BED BLOCKING AT MEDISCH SPECTRUM TWENTE (MST)

Reducing variation and waste in the transition process from the hospital to aftercare institutions.

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INDEX

PREFACE

In front of you lays my master thesis 'Bed blocking at MST'. The thesis provides advice on how to reduce bed blocking at MST.

A very relevant topic of interest for me as a bachelor of nursing.

As Health Science student at the University of Twente I worked with much pleasure on my thesis. It was a great opportunity for me to bring my knowledge into practice.

Hereby I would like to thank all the people who assisted me in creating this thesis.

I especially want to thank my supervisors Dr. J.G. Van Manen, Ir. W.A.M. van Lent of the University of Twente and Drs. E. Stijnen from the MST for their outstanding support, advice and professional feedback.

Wendy Haas
November, 2011

Reading instructions

- All abbreviations & terminologies are written *cursive* and explained into the glossary (Page 6).
- In the tables the sign '#' is used. This sign stands for 'amount'.
- References to an appendix or figures and graphs are underlined.

ABSTRACT

The importance of an efficient patient flow is increasing nowadays, while discharging patients is getting more and more complex. Since the pressure on occupied hospital beds increased drastically at MST, they would like to structurally reduce the total amount of so called *blocked beds*. The purpose of this research is to come up with useful recommendations on how to reduce the total throughput time for patients from the enrolment (for an aftercare institution) till the physical discharge (out of the hospital).

The 3 research questions (**RQs**) are:

- **(RQ1)** What is the current throughput time for patients in the transition process from enrolment (for an aftercare institution) till the physical discharge (out of the hospital)?
- **(RQ2)** What kind of variation and waste can be identified in the different steps of the transition process from the MST to aftercare institutions?
- **(RQ3)** What are the typical characteristics of patients on the waiting list and is there any relation to the amount of blocked beds?

Main findings after investigation of above mentioned **RQs**:

- **(RQ1)** This RQ learns that the current throughput time of the transition process takes approximately one week (including all inefficiencies), while theoretically the actual physical work could be done in less than one hour. Furthermore is noticed that the total transition process could basically be distinguished into five steps:
  1. Enrolment, **2.** Transferpoint, **3.** Queue list, **4.** Contact, **5.** Discharge.
- **(RQ2)** Per step the main types of *variation* and *waste* are:
  - **Step 1:** The method of enrolment to an aftercare institution together with the method of collecting the *admissions forms* delays the process with more than one day.
  - **Step 2:** The incompleteness of *admission forms* (in 34,5% of the cases) together with the indication request contributes to a few days of delay.
  - **Step 3:** The moment a patient is placed at the queue list, communication disorders and admission limitations leads to one hour till a few days of delay.
  - **Step 4:** Visiting the patients by aftercare increases the throughput time with a few days.
  - **Step 5**: Unexpected changes during the enrolment step and the registration of patient data leads to delay of many days.

  These typical findings are explained into more detail in table 5 (page 26) and figure 5 (page 27). Each reduction of *variation* or *waste* can be a relatively small change, but together they may result in an overall process improvement and consequence an increased throughput time.
- **(RQ3)** After investigation of the patient database of MST was figured out that the typical characteristics for patients on the waiting list are:
  - In 46% of the cases the *admission form* was handed in too late.
  - 33% of the registered patients have as the main diagnose *CVA* with an average of 6,2 days of *bed blocking* instead of the overall average of 4,67 days.
  - 26% of the *blocked beds* were a consequence of complex cases.

In chapter 14 the main recommendations for structural improvements are described, see table 9 (page 38). In principle it is a list of many small improvements. Looking over this improvement list, the main advice to the MST would be to digitalize the whole paper flow. Preferable with a kind of track- and trace system to be able to follow the status of the mediation.

GLOSSARY

Admission form

A form filled in by the nurse of a unit with data from the patient. This form should give proper information to the *transferpoint* employee to be able to know what kind of aftercare is necessary.

Algemene Wet Bijzondere Ziektekosten (AWBZ)

The in English called Exceptional Medical Expenses Act is a general act on special medical expenses in the Netherlands. In principle everyone who lives or works in the Netherlands is automatically insured according to this law. It insures the high costs of long term treatment, support, nursing and personal care (www.cvz.nl).

Blocked bed

Many of the beds in the former voluntary hospitals and in the modernised local authority hospitals are being used by elderly people who do not really require hospital treatment. They cannot return home because of poor home conditions and lack of home care (Hazel in Hall & Bytheway, 1982, pp. 1985). When in this thesis the amount of blocked beds is described this could read as amount of days a bed is blocked if timeframe is not mentioned.

Centrum Indicatiestelling Zorg (CIZ)

A governmental institution which determines if people are entitled for health care financed by the *AWBZ*. They base their decision on objective criteria related to the patients' health care status.

Complex(patients)

In the *transferpoint* database some patients are defined as '*complex patients'*. This is based on the definition of E. Stijnen (2011) where typical diagnosis, characteristics and circumstances are identified as *complex* for aftercare as described below. A patient is defined as *complex* if one of the next characteristics is present:

- Cognitive disorders
- Alcohol abuse
- Without a permanent residence
- A (multi-) resistant bacteria
- An infuse for antibiotics or parenteral food
- A trachea tube
- No insurance
- Special wound therapy
- Patient who needs to fix based on somatic reasons

These types of patients are difficult to place at aftercare since the circumstances are not suitable for them or because the health care employees are not high enough educated to be able to do this.

Cerebrovascular accident (CVA)

CVA is a generic term for a cerebral haemorrhage and a cerebral infarct. It means a blockage or bleeding into the brain (Gelmers, 2010). Both diseases could have different causes and also different consequences. Often patients should rehabilitate after a CVA. In English also referred to as a 'stroke'.

Diagnosis Treatment Combination or in Dutch a Diagnose Behandel Combinatie (DBCs):
A DBC is a classification system that groups' patients according to the demand of care, the type of care they need, the diagnosis and the treatment (www.dbconderhoud.nl and U.S. Congress, 1983, pp. *ix)*.

Lean Thinking
A process improvement theory which focuses on the removal of *waste*, defined as anything not necessary to produce the product or service (Nave, 2002).

Medical ready
If a multidisciplinary team agreed that the patient is ready and it is safe to discharge (The community care (delayed discharges) act, 2003 in Benson, Drew & Galland, 2006).

Six Sigma
A process improvement theory which claims that focusing on reduction of *variation* will improve process and business problems (Nave, 2002).

Stakeholder analysis
Analysis of 'any group or individual who can affect or is affected by the achievement of the organization's objectives'(Freeman in Mitchell, Alge & Wood, pp. 854, 1997).

Transferpoint
The *transferpoint* is an office in the MST where the whole coordination of the transition process from enrolment till physical discharge is arranged.

Variation
A no uniform organized process (Nave, 2002).

Waste
'Anything not necessary to produce the product or service' (Nave, 2002, pp.74).

Wrong bed occupation
'Each day a patient who does not really require hospital treatment occupies a bed. This because the patient cannot go home and there is no bed available at aftercare (Stijnen, 2010). It is a synonym of '*blocked bed*'. For the continuity, *blocked bed* is mostly used in this paper.

X-care
The hospital database used in MST.

INTRODUCTION

1. Background information

Aging of the population is a general trend all over the world (van den Berg Jeths, Timmermans, Hoeymans & Woittiez, 2004, pp. 19). The life expectancy in the Netherlands has increased while the mortality rates have decreased (van den Berg Jeths et al., 2004, pp. 19). The pressure on healthcare resources increases (Styrborn & Thorslund, 1993). In some cases a patient cannot be discharged after medical treatment in the hospital due to poor home conditions or a lack of aftercare beds (Hall & Bytheway, 1982, pp. 1985). Each day a *medically ready* patient stays at the hospital is often referred to *'wrong bed occupation'* (Stijnen, 2010).

2. The problem

The importance of an efficient patient flow is increasing nowadays, while discharging patients is becoming more and more complex. Since the introduction of the Dutch case mix system for financing health care in 2005 financing is regulated by Diagnosis Treatment Combinations (DBCs). A DBC is a classification system that groups patients according to the demand of care, the type of care they need, the diagnosis and the treatment (www.dbconderhoud.nl). The goal of DBCs is to get a uniform process taking the different interests of stakeholders into account. Patients get insight into the quality and efficiency of the care provider to make deliberate choices. A consequence for the hospital is the need of an efficient working method due to the increased market forces. Since efficiency became more important the hospital reduced the capacity of hospital beds. Furthermore the duration of patient hospitalization should be reduced to continue delivering care to the same number of patients.

The pressure on an occupied hospital bed increases due to social- and demographic changes and the current financial regulation. The so called *blocked beds* are having bigger consequences than in the past. Each patient who *blocks* a *bed* cost money while each new admission could bring in money. So it is an expensive problem when the hospital could not admit patients due to *bed blocking.* Prolonged hospitalisation is also associated with complications for the patients' health state due to the inadequate health service into the hospital (Lim, Doshi, Cstasus, Lim & Mamun, 2006, pp. 27 and Rinkel, Visser & Speelman, 2004, pp. 2426). Therefore it is important to improve the patient flow and use hospital capacity efficiently.

2.1 Case description

In 2009 the MST counted 207.952 clinical hospital days inclusive 6.761 *blocked beds* (3,25%) (MST, 2010, pp. 17). Therefore in February 2010 the capacity of aftercare institutions was increased by adding an additional 33 short rehabilitation beds distributed over two aftercare institutions. In 2010 the MST counted 5.746 *blocked beds* so *bed blocking* was still a problem (Stijnen, 2010). Capacity of the aftercare institutions therefore does not seem to be the fundamental problem. The transition process from the hospital to aftercare institutions might contribute to the problem.

To analyse this problem the MST preferred to split up the transition process from hospital to aftercare institutions into three phases as shown in figure 1 on the next page.

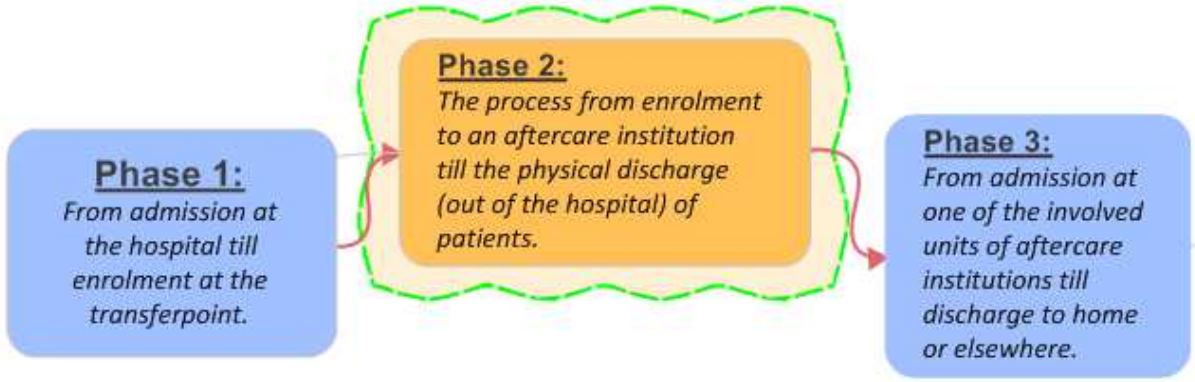

Figure 1: Global overview of the three phases

Phase 2 is the focus of this research. The throughput time of this phase is from the enrolment to an aftercare institution till the physical discharge (out of the hospital). It identifies all the activities at the *transferpoint* of the MST, which are explained into more detail in figure 2 (page 17). The *transferpoint* is the office in the MST where employees mediate between the hospital and aftercare institution to arrange aftercare after hospital treatment. The phase starts when the *admission form* is present at the *transferpoint*. This form should give proper information to the *transferpoint* employee to be able to know what kind of aftercare is necessary

3. Literature on bed blocking

A literature study has been done to find out what kind of methods there are available to reduce *bed blocking* in hospitals. The database PubMed and the database search engine FindUT are used. The selected databases for findUT are: Scopus, Web of Science, OPmaat and Business Source Elite. Used keywords (or combinations of) are: patient, transfer, discharge, delay, *bed blocking* and bed occupancy. At PubMed some of these keywords are used as Mesh terms. Appendix I (page 45) shows a specific elaboration of the search strategy and how only four articles remained after using my pre specified elimination criteria. These four remaining articles are being used as main reference information for this thesis.

Reading through these four articles it became clear that specific patient characteristics can be directly related to *bed blocking*. The main findings on this aspect are explained into detail in chapter 11 (page 28). The literature learns that problems as *bed blocking* could be improved by using the *Six Sigma* and *Lean Thinking* principles (Nave, 2002). Hereby the focus is on reducing *variation* and removing *waste* out of the process. In this context it means a uniform process and optimization of the patient flow in the transition process from enrolment till the physical discharge. The way how *Six Sigma* and *Lean Thinking* have been used as methods to solve the problem of *bed blocking* is described in detail into the next paragraphs.

3.1 Six Sigma

Six Sigma claims that 'focusing on reduction of *variation* will improve process and business problems' (Nave, 2002, pp. 73). It could actually have a detrimental effect on the company's ability to satisfy the customer's needs and provide product and services at the right time at the lowest cost' (Nave, 2002). The assumption of *Six Sigma* is that 'the outcome of the entire process will be improved by reducing *variation* of multiple elements' (Nave, 2002, pp. 74). So reduce *variation* in the transition process should lead to a shorter throughput time. This could be gained by analysing the process and identifying which tasks in this process are not in time or not always similar.

Six Sigma is based on 5 steps:

1. **Define** the process is done at the introduction resulting in RQs.
2. **Measuring** the process is done by observations, registration of patient data and doing interviews.
3. In the **analysis** were the results of measuring the process used to get a clearer overview of the process and identify the fundamental causes and problems.

The steps 4: '**Improvements'** and 5: '**Control'** are both out of the scope of this research since an advice to the MST is the aim of this research.

It will be expected that the different working methods of employees contributes the most to *variation* into the process. Furthermore, if processes are not well connected to each other this could also lead to *variation*. In this context *variation* is not related to differences in kind of admissions or complexity of patients.

3.2 Lean Thinking

Lean Thinking means 'remove anything not necessary to produce the product or service' (Nave, 2002, pp. 75). The process improvements by removing *waste* make the process easier and more efficient for each stakeholder in the process (Rother & Shook, 2003). It aims to achieve the highest quality with the lowest costs and the shortest lead times by eliminating *waste*. *Waste* is anything that doesn't add value for the customer.

Seven types of *waste* are distinguished:

1. Production, **2.** Transportation, **3.** Inventory, **4.** Process, **5.** Defects, **6.** Waiting time and **7.** Motion (Rother & Shook, 2003).

Since *Lean Thinking* is a business method to solve problems the types of *waste* looks like irrelevant for a non-profit organisation as a hospital. This is not the case, explained by the next examples:

1. *Waste* in **production** could be overproduction as doing things too early or too much. It could also be underproduction like doing tasks too late or too less. Both could have consequences for the next step into the process or have consequences for aftercare. This aspect is relevant thinking of an admission which is cancelled while all administrative work is already done.
2. **Transportation** is *waste* when persons, stuff and materials were unnecessary transferred. For example when doctors has to go to different hospital departments to visit their patients.
3. **Inventory** is necessary in health care when it could save lives. In this case the priority of inventory is low and should therefore reduce to a minimum.
4. The **processes** should be optimized by reduce *waste* like reduce the lose time between the different steps.
5. Not well function material could see as **defects** and is always *waste*. For example when more time is needed to gain the same information then when materials work correctly.
6. **Waiting time** is expansive since it is unnecessary. For example the waiting time till an available aftercare bed adds no value to the process. It cost money and have consequences for the patients' health state.
7. **Motion** is related to the location of the different departments and offices. Possibly they influence the throughput time in the current process but plays no role by digitalization of the whole paper flow (Rother & Shook, 2003).

Further elaboration of the seven types of *waste* in the transition process is in table 5 of chapter 10 (page 26). Each reduction of *variation* or *waste* can be a relatively small change, but together they may result in an overall process improvement and consequence an increased throughput time.

4. Research Questions (RQs)

The purpose of this research is to come up with useful recommendations on how to reduce the total throughput time for patients from the enrolment (for an aftercare institution) till the physical discharge (out of the hospital).

- First of all the current throughput time of the transition process should be known. Therefore in **RQ1** is find out how this process looks like and what the length of current throughput time is.
- By reading literature it became clear that the problem of *bed blocking* could be improved by using the business frameworks *Lean Thinking* and *Six Sigma*. Therefore in **RQ2** the types of *variation* and *waste* are identified. Furthermore the frequencies and delay time per delaying factor are visualised resulting in figure 5 (page 27). This figure shows the differences between the time needed and current duration.
- Literature learns also that specific characteristics of patients could have a higher contribution to *bed blocking* like the main diagnose cerebrovascular accident (*CVA*). Therefore at **RQ 3** the relation between the characteristics of patients on the waiting list and the amount of days a patient *blocks* a *bed* are calculated and visualised. The characteristics that occur often and have a high contribution to *bed blocking* should be solved for the highest impact on reduce *bed blocking*.

The 3 RQs are:

- **(RQ1)** What is the current throughput time for patients in the transition process from enrolment (for an aftercare institution) till the physical discharge (out of the hospital)?

- **(RQ2)** What kind of *variation* and *waste* can be identified in the different steps of the transition process from the MST to aftercare institutions?

- **(RQ3)** What are the typical characteristics of patients on the waiting list and is there any relation to the amount of blocked beds?

METHOD

5. Scope

The scope of this research is limited to three selected units at the MST and also three selected aftercare institutions (listed below). It would be too complex to take all units into account. Only the short rehabilitation and transition units of the selected aftercare organisations are involved. The most *bed blockers* are waiting for a bed on this type of unit (Stijnen, 2010).

5.1 Units

The involved units are Neurology (D4), Traumatology (D3) and Orthopaedics (A5) since these create approximately 50% of the total *blocked beds* in the MST in 2010. From March till August 2010 on average eight *beds* per day were *blocked* on these three units alone where on average daily 16 *beds* were *blocked* in the hospital (Stijnen, 2010).

5.2 Aftercare institutions

The involved aftercare institutions are Ariëns Zorgpalet (AZP), Livio and Zorggroep Sint Maarten (ZSM). These organisations together take care for almost 70% of the *bed blockers* from the MST in 2010. Patients who go directly to other hospitals or health care organisations in- and outside the region are not included in this research. Responsible for the other 30% were residential care home (15%), 'Het Roessingh' rehabilitation centre (10%) and terminal- or homecare (5%) (Stijnen, 2010). Obviously the aftercare institutions deliver other care to patients too and admit patients from other hospitals. This is out of the scope of this research. Appendix II (page 47) provides an elaboration of the different aftercare organizations.

6. Units of observation

Make a case for the selection of the sources to observe.

6.1 Transferpoint employees

A *stakeholder analysis* is done to identify which persons are important as a source of information for this research. For the determination of stakeholder positions the typology developed by Mitchell, Agle & Wood (1997) was used as shown in Appendix III (page 48).

Based on this analysis were all ten *transferpoint* employees identified as definitive stakeholders for this research. They are selected as units of observation for the basis of data collection. Of the ten employees working at the *transferpoint* two were secretaries. Due to part time jobs the office occupancy is on average five employees per day. All ten employees are sources of information by observations. Besides two of them are source as respondents for the interview. The specific way of observations is further elaborate at the relevant RQ.

6.2 Clinical patients

Clinical patients from one of the involved units were also a source to observe. Only if they are enrolled at the *transferpoint* between the 18th of April and the 28th of May and go to a short stay or rehabilitation unit at one of the selected aftercare organisations. The database of the *transferpoint* is used to register the typical characteristics of these patients.

Making use of these sources of information will help to answer the three RQs. The next chapter describes the methods of gathering data from these sources.

7. Data collection

Three different methods of gathering data were used. Each method leads to other type of results:

- The **interviews** itself gave a clearer view of the real problem. It leads to new insights about the problem.
- **Observations** increased the knowledge about the process and confirmed the found data.
- The **registration** of patient data gave objective information. For better understanding a graphical representation of the data is made. This provides new perspectives of the process (Nave, 2002). Different combinations of patient characteristics show trends that lead to the most *blocked beds*. Also the throughput time per patient was calculated and analysed in this way.

The use of different methods of data collection has positive effects on the validity of the results (Babbie, 2007). Therefore these methods are combined. Per RQ the method of collecting data is elaborated.

7.1 RQ1: Current throughput time

What is the current throughput time for patients in the transition process from enrolment (for an aftercare institution) till the physical discharge (out of the hospital)?

Observing *transferpoint* employees gave a global view of all activities and the duration per step of the process. Therefore during three weeks the daily activities at the *transferpoint* were observed:

- At **step 1** is observed how to collect the *admission forms* and how the secretary makes the contact information digital.
- At **Step 2** is observed how *transferpoint* employees make personal information digital and how they will be informed about patients' first choice. Furthermore is observed how they request and hand in the *CIZ* indication.
- **Step 3** is about the method they place a patient on the queue list and how the responsible queue list manager manages this list.
- In **step 4** is the mediation observed.
- At **step 5** the contact with hospital departments is observed. Even as the registration in the database after physical discharge of patients.

Additionally two of the *transferpoint* employees were interviewed about the current process. These respondents have both more than three years of experience at the *transferpoint*. As they manage the queue list they have an overview of the whole process. Interview questions were about the experiences of the current situation, the possible interventions and responsibility per step of the process, the kind of bottlenecks they could identify and also how to improve the throughput time. The interview gave more detailed information about the daily activities. Global outline is shown in Appendix IV (page 49).

The interviews are done face to face since it is less time intensive for the respondents. Interviews are anonymous and recorded on tape. On forehand respondents were informed about this to prevent social-essential answers and other negative side effects. Transcriptions can be requested by the researcher. Interviews are individually. Participants in focus groups are not likely to be chosen by probability sampling methods. Therefore they could represent no meaningful statistical population (Babbie, 2007).

The interviews and observations together help to develop a process description that provides insight into the daily tasks at the *transferpoint* of the MST. The results were also used at the next RQ.

7.2 RQ2: Variation and Waste

What kind of variation and waste can be identified in the different steps of the transition process from the MST to aftercare institutions?

The identification of *variation* and *waste* in the process is based on the business methods *Six Sigma* and *Lean Thinking*. This is done per step as shown in the process description at RQ1. The *variation* and *waste* is discovered by the interviews and observations at RQ 1. Additionally from 18th of April till 28th of May each day one *transferpoint* employee responsible for the queue list is observed. Furthermore the secretary is observed during daily activities. Observing staffs verifies the collected data and identifies problems that are overlooked in the interview. *Variation* and *waste* were discussed in the same paragraph since they overlap and influence each other.

7.3 RQ3: Characteristics of patients on the waiting list

What are the typical characteristics of patients on the waiting list and is there any relation to the amount of blocked beds?

After investigation of the patient database of MST is figured out that there are typical characteristics for patients on the waiting list. Making relevant combinations of these characteristics results in an overview of the relation between characteristics and the amount of blocked beds they contribute to. For example the amount of blocked beds distributed per hospital department. Show these results by graph gave a better insight into the relations. For all steps in the process the date is registered to discover the throughput time of the process per patient. Additional characteristics like the age and sex were registered to discover factors that may contribute to *bed blocking.* It gave insight in trends in *bed blocking* and the type of patients which were responsible for the most *blocked bed*s.

The database of the *transferpoint* is source of information for this question. Retrospective data could be influenced so to obtain unbiased information data is prospectively collected. Study population consist of all clinical patients from one of the involved units who are enrolled at the *transferpoint* at the 18th of April till the 28th of May and go to a short stay or rehabilitation unit at one of the selected aftercare organisations. Patients who are ready to be discharged but are still on the queue list on May 28 are also included in this study. These specific patients were followed till discharge to know the real time of delay.

For step 4 is registered at which moment aftercare knows the admission capacity. This leads to a clearer overview of the internal processes of the aftercare organisations. This aspect is of interest because delay of this information has consequences for the process. An optimal internal process is important for the mediation. Information is prospective collected during the four weeks between 18th of April and 13th of May.

Planners at aftercare registered this fact per day. Registration per patient is not possible. Contact between aftercare and *transferpoint* is daily and not always related to a specific case.

To discover factors that may contribute to *bed blocking* per step in the phase the following characteristics of the patient on the queue list are registered:

- **Step 1 - Admission:** Age, sex, hospital department, moment of admission, admission indication, type of aftercare need, method of admission, completeness of admission and complexity.
- **Step 2 - Transferpoint:** Kind of indication and first choice of the patient.
- **Step 3 - Queue list:** Date of medical ready, date hand in *CIZ* request and date indication starts.
- **Step 4 - Contact aftercare:** Date of admission at aftercare, date sending queue list to aftercare, date aftercare react on queue list and moment that aftercare knows admission capacity.
- **Step 5 - Discharge:** Moment of change in healthcare demand is mentioned, moment of data of discharge is announced to hospital department, type of aftercare, location of aftercare, amount of days blocking a bed, reasons of blocking a bed and date of discharge.

8. Analysis

This chapter described how the found data is used to come up with the results and conclusions.

8.1 Analysis of the found data of RQ1

The interviews at RQ1 gave a clearer overview of the current process at the *transferpoint*. This global overview is analysed by split up the process into five logic steps. These steps were the basis for further research. For the interviews a semi-structured approach is used to compare the results between respondents (Van Aken et al., 2008). By making comparisons is focused on agreements and differences between both respondents. Those specific points were used as the focus for observations. The interviews increased the knowledge about the process and confirmed the found data. Observations were also done to discover trends in the process and to identify *variation* and *waste*. This way of analysis leads to the five logic steps of the transition process. In combination with the results of question three these steps were made objective.

8.2 Analysis of the found data of RQ2

Variation and *waste* are both not measurable in terms of responsibility for throughput time or *blocked beds*. Therefore in the analysis these aspects were structured per step of the process and discussed in terms of impact on the throughput time. Also an overview of *waste* is made differentiated per type of *waste*. This is based on the source www.7verspillingen.nl a site of A. van der Hulst, based on the book 'Learning to see' of Rother & Shook about Value Stream Mapping and *Lean Thinking*.

8.3 Analysis of the found data of RQ3

Analysing the characteristics of patients on the waiting list for aftercare is done by making relevant combinations of these characteristics. Choice for the analysis is partly based on the experience of the *transferpoint* employees obtained by the interviews and partly based on own experiences.

Combinations for analysis are:

- The moment of enrolment at the *transferpoint* per hospital unit.
    - Visualised by graph 1 (page 29).
- The total number of patients being responsible for the blocked beds.
    - Expressed by circle diagram figure 6 (page 30) in percentage of patients differentiated per type of admission
- The total number of patients responsible for the amount of blocked beds distributed per admission indication (short rehabilitation or transition).
    - Structured in excel table 6 on page 30 including the percentage and average days of *bed blocking*.
- The complexity of patients related to the amount of blocked beds.
    - Shown in excel table 7 on page 30
- The total amount of blocked beds per hospital department.
    - Shown in graph 2 on page 31
- The total amount of days a bed is blocked and the average amount of days a bed is blocked per main diagnosis.
    - Visualised by table 8 on page 31 for the seven main diagnoses.
- The duration till approval by CIZ.
    - Expressed in amount of workdays on page 30.
- The total number of patient which blocked a bed per amount of days a bed is blocked.
    - Visualised by graph 3 on page 32.
- The throughput time in the system per number of patients and the throughput time after the patient is medically ready.
    - Expressed by graph 4 and 5 on page 33 which are put side by side to get a better visualisation.

RESULTS

9. Current process (RQ1)

What is the current throughput time for patients in the transition process from enrolment (for an aftercare institution) till the physical discharge (out of the hospital)?

Based on the interviews and observations a process description is made as shown in figure 2.

The current processes at the *transferpoint* of the MST could be split up into five steps. In table 1 the specific aspects of these five steps are described. Between the steps there is some waiting time. The duration of this waiting time depends on many factors. This will be further elaborated in the next chapter and is therefore not mentioned in table 1.

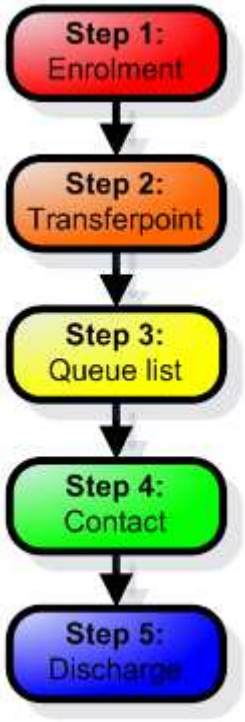

Figure 2: Process description

Step	Activity	Responsible	Where	When	Duration	Additional information
Step 1: Enrolment	Collect the admission form	Transferpoint employee	Hospital unit	Each weekday at 11 o'clock	5 min. per form	Total duration per day is on average 30 minutes.
	Make contact information digital	Secretary	Access	When form is present at transferpoint	2 min. per form	If data is not well readable more time is needed.
Step 2: Transfer point	Make personal information digital.	Transferpoint employee	Access	When secretary have finished her part	5 min. per form	Delay when form is incomplete.
	Inform about patients first choice	Transferpoint employee	By phone	Before indication request	5 min.	When patients want to discuss this subject with family it takes extra time.
	Hand in the *CIZ* request	Made and hand in by transferpoint employee	By mail	When patient is medical ready and first choice is known	10 min.	Indication request differs per type of aftercare. For transition request more time is needed.
Step 3: Queue list	Place patient at digital queue list	Transferpoint employee	Access	As soon as possible after admission	A mouse click	Patients are on the queue list whether or not they are medical ready for discharge.
	Manage queue list	Queue list manager	Access	Each morning the list is updated	10 min.	
	Send the list to aftercare	Queue list manager	By mail	Each weekday before 9 o'clock	A mouse click	
Step 4: Contact aftercare	Mediate	Queue list manager & planner aftercare	By phone	Each weekday between 9 and 11 o'clock	Differs per day	
Step 5: Discharge	Contact unit about date of discharge	Transferpoint employee	By phone	If discharge is planned	5 min.	Sometimes units are difficult accessible.
	Registration	Transferpoint employee	Access	After each discharge	5 a 10 min.	Important data for care admission office.

Table 1: Five steps of the current process

9.1 Step 1: Enrolment

Every weekday the *transferpoint* employee has to go to selected hospital units to collect a part of all *admission forms. Admission forms* that are not ready before 11 o'clock were stored till the next workday or will be sent by fax to the *transferpoint*. The hospital database is not connected with the database of the *transferpoint*. So when the *admission form* is present at the *transferpoint* the secretary has to re-type the contact information in Access. Characteristics of the enrolment are shown in table 2.

Step 1: Enrolment (N=55)

- Collect the admission forms
- Make enrolment digital *(by secretary)*

Characteristics	*Value*
Method of admission, no. (and%)	
⇨ Fax	16 (29,1%)
⇨ pick the form up at the unit	39 (70,9%)
Complete, no. (and %)	
⇨ Yes	36 (65,5%)
⇨ No	19 (34,5%)
Complex, no. (and %)	
⇨ Yes	9 (16,4%)
⇨ No	46 (83,6%)

Table 2: Admission characteristics

9.2 Step 2: Transferpoint

A *transferpoint* employee first digitalizes personal information like health care demand. Second step is the *CIZ* request. This could be hand in online and is based on the information at the *admission form*. Additional information needed is the 'first choice', the aftercare organisation the patient prefer and the date of birth of the spouse. This information is gathered by telephone contact with the patient or first contact person of the patient. Before aftercare could be arranged the indication request must be approved. By law patients should be asked for the first choice of aftercare.

Step 2: Transfer point

- Make enrolment digital *(by transfer employee)*
- Hand in the *CIZ* request
- Inform about the 1e choice of the patient

Characteristics	*Value*
**Kind of indication, no. (and %) ***1	
⇨ SIP	43 (78,2%)
⇨ 'general' request	9 (18,2%)
Amount of days till approve general request:	
- *Mean*	2,9 days
- *Range*	1-5 days
First choice, no. (and%)	
⇨ AZP	23 (41,8%)
⇨ Livio	15 (27,3%)
⇨ ZSM	6 (10,9%)
⇨ Other	11 (20,0%)

Table 3: CIZ indication

**1: Two patients (3,6%) had already a CIZ indication at moment of enrolment, so a new request was not necessary.*

The *transferpoint* employee is responsible for asking patients' first choice. A nurse cannot know the full guide of social services in the neighbourhood including all types of aftercare they deliver. When there is no capacity available at first choice the patient should agree with a second best option. If long queue lists are present the second best could be a location out of the area. For the elderly this could be a big issue due to mobility. Registration of step two identifies the patients' first choice of aftercare and the kind of *CIZ* request is handed in.

9.3 Step 3: Queue list

A *transferpoint* employee places the patient on the queue list. This list is also in Access and will be updated by the responsible queue list manager. Two *transferpoint* employees are responsible for the queue list for a period of three months successively. They have to update the list daily by removing physically discharged people off the list and add new enrolments. Each workday at 9 o'clock this list should be send by mail to aftercare which has to react per mail before 10 o'clock.

9.4 Step 4: Contact aftercare

The responsible queue list manager has to check the available capacity of the different aftercare locations. Discharge will be planned based on the admission opportunities of aftercare. The *transferpoint* employee decides which patient on the waiting list will be discharged. Generally this is the patient who was waiting the longest. In some cases they could decide to wait with discharge the patient if there is no capacity available on first choice but it is on forehand known that within a few days there is an admission possible. That is why patients' first choice is important to know.

The mediation between *transferpoint* and aftercare is daily between 10 and 11 o'clock. The *transferpoint* calls aftercare to discuss about a case and make appointments for discharge. Sometimes the planner of aftercare contacts the *transferpoint* earlier because they should also deal with other organizations. A special mobile phone is reserved for this contact so they should not wait for the secretary. In some cases they want more information about the patient. Then they can call the responsible nurse or plan a visit with the patient and/or family.

The mediation became difficult since not all aftercare organizations can deliver all types of health care at each unit or location. The first choice of patients is in some cases not realizable. Partly this is known on forehand but partly it depends on actual admission limitations of aftercare. Some organisations care different sexes separate from each other. Others admit a maximum amount of new admissions per day dependant on the amount of physicians present. Available capacity changes continue since aftercares are depending of each other. If a patient transfers from the one organisation to another a new patient from the hospital could be admitted to aftercare. These aspects are not fully known at the moment of mediation which makes this process more difficult.

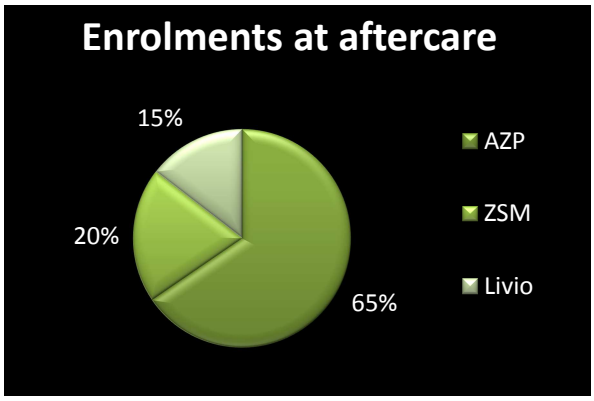

Figure 3: Percentage enrolments at aftercare

The first choice in combination with the admission possibilities of aftercare provides the flow of patients. Figure 3 shows that AZP admit the most patients directly from the hospital. This is possible because AZP has two units located in the hospital. The patient utilization is high on these units. ZSM and Livio admit mostly patients from AZP before they admit a patient directly from the hospital. Therefore the problem of *bed blocking* is shifting to AZP and continues.

9.5 Step 5: Discharge

When the discharge is planned the *transferpoint* employee calls a nurse of the hospital department to inform them about the date of discharge. Patients are not always content when they should discharge to a second best option. If they decline to be discharged the case will be discussed with the head of the department. Otherwise the patient will be discharged at planned moment.

The *transferpoint* registered facts about each case. For example the location and unit of aftercare where the patient was discharged to, the type of aftercare the patient receives there, the amount of days the patient had *blocked* a *bed* etc.

This information is saved in the *transferpoint* database and will be checked by the head of the *transferpoint*. It is also available for the care admission office. This office is responsible for the capacity of aftercare beds. If available capacity within the facilities is insufficient they should optimize the situation.

Registered data at step 5 identifies the kind of discharges from the selected units at MST to the aftercare units as shown in table 4.

Step 5: Discharge

- Contact unit about date of discharge
- Registration

Characteristics	*Value*	
Type of aftercare, no. (and %)		
⇨ Short rehabilitation	43	(78,2%)
Subdivided in:		
- *'general' short rehabilitation*	29	(52,7%)
- *Collum # care*	1	(1,8%)
- *Elective orthopaedics*	7	(12,7%)
- *CVA rehabilitation unit*	6	(10,9%)
⇨ Transition unit	10	(18,2%)
⇨ Other		
- nursing home	1	(1,8%)
- residential care home	1	(1,8%)
Location aftercare, no. (and%)		
⇨ AZP	36	(65,5%)
⇨ ZSM	11	(20,0%)
⇨ Livio	8	(14,5%)

Table 4: Discharge data

The process description of this RQ gave an overview of the current processes within the phase. In principle the actual physical work could be done in less than one hour but the overall time of the phase is delayed for one week. This could be due to the steps in the process or due to delay between the steps. This is elaborated in the next chapter.

10. Variation and Waste (RQ2)

What kind of variation and waste can be identified in the different steps of the transition process from the MST to aftercare institutions?

Often *waste* exist because of the *variation* in the process. Since these subjects overlap each other they are elaborated in one chapter together. At the end of this chapter table 6 (page 26) shows an overview of *waste* distributed per type of *waste*. Figure 5 (page 27) visualises the impact of *variation* and *waste* on the throughput time.

10.1 Step 1: Enrolment

The moment an *admission form* is completing is dependent for the whole process. Early enrolments were not useful since the health state of patients could change a lot between the moment of enrolment and the moment a patient is medically ready for discharge. Accurate mediation for aftercare is not possible at that moment. In 46% of the registered cases were *admission form* hands in too late. So aftercare could not be arranged on time. Both are causes of *bed blocking*.

The *transferpoint* employees pick up the *admission form*s from the hospital departments. This method of collecting is *waste.* In the interview at RQ1 the *transferpoint* employees said that "the current method of collection works successfully. It is an effective method of communication and we have the possibility to ask something directly to the nurse". Of course, if the *admission form* is not complete it could take a lot of time to find out this information. Although these activities were less often necessary if the *admission form* was complete.

Observing employees learns that each employee has an own method to collect the *admission form*s. In some cases it looks a useful method, but some employees make no profit of this. So there is some *variation* within the process. Picking up the forms takes a minimum of 30 minutes time per day per employee. It depends on the hospital departments were to collect forms. Although from a logistic point of view the *transferpoint* is wrongly situated. The hospital has two locations where the *transferpoint* is situated at the location with fewer hospital departments. The units where an employee has to collect *admission forms* were not optimal divided. Some should collect forms from one unit at the other location and the others from the same location as the *transferpoint* is situated. Transfer to the other location takes 20 minutes. All *transferpoint* employees go to their units at the same time to pick up the *admission form*s from the hospital units. It is time consuming and therefore an expensive activity. For example, on a normal day four employees make this transfer together. Four times 20 minutes means more than one hour per day of delay in throughput time due to the location of the *transferpoint*. Besides the accessibility of *transferpoint* employees were interrupted during that time.

After collecting the forms the secretary makes the contact information digital. This because there is no connection between the hospitals' databases *X-care* and the stand-alone database of the *transferpoint*. It takes just a 5 till 10 minutes time per *admission form* but if databases were connected re-typing was not necessary. Therefore this can be identified as *waste*.

Figure 4 shows that 30% of all *admission forms* were send by fax. It is not for sure that the hardcopy also comes through to the *transferpoint*. So the secretary has to re-type the contact information in Access when the fax is at the *transferpoint*. Sometimes the fax is unreadable and data should be looked up in *X-care*. This takes a 5 till 10 minutes extra work per unreadable fax. *Admission forms* per fax were also not official. The original signature of the patient is necessary to give permission for arrange aftercare and request an indication. Request for a signature could be time intensive for *transferpoint employees* and/ or nurses due to the target group.

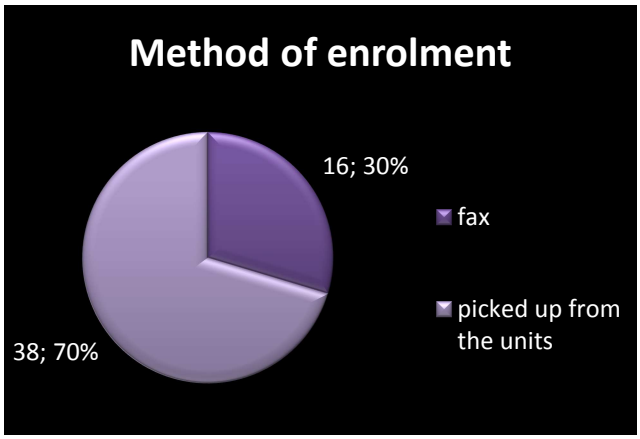

Figure 4: Method of enrolment

No weekend service is delivered by *transferpoint* and planners / physicians of aftercare. This delays the process. *Admission forms* filled in after 11 o'clock will be collected for the next work day so one till three days after the form is complete. This leads to extra work for the *transferpoint* employees. Aftercare will be called more often to mention that another patient could be discharged as soon as possible. Especially in complex cases these consequences increases. Due to the limited possibilities of aftercare to admit complex patients and the extra preparation necessary before discharge is possible.

10.2 Step 2: Transferpoint

The most important *waste* in this step is re-typing health care related information of the enrolment. Digitalize the *admission form* by secretary and *transferpoint* together cost a 15 till 30 minutes time per form. Due to other activities in between the time spending at digitalization is much more. Therefore re-typing is time consuming. Furthermore it increases the chance to make mistakes.

When *transferpoint* employees want to make the *admission form* digital it is important that the *form* is correct, complete and readable. In 34.5% of the cases the *admission form* was not complete. Incompleteness means a lack of necessary information and / or no signature. Extra time needed varies from 5 till 30 minutes per case. If employees have to make inquiries this delays the overall process. Sometimes no *CIZ* indication can be requested when an *admission form* is incomplete. It depends on the missing facts.

According to the law hospitals should ask for the patients' first choice. Since *transferpoint* employees know the guide of social service they request for patients' choice. Nurses could not know all aftercare organisations and type of healthcare they deliver. Asking this relative simple question could leads to a lot of delay because most families want to think about this decision. So while asking this question takes just five minutes sometimes it takes a few days in the process.

The protocol 'first choice, second best' of the MST could also lead to undesired situations for patients. If there is no admission possible at the preferred unit of aftercare the patient were discharged to a second best option. This could be a unit on a location outside the region in case of long queue lists. Mostly patients do not expect this when they were requested for a first choice. For this target group it is undesired situation because the limitations in mobility. *Waste* due to processes.

The *CIZ* request could delay the process. The indication request differs per type of aftercare requested. For a general *CIZ* indication in case of a transition unit request it takes a few days till request is approved. This waiting time is *waste* but by law necessary and could lead to extra *bed blocking* days. A short rehabilitation indication is always directly approved and starts at the moment of request. This indication is for just a couple of weeks, so the request is done as late as possible. This procedure is described in the work processes of the *transferpoint*. Mostly as kind of reminder the *transferpoint* employee insert a notification in the database to hand in a *CIZ* request at day of *medical ready*. This adds no value to the process since working methods are not consistent. So employees can and should not trust on this notification and should always check when the indication should be done. There is no delay in the process due to this step but it could lead to mistakes.

Transferpoint employees have daily contact with the *CIZ*. For example to know what kind of indication a patient already have. *CIZ* wants extra information about the patients' health state when they doubt about the indication. This telephone contact is time consuming.

In 23 cases (41,82%) an unexpected change regarding to the enrolment existed. Aftercare could already be arranged while the patient is no longer *medical ready*. This could lead to undesired situations and direct or indirect to *bed blocking*. In some situations unexpected changes are definitely unexpected. Although it is important that nurses communicate this as soon as possible to the *transferpoint*. Frequently occurred unexpected changes are elaborated:

<u>Unexpected changes regarding to the enrolment:</u>

- As a consequence of a worsen medically health state of the patient;
  - Related to the hospital health care which is not accurate for rehabilitation. The occurrence of complications like a hospital bacterium exists as consequences of long time hospitalization.
- Due to the preferences of the patient or family;
  - When the patients were informed about the aftercare locations it could change their mind positively but also negatively.
- By miscommunication.
  - This will happen unfortunately.

The communication between the hospital units and the *transferpoint* could anyhow be improved. For example the fact that sometimes nurses does not mention that a patient is *medical ready*. So the *transferpoint* does not arrange aftercare. This miscommunication leads to delay and *bed blocking.* Procedure is that nurses contact the *transferpoint* about changes. Due to v*ariation* in the process *transferpoint* should contact often for these information. So *variation* in the process results in *waste* activities and could lead to delay.

10.3 Step 3: Queue list

A nurse enrols a patient to the *transferpoint w*hen it is certain that they could not be discharged to home. The *transferpoint* employee inventories the situation based on the information at the *admission form*. They request the first choice of the patient. Other activities could not be done because the situation could change till the moment the patient is *medically ready*. In the meantime these patients are still on the waiting list. This method of inventory information is a type of *waste*. None can react on this information. It is not for sure that the aftercare location the patient prefers could deliver the care the patient needed at moment of discharge. Furthermore this process varies due to working methods. Some employees place patients on the queue list when they are ready to transfer. Other employees place all enrolments on this list. This leads to mistakes. Early enrolments and *admissions forms* who are hand in too late are both causes of delay.

The queue list should be accurate to prevent miscommunication. The organisation of first choice is mentioned on the queue list. When a patient discharge to a second best option this organisation will not mentioned on the queue list. Only the first choice is shown on this list instead of the location of discharge. It occurs that planners of aftercare make a mistake and are afraid that they get an admission while there is no availability. In that case a patient discharged to a second best option but it looks like to the first choice since that organisation is mentioned on the queue list together with the date of discharge. The *variation* in this process could lead to problems and a few minutes up till hours of extra work for *transferpoint* employees.

If patients are a long time on the queue list as consequence of capacity problems at aftercare the health care demand could changes. Health states of the patients could improve drastically and aftercare is not necessary anymore. These patients go home without rehabilitation at aftercare while all facilities are arranged. It occurs also that patients change their mind and want to rehabilitate at the rehabilitation centre instead of the general aftercare locations. In that case a lot of unnecessary task were fulfilled because arrange rehabilitation care is no tasks of the *transferpoint*. An indication is in both cases unnecessary anymore and patients move from the queue list for aftercare. Mostly these patients create a lot of *blocked bed*s due to unexpected changes regarding to the enrolment.

10.4 Step 4: Contact aftercare

The most important problem in this step is the accessibility of the planners at aftercare and the *transferpoint* employees.

If one of them is busy or out of the office telephone contact is not always possible. This could lead to just a few minutes to days of delay. Therefore accessibility of aftercare and *transferpoint* is a problem in this process. Frequently both employees try to contact each other. This is time intensive and an example of *waste* in waiting time. In fact it is a *waste* activity to contact each other by telephone. Nowadays other modern techniques work more efficient like email. Mail contact is also used at the *transferpoint* but mostly mails from aftercare are designated for the queue list manager. Since this is not always the same person mail will be send to the secretary.

They send the mails to the relevant persons. When the secretary is busy at that moment there is some delay in receiving emails. This could be a few minutes but in one case it was delayed with one hour. This waiting time is *waste.* The delay has consequences since within that hour a lot of things could be changed. Appointments with other aftercare organisations could already been made. So the mail could be irrelevant or the patient is already planned for a second best. Improved this contact per mail optimizes the whole transition process.

Accessibility is also a problem when one of the planners is absence for a few days. In principle the *transferpoint* is five days a week available during office hours while the individual employees work part-time. Therefore a lot of time is spent on reading about the case and realize what should be done. Duration depends on the completeness of the information. Planners of aftercare are even so not always accessible due to part-time work hours. The planners are mostly individual responsible for several units. No colleague takes over tasks when a planner is absent. This leads to low accessibility. Absence of a planner during holidays or vacation could leads to a lot of delay in the process. It occurs frequently that no planning could be made at most important aftercare organisations with the consequence that a long queue list creates during these days. The low accessibility of aftercare is a type of *waste* in the domain of waiting time. It is useful in terms of reduce *waste* when planners and employees at the *transferpoint* would both work full time. It should not be possible that patients could not be discharged due to the absence of a planner while a bed is available.

There are two aftercare organisations who want to visit the patient before admission. ZSM visits all enrolments, Livio only the *complex* cases. Rule is that this will not lead to delay of the transition process but in some cases it does. This *variation* leads to disorder by nurses and patients. For the uniformity of the process it is possibility better to not do visits in the hospital. While some aftercare organizations are positive about the visits it is not proven that this is suitable. The patient's related information delivered by the *transferpoint* should be enough for an admission. Aftercare should trust on these information and handle to this. The reason why they want to visit the patients is maybe because of miscommunication in former times. When the queue lists increases and the pressure from the hospital became too high it could be imagine that some specific information will not be mentioned in mediation. A patient discharged to an aftercare unit that could not deliver the adequate health care for that patient with all its consequences.

10.5 Step 5: Discharge

The aftercare locations have some limitations to admit patients but have also some preferences for admissions. Locations at Enschede prefer to admit patients living in that area. Locations specialized into *CVA* patients prefer to admit only *CVA* patients. Sometimes these patients are not on the waiting list or other patients are waiting much longer. Organisations prefer to admit first patients who are waiting at other locations (second best) before admitting a patient directly from the hospital. (The second best option is mostly the short stay unit in the hospital). This will lead to much more mutations at the short stay unit in the hospital, more *blocked bed*s at the hospital and it is a patient-unfriendly situation. These consequences occur because of the *variation* between the different organisations: different vision, preferences and needs. The time a patient *blocks* a *bed* due to this problem is not precise known. Although it could be imagined that this is time intensive and leads to extra days of *bed blocking* instead of hours of delay.

When a patient disagrees with the second best option the head of the unit decide if the patient may stay at the hospital. If they decide that the patient could stay a few days longer at the hospital it is *waste* in terms of defects. For the individual patient this could be patient-friendly. But in fact it is better when there is no *variation* in this process. Comparable treatments between patients were preferred. Furthermore aftercare organizations could feel negative consequences of this.

Physicians do not admit patients at the aftercare units during weekends and admit a limited number of patients per day. In short the amount of admissions depends on the amount of physicians present at that specific day. During holidays, vacation and due to part time work hours of physicians the admission capacity is limited. It looks like that it makes no sense to them when the queue list is long. It happened that there was capacity available but just a maximum of one admission per day could be admitted due to this limitation. *Waste* in terms of waiting time and process.

AZP has got two units located in the MST which deliver rehabilitation and transition care. Patients with physical disorders could also be admitted. This location has a lot of advantages since the patient only have to transfer from unit, not from location. Mostly it is not the first choice of patients to be admitted over there. It often occurs that patients were admitted at AZP and were moved to the location of first choice within a few days. A lot of mutations take place at these two units of AZP. It is not an optimal situation for patients as for employees at these units. It looks like a temporary move of the problem, from the hospital to AZP. This transport of patients adds no value. It improves the reduction of the amount of *blocked bed*s at MST, but at the same time it stagnate the patient flow. Fewer admissions to other aftercare organisations were possible since they admitted patients waiting at AZP first. *Waste* in terms of transport and inventory.

The data *transferpoint* employees should register after discharge of the patient adds no value to the transition process. It could be seen as *waste* in terms of production, but is has no effect on the amount of days a patient *blocks* a *bed*. It is important to register how the amount of *blocked bed*s in the hospital change over time and what causes and consequences this could have. These facts will be known by the health care office, which reacts in terms of bed capacity.

Finally the process is organised in such way that information and patients were transported by many stakeholders therefore information will be lost and patients are not getting the right health care.

Types of waste

Type of Waste	Waste	Frequency	Impact per case	Comments
1. Production				
Overproduction:	Notification of *CIZ* request	Per admission	1 minute	It is not trustful so miscommunication occurs.
Produce too early:	Admission which is cancelled	Weekly	30 minutes	Mean time needed for an admission is 30 minutes.
For external Stakeholders:	Registration afterwards	Per admission	10 minutes	
2. Transportation				
Of information:	Method of collecting admission forms	Daily	30 minutes	Each employee collects his own forms at the different units.
	CIZ indication (information)	Per admission	5 till 15 minutes	Depending on the kind of request.
	Part time work hours	Daily	10 minutes	Per day. To inform about current cases.
Of people:	Unit AZP in the hospital	Daily		
3. Inventory				
	Early admissions	Weekly	30 minutes	When all activities for arranging aftercare are finished.
	Location AZP in the hospital	Daily	Mostly a few days	Till a patient could be admitted to location of first choice. It is a temporary solution and a shifting of the problem from MST to aftercare.
4. Process				
	CIZ indication	Each admission		Process adds no value but is by law necessary.
	First choice, second best protocol	Per admission	15 minutes till a few days	15 minutes to inform a patient about possibilities. A few days if the patient doubt about a decision. Extra time if the patient disagrees with second best option.
	Digitalization of admission	Each admission	30 minutes	For secretary and transferpoint employees together.
	Registration afterwards	Each admission	10 minutes	
5. Defects				
	Disagree with second best	Monthly	1 till a few days	When a patient disagrees it takes a few days to discuss the situation and decide.
	Unreadable fax	Daily	15 minutes	To search data in X-care, print and type over.
6. Waiting time				
On information:	About first choice	Weekly	Depends	To contact aftercare.
	Admission	Weekly	Maximum observed is 9 days to late.	If the patient is admitted too late to the transferpoint.
	Incomplete admission form	Daily	One work day	Necessary for arrange aftercare
	On signature patient	Weekly	One work day	Necessary for arrange aftercare.
	Till *CIZ* approve indication	Monthly	A maximum of 2 workdays	So discharge could be planned.
	Mails	Weekly	A few minutes till one hour	Secretary sends this to the relevant person.
On people:	Due to weekend days	Weekly	Maximum of 3 days	Waiting on planners of aftercare, transferpoint employee and / or a physician at aftercare.
	Due to part time work hours and holiday	Monthly	Maximum of one day	Accessibility of Stakeholders.
7. Motion				
	Location transferpoint	Daily	30 minutes' walk	By collect Admission forms from the units.
	Location units	Daily	Depends	On distribution of the allocated units.

Table 5: Types of waste

Impact of *variation* and *waste*

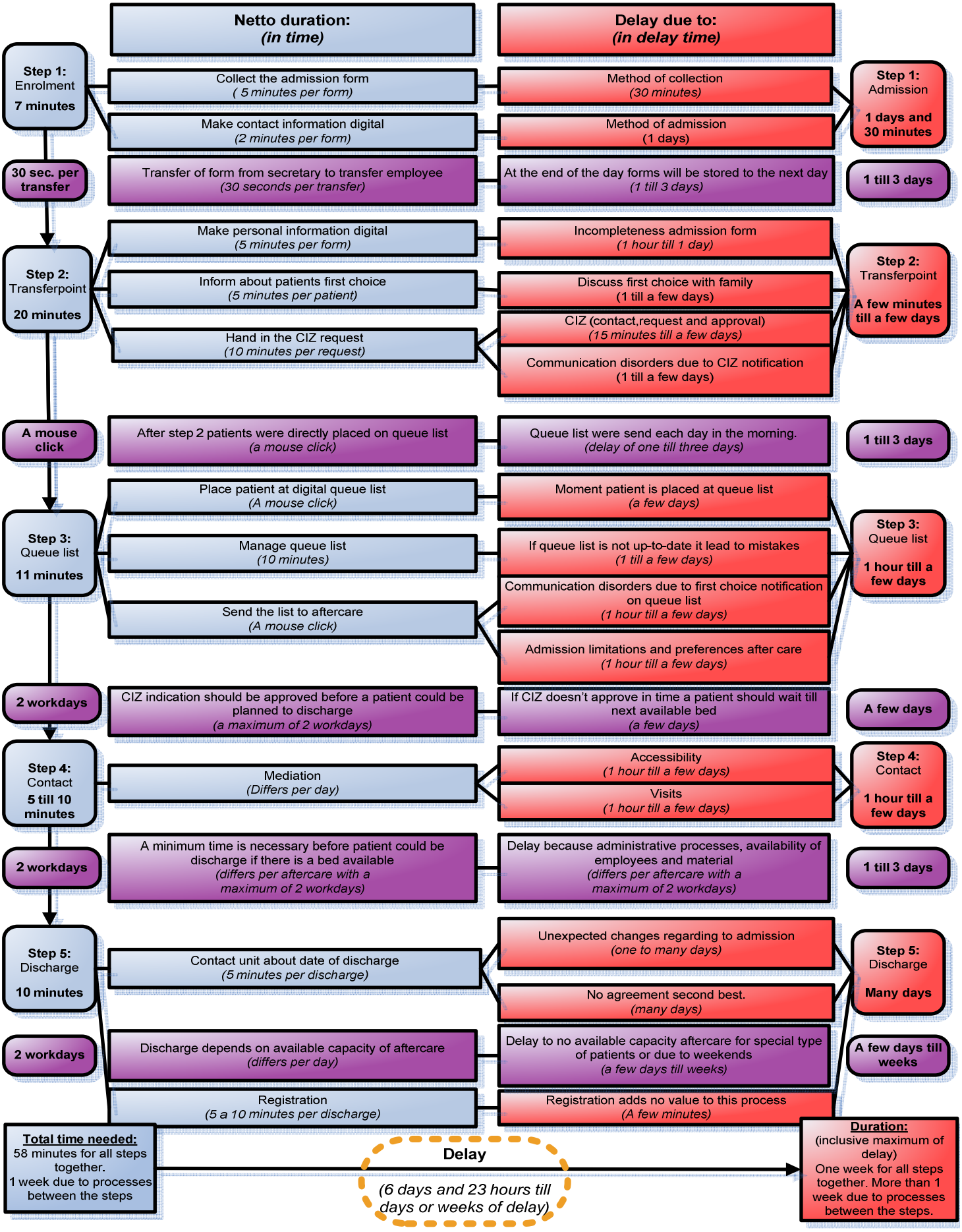

Figure 5: Impact of *variation* and *waste* on throughput time

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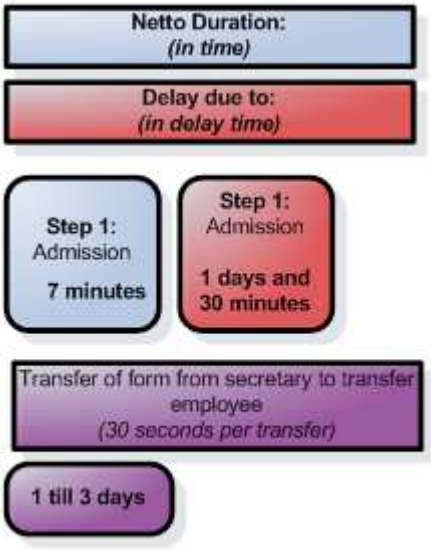


} Description of the activities based on the duration the actual physical work could theoretically be done (blue one) and the current throughput times of transition process inclusive a maximum of delay (red).

} Description of the steps and duration for netto duration (blue one) and for current throughput time (red one).

} Activities and duration of activities between the steps

} Duration of the activities between the steps. At the left side the netto duration, at the right the current throughput time.

11. Characteristics of patients on the waiting list (RQ3)

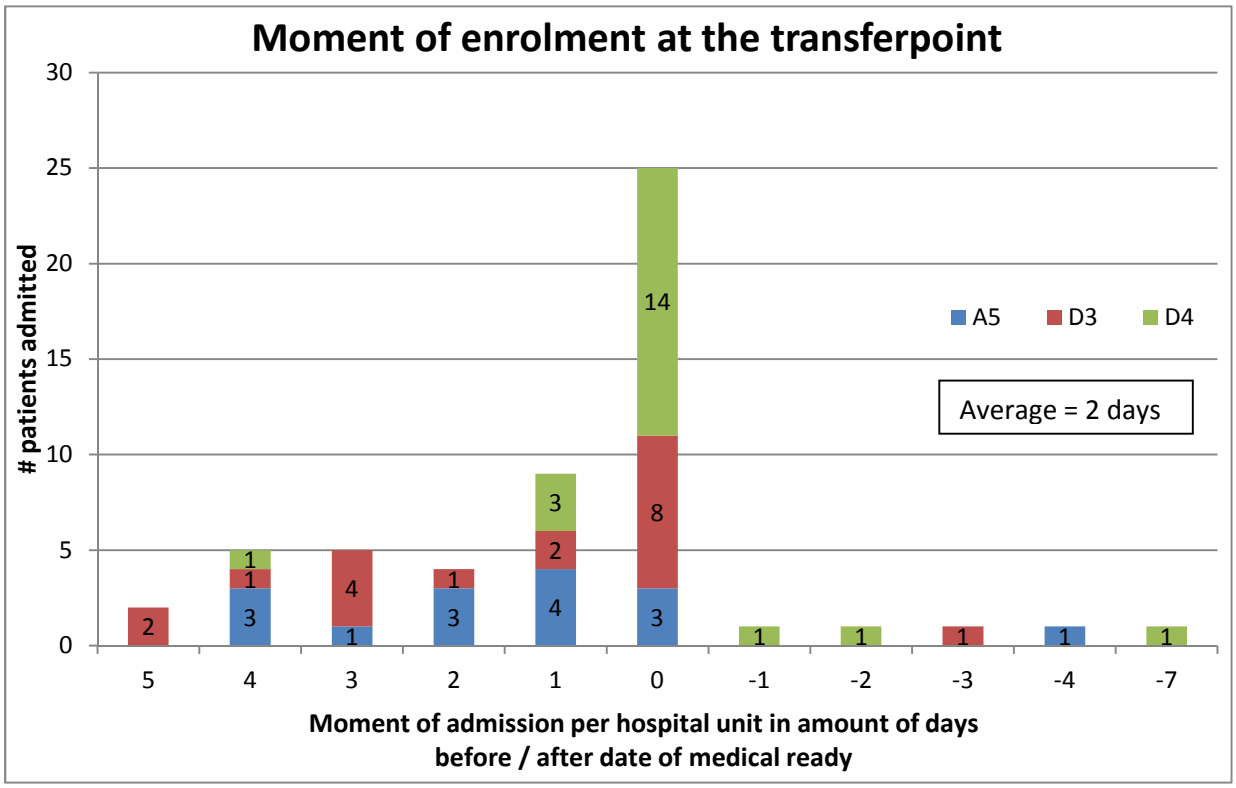
What are the typical characteristics of patients on the waiting list and is there any relation to the amount of blocked beds?

In this chapter the typical characteristics for patients on the waiting list are elaborate. The registration gives insight into the amount of (*blocked bed*) days a patient is in the process. Results of the registration are visualised because it gives a better insight in the process in terms of frequencies. Trends in factors which contribute to *blocked bed*s might show for example by a graphical presentation. Combinations of the registered characteristics could lead to new evidence and different perspectives of the process which is important for the outcome of this research.

11.1 Step 1: Enrolment

During the period of registration there were 73 patients with health care demand 'short rehabilitation' or 'transition unit' admitted to the *transferpoint*. 10 of them had a first choice other than the involved aftercare organisations whereof 15% prefer Trivium-Meulenbeltzorg (TMZ). From the 73 enrolments 18 patients are ruled out. They are discharged to an aftercare location out of the scope of this research or decide to leave the hospital without aftercare. Possibly they left because of the long waiting lists or disagreement of second best option. Some patients ruled out since they moved from hospital department. Sometimes patient are no longer *medical ready* due to unexpected changes of their health state regarding to the enrolment. Therefore the study population decreased to 55 patients.

30% of the *admission forms* were still send by fax. The moment of enrolment differs per unit. In 46% of the registered cases the *admission form* is handed in too late. Remarks could be made on this fact since no procedure is made about the time an *admission form* should be hand in. *Transferpoint* employees' registries the enrolment as 'too late' if it was not possible anymore to arrange the aftercare in time. Therefore graph 1 visualise the moment of enrolment in relation to the date when a patient is *medically ready*.



Graph 1: Moment of enrolment at the transferpoