get a more precise estimation of savings of the nurse labour costs if there is a very skew distribution (i.e relatively high scaled nurse distribution when nursing staff is relatively long employed). Amounts are given in monthly gross salaries in euros. In terms of total salary costs the holidays allowance (8%) and endyear payment (8,33%) are also added according to the total weighted average.

Functiongroup 55	
Salary scale	**Salary(€)**
0	2492
1	2616
2	2746
3	2873
4	3007
5	3132
6	3264
7	3325
8	3387
9	3457
10	3520
11	3600
12	3664

- [12] Cao Ziekenhuizen 2011 - 2014

Appendix D: Detailed description Patient Path GP Post[13]

Caller

1) Patient calls to IEP

2) Telephonic Triage: GP Assistant performs telephonic triage and can choose following:
   i. Telephonic Advice GP Assistant
   ii. Telephonic Consult supervisory GP
   iii. Visit patient by GP
   iv. Invite patient to IEP

-For i. the patient path ends if the supervisory GP authorizes the advice of the GP assistant

-For ii. the patient path ends if the telephonic consult is sufficient, else iii. or iv. are applied.

-For iii. The patient path ends when the GP is able to treat the patient. In case of emergency or lack of (sufficient) resources an ambulance can be called to bring the patient to the ED (see step 6 Arrival at Emergency Department)

Self-Referral

3) Arrival at IEP: Patient arrives at IEP and is being registered by medical assistant. If the patient has already called the patient proceeds to step 5

4) Triage: GP assistant/NP performs physical triage with a number of possible followups
   I. GP/NP gives and advice which has to be authorized by GP
   II. GP consult (step 5)
   III. ED visit (step 6)

5) Consultation GP: GP consults and treats patient, when GP is not able to aid patient further referral to specialist of ED.

Formal Boundary first and second line healthcare

6) Arrival at Emergency department: ED triages and treats patient with a number of follow up possibilities:
   i. Patient is dismissed and can return hom
   ii. Patient is admitted
   iii. Patient is transferred to a specialized hospital

[13] Based on "Onderzoeksrapport – Spoedpost Almelo" by K.Smid 2010

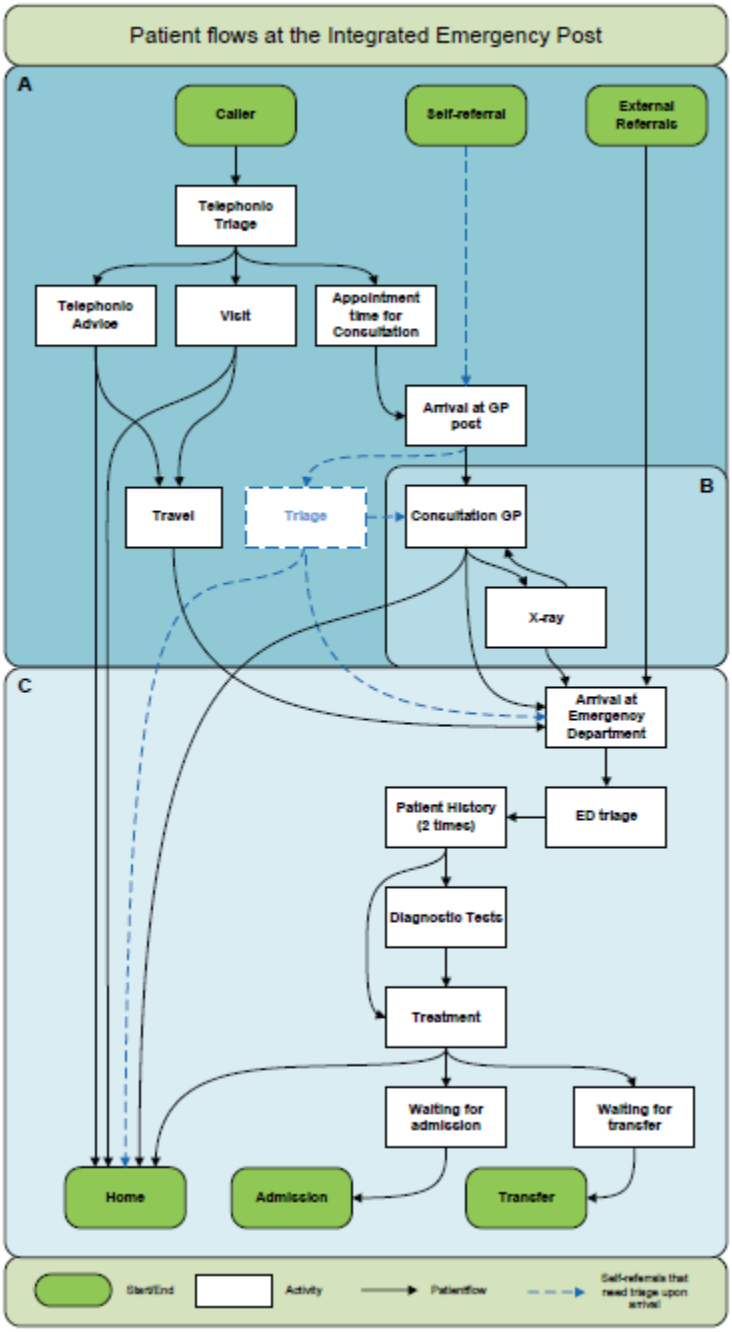


Figure D.1 Flowchart of patient path IEP[14]

[14] From "Modelling an Integrated Emergency Post" – R.E. Visser 2011

Appendix E. GP Post Rosters

The tables below give an example of a roster of a GP Post at given time intervals. In the model the values can be adjusted for current rosters and all adjusted hours will be calculated with the coherent cost posts on the balance sheets.

Monday-Friday	GP Assistant	Triage Assitant	GP	PA
0:00	0	1	2	0
1:00	0	1	2	0
2:00	0	1	2	0
3:00	0	1	2	0
4:00	0	1	2	0
5:00	0	1	2	0
6:00	0	1	2	0
7:00	0	1	2	0
8:00	-	-	-	-
9:00	-	-	-	-
10:00	-	-	-	-
11:00	-	-	-	-
12:00	-	-	-	-
13:00	-	-	-	-
14:00	-	-	-	-
15:00	-	-	-	-
16:00	-	-	-	-
17:00	1	1	2	0
18:00	2	1	3	0
19:00	2	1	3	0
20:00	2	1	3	0
21:00	2	1	3	0
22:00	2	1	3	0
23:00	2	1	3	0

Saturday	GP Assistant	Triage Assitant	GP	PA
0:00	0	1	2	0
1:00	0	1	2	0
2:00	0	1	2	0
3:00	0	1	2	0
4:00	0	1	2	0
5:00	0	1	2	0
6:00	0	1	2	0
7:00	0	1	2	0
8:00	0	1	2	0
9:00	3	1	3	0
10:00	4	1	4	1
11:00	4	1	4	1
12:00	4	1	5	1
13:00	4	1	5	1
14:00	4	2	5	1
15:00	4	2	5	1
16:00	4	2	5	1
17:00	4	2	5	1
18:00	3	2	5	0
19:00	3	2	4	0
20:00	2	1	4	0
21:00	2	1	4	0
22:00	2	1	4	0
23:00	1	1	2	0

Sunday	GP Assistant	Triage Assitant	GP	PA
0:00	0	1	2	0
1:00	0	1	2	0
2:00	0	1	2	0
3:00	0	1	2	0
4:00	0	1	2	0
5:00	0	1	2	0
6:00	0	1	2	0
7:00	1	1	2	0
8:00	2	1	3	0
9:00	2	1	3	0
10:00	3	1	3	1
11:00	3	1	4	1
12:00	3	1	4	1
13:00	3	1	4	1
14:00	3	1	4	1
15:00	3	1	4	1
16:00	3	1	4	1
17:00	3	1	4	1
18:00	2	1	4	1
19:00	2	1	4	0
20:00	2	1	4	0
21:00	2	1	4	0
22:00	2	1	4	0
23:00	1	1	2	0

Appendix F. Model Description

To generate insights and results in the financial streams an according model is developed. Looking at the excel model there are 8 tabs:

- Generic Overview
- Roster GP Post
- Salary Nurses
- Remuneration Specialists
- Patient Details
- Structure GP Post
- Structure ED
- Holistic Effects

The first 5 tabs contain user-input parameter cells and the remaining 3 tabs generate output only. In the model all navy-coloured cells are adjustable as input and will result in coinciding changes in other cells. A short summary is given in how the model translates logistical restrictions into financial output streams and how the user can apply changes in the input tabs. With given input, output is generated based on rules and regulations discussed in Section 5 of this thesis.

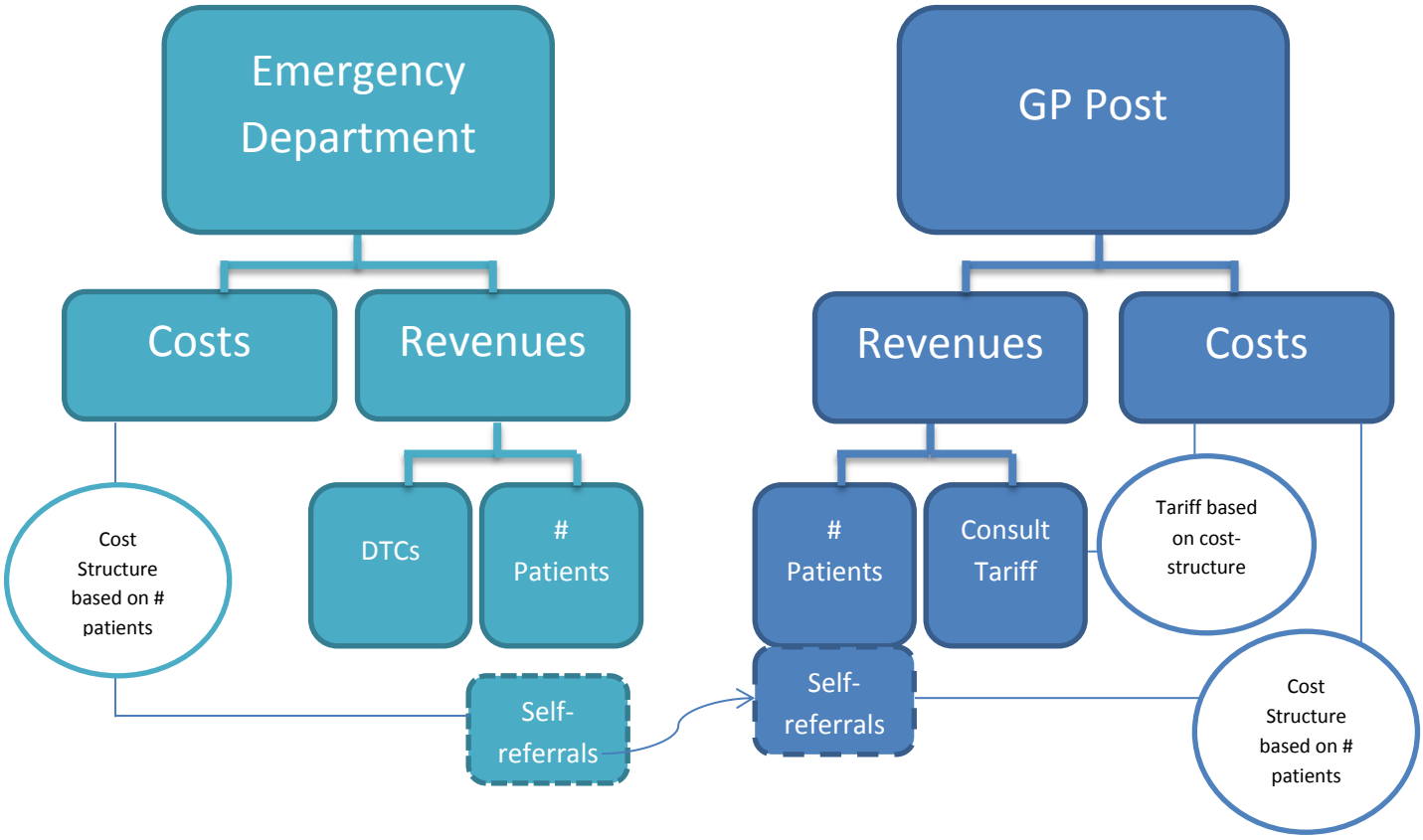


Figure F.1 Schematic overview changes financial streams due to integration.

Generic Overview

In the generic overview tab, general patient parameters can be filled in the dark-blue Cells and adjusted accordingly. Patient numbers are inserted on yearly basis. In order to examine the extra workload considering GP Consults the patient arrival rates for self-referrals per hour have to be inserted. Data for patient arrival dates can be found in the patient monitoring database systems. A screenshot of the patient parameters can be seen in Figure F.1

The standard template are parameters based on empirical historical data of the case in Almelo.

Patient Parameters

Parameters Before Integration		
Number of patients Emergency Department	18000	
		Absolute number
Percentage Self-referrals (%)	32	5760

Expected Distribution Selfreferrals in %		*Absolute number*
Self-referrals to ED after triage (A1)	2	115
Self-referrals to home after triage (A2)	8	461
Self-referrals to GP consult after triage (A3)	90	5184

Expected Urgency Distribution Self-Referrals Consult in %	*Percentage urgencies (%)*	*Absolute number*
U1	0,23	12
U2	6,79	352
U3	42,82	2220
U4	50,16	2600
		5184

Expected Distribution Patients after GP Consult		
GP Consults needing X-ray and visiting ED (B3)	5,7	295
GP Consults visiting ED (B4)	9	467
Percentage of GP consults to ED (B3&B4) in %	14,70	762

Self-Referrals Arrival Rates per hour

	Weekdays	Saturday	Sunday
0:00	3,13	3,87	4,29
1:00	2,37	2,79	3,9
2:00	1,9	2,62	3,33
3:00	1,67	1,87	2,75
4:00	1,33	1,73	2,19
5:00	1,29	1,58	2,71
6:00	1,27	2,48	2,56
7:00	1,34	7,56	6,56
8:00	-	22,77	15,75
9:00	-	29,75	22,12
10:00	-	32,19	23,41
11:00	-	27,19	24,42
12:00	-	24,94	23,1
13:00	-	23,37	20,73
14:00	-	21,38	16,87
15:00	-	20,77	14,62
16:00	-	21,6	16,21
17:00	13,41	21,46	16,33
18:00	15,89	20,29	16,79
19:00	14,91	18,5	14,77
20:00	12,65	15,58	12,73
21:00	11,17	13,6	10,9
22:00	8,16	10,15	8,15
23:00	5,15	6,98	5,29

Figure F.2 Patient Parameters in the model

To examine the effect of integration it is important to understand the current financial structures of both entities . Therefore the financial structures have to be inserted accordingly. For financial data, annual reports can be used to determine number of patients and the various cost posts. For the Emergency Department annual budgets can be used to allocate the various cost posts.

In order to calculate the consult tariff, the extra allowances which vary per region can be inserted as well. The module Rural Area and Module Healthcare consumption can be found in the tariff requests issued by the NZa.

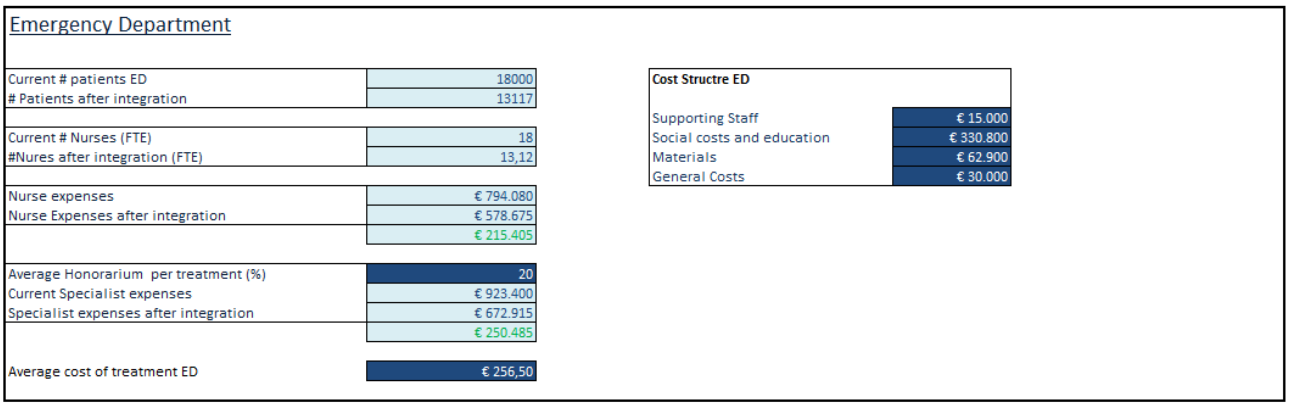
GP post

Current # patients GP (Consultations)	30000
Current # patients GP (Telephonic)	23000
Current # patietns GP (Visit)	5700
Current Consult tariff	€ 69,76
Telephonc Tarif	€ 25,00
Visitation Tarif	€ 104,65
Module Rural Area	€ 2,76
Module Healthcare Consumption	€ 2,21

Based on Roster in "Roster GP Post" tab	
Current # GP hours	17524
Current # GP Assitant Hours	8112
Current # PA hours	832
Current # Triage Assistant Hours	6708

Extra # GP Hours	1560		
1st year Tarif	€ 80,00		
2nd year tarif	€ 65,00	*1st year*	*2nd year*
Extra GP Labour Costs		€ 124.800	€ 101.400

Cost Structure GP Post	
Salary GP Assistents+Management	€ 1.035.060
Accomodation	€ 104.604
Transportation	€ 351.955
PR and information	€ 27.274
Depreciation	€ 52.850
Other	€ 361.994



Emergency Department

Current # patients ED	18000
# Patients after integration	13117
Current # Nurses (FTE)	18
#Nures after integration (FTE)	13,12
Nurse expenses	€ 794.080
Nurse Expenses after integration	€ 578.675
	€ 215.405
Average Honorarium per treatment (%)	20
Current Specialist expenses	€ 923.400
Specialist expenses after integration	€ 672.915
	€ 250.485
Average cost of treatment ED	€ 256,50

Cost Structre ED	
Supporting Staff	€ 15.000
Social costs and education	€ 330.800
Materials	€ 62.900
General Costs	€ 30.000

Figure F.3 Financial parameters GP Post and Emergency Department

Roster GP Post

In this tab the GP Roster as depicted in Appendix E can be filled in to determine the occupancy of the various actors. Since as a results of self-referrals only GP consults are considered, the effect of extra consults is generated using Erlang-C to determine the time implications for patients (see Section 6.2 for more detail about Erlang-C). Using the patient distributions and number of self-referrals Average waiting times for GP consults can be depicted. The column *"Average Waiting Time patient (old)"* indicates the average waiting time of patients for a GP Consult pre-integration. The column *"Average Waiting Time Patient (new)"* indicates the average waiting time of patients for a GP Consult ante-integration without additional GP labour. Finally the *"Adjusted Waiting times (extra GP) "* column depicts the waiting time in case extra GP labour is added to overcome additional waiting times. In the coloured *"Adjusted Waiting Time Increase (minutes)"* the effect of extra waiting time for GP consults is shown according to the total amount of available actors performing GP consults.

By examining the *"Adjusted Waiting time Increase"* users can allocate additional GP labour accordingly based on (practical) preferences in the column *"Extra GP labour"*. The colour scheme is an indication of how severe average waiting times for patients are affected based on the available actors. Furthermore users can also allocate extra PA Labour in the column *"Extra PA Labour"*. Also the extra GP Assistant hours can be allocated according to preferences in the *"Extra GP ass. Labour"*. In Figure F.3 an example of a possible allocation of extra labour based on patient streams is given. In order to calculate the financial effects of the total number of hours, a timeframe of 52 weeks is being considered. Users can define different allocation for Weekdays, Saturdays and Sundays based on workload.

Saturday	GP	PA	Extra GP labour	Average Waiting time patient(old) in minutes	Average Waiting time patient (new) in minutes	Adjusted Waiting times (extra GP)	Adjusted Waiting Time Increase (minutes)	Adjusted Waiting time increase (%)
0:00	2	0	0	15,890	18,723	18,723	2,834	17,83%
1:00	2	0	0	11,032	13,247	13,247	2,215	20,08%
2:00	2	0	0	10,234	12,340	12,340	2,107	20,58%
3:00	2	0	0	6,638	8,197	8,197	1,559	23,49%
4:00	2	0	0	5,964	7,405	7,405	1,441	24,17%
5:00	2	0	0	5,246	6,556	6,556	1,309	24,96%
6:00	2	0	0	9,570	11,584	11,584	2,014	21,04%
7:00	2	0	1	30,827	36,272	24,181	-6,646	-21,56%
8:00	3	0	2	51,557	79,153	47,492	-4,065	-7,88%
9:00	4	0	2	36,951	55,420	36,947	-0,004	-0,01%
10:00	4	1	1	22,731	30,454	25,378	2,648	11,65%
11:00	4	1	0	17,813	22,393	22,393	4,581	25,72%
12:00	5	1	0	10,582	12,844	12,844	2,263	21,38%
13:00	5	1	0	9,788	11,856	11,856	2,068	21,13%
14:00	5	1	0	8,790	10,650	10,650	1,860	21,16%
15:00	5	1	0	8,483	10,287	10,287	1,804	21,26%
16:00	5	1	0	8,900	10,782	10,782	1,881	21,14%
17:00	4	1	0	13,305	16,129	16,129	2,824	21,22%
18:00	4	0	0	20,497	25,309	25,309	4,812	23,48%
19:00	4	0	0	18,340	22,316	22,316	3,976	21,68%
20:00	4	0	0	15,063	18,076	18,076	3,013	20,00%
21:00	4	0	0	12,916	15,468	15,468	2,552	19,76%
22:00	4	0	0	9,102	11,067	11,067	1,965	21,59%
23:00	2	0	0	28,503	33,390	33,390	4,887	17,14%

Figure F.4 Example of adjusted Waiting times based on extra GP labour

Salary Nurses

In this tab the distribution of nurses at the Emergency Department can be filled in. In the template parameters, the nurse distribution is considered to be uniform, but can be adjusted by weighting percentages in corresponding salary scales. The basic template is based on Appendix C. The monthly wages are based on *CAO ziekenhuizen 2011-2014*.

Functiongroup 55			
Salary scale	Percentage Nurses in scale	Gross Salary	Weighted Average
0	7,69%	€ 2.492	€ 191,69
1	7,69%	€ 2.616	€ 201,23
2	7,69%	€ 2.746	€ 211,23
3	7,69%	€ 2.873	€ 221,00
4	7,69%	€ 3.007	€ 231,31
5	7,69%	€ 3.132	€ 240,92
6	7,69%	€ 3.264	€ 251,08
7	7,69%	€ 3.325	€ 255,77
8	7,69%	€ 3.387	€ 260,54
9	7,69%	€ 3.457	€ 265,92
10	7,69%	€ 3.520	€ 270,77
11	7,69%	€ 3.600	€ 276,92
12	7,69%	€ 3.664	€ 281,85
			€ 3.160,23
	Holiday allowance	8,00%	€ 252,82
	Endyear payment	8,33%	€ 263,25
	Total Weighted monthly Salary		€ 3.676,30
Average 1 FTE on yearly basis	€ 44.116		

Figure F.5 Example of Salary Nurses

Remuneration Specialists

Here the average remuneration of the specialists is being determined based on DTCs in the A-Segment given by the NZa. In case refined patient data is available from self-referrals this can be inserted instead to determine refined remuneration fees of specialists.

Patient Details

In order to quantify the average DTC billings of self-referrals, historical patient can be analysed. Due to confidentiality issues no patient data are provided. Therefore for the average DTC price we use the amount of €256,50 found by Giesbers et al.(2011). Important is to note that these numbers are generated in an academic hospital. To overcome potential discrepancies in DTC tariffs, in the model users can adjust patient details to refine DTC billings. Users can change the patient distribution as well as the average DTC tariff for a particular patient group.

Self-Referral Patient complaint category

	Percentage patients in complaint category	Average DTC	Weighted Average
Tractus Digestivus	13,00%	€ 256,50	€ 33,35
Urinary Passages	3,00%	€ 256,50	€ 7,70
Eye complaints	6,00%	€ 256,50	€ 15,39
Tractus Circulatorius	11,00%	€ 256,50	€ 28,22
Mobility complaints	18,00%	€ 256,50	€ 46,17
Nervous system	5,00%	€ 256,50	€ 12,83
Nose Complaints	4,00%	€ 256,50	€ 10,26
Tractus Respiratorius	8,00%	€ 256,50	€ 20,52
Skin and Subcutis	2,00%	€ 256,50	€ 5,13
General not specified complaints	30,00%	€ 256,50	€ 76,95
	100,0%		€ 256,50

Total Weighted self-referral DTC tariff	€ 256,50

Figure F.6 Example of Patient details.

Structure GP Post

According to the input parameters the financial changes for the GP Post are depicted in this tab. The various revenues as well as cost posts determined by the input parameters are depicted tables and graphs.

GP Post

Costs	Pre-integration Old Situation	Integration First year	Integration Second year
Salary GPs	€ 1.139.060	€ 1.263.860	€ 1.240.460
Salary GP Assistents+Management	€ 1.035.060	€ 1.035.060	€ 1.035.060
Accomodation	€ 104.604	€ 104.604	€ 104.604
Transportation	€ 351.955	€ 351.955	€ 351.955
PR and information	€ 27.274	€ 27.274	€ 27.274
Depreciation	€ 52.850	€ 52.850	€ 52.850
Other	€ 361.994	€ 361.994	€ 361.994
Total	**€ 3.072.797**	**€ 3.197.597**	**€ 3.174.197**

Revenues	Pre-integration Old Situation	Integration First year	Integration Second year
Consults	€ 2.092.911	€ 2.486.713	€ 2.273.507
Telephonic	€ 575.000	€ 575.000	€ 575.000
Visits	€ 596.480	€ 596.480	€ 545.339
Total	**€ 3.264.391**	**€ 3.658.193**	**€ 3.393.845**
Net Result	**€ 191.594**	**€ 460.596**	**€ 219.648**

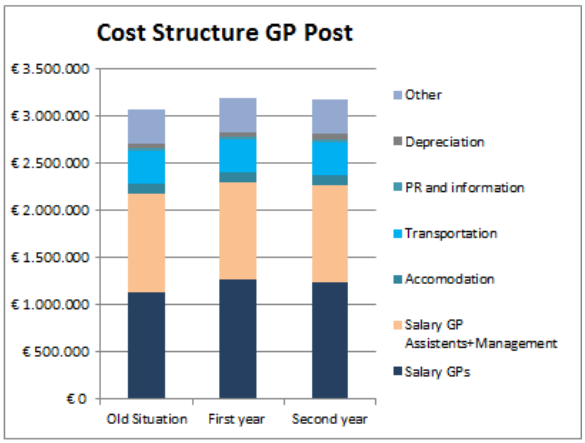


Figure F.7 Example overview Structure GP Post

Struvture GP Post

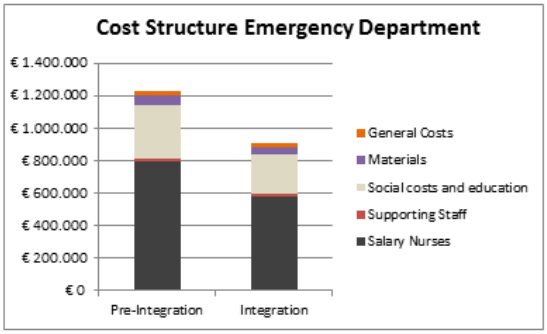
According to the input parameters the financial changes for the Emergency Department are depicted in this tab. The various revenues as well as cost posts determined by the input parameters are depicted tables and graphs.

Emergency Department

Costs	Pre-Integration	Integration
Salary Nurses	€ 794.080	€ 578.675
Supporting Staff	€ 15.000	€ 15.000
Social costs and education	€ 330.800	€ 241.066
Materials	€ 62.900	€ 45.837
General Costs	€ 30.000	€ 30.000
Total	**€ 1.232.780**	**€ 910.578**

Revenues	Pre-Integration	Integration
Hospital Component	€ 3.693.600	€ 2.691.659
Remuneration specialists	€ 923.400	€ 672.915
Totatal DTCs	**€ 4.617.000**	**€ 3.364.574**
Net Result	**€ 3.384.220**	**€ 2.453.996**

average DTC price	€ 256,50
Percentage Honorarium	20



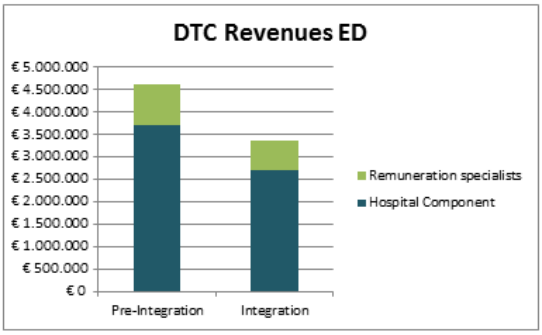
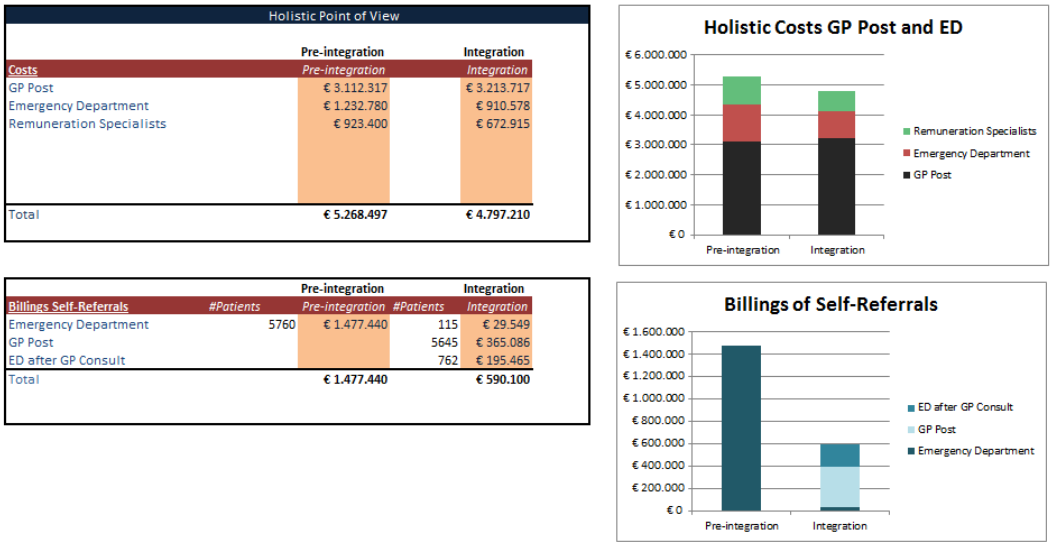


Figure F.8 Example overview structure ED

Holistic Effects

In this tab the hollistic effects of integration are depicted. Both costs and billings are compared pre and postintegration to determine possible benefits of integration.



Holistic Point of View

Costs		Pre-integration		Integration
		Pre-integration		*Integration*
GP Post		€ 3.112.317		€ 3.213.717
Emergency Department		€ 1.232.780		€ 910.578
Remuneration Specialists		€ 923.400		€ 672.915
Total		**€ 5.268.497**		**€ 4.797.210**

Billings Self-Referrals	#Patients	Pre-integration	#Patients	Integration
		Pre-integration		*Integration*
Emergency Department	5760	€ 1.477.440	115	€ 29.549
GP Post			5645	€ 365.086
ED after GP Consult			762	€ 195.465
Total		**€ 1.477.440**		**€ 590.100**

Figure F.9. Example overview Hollistic Effects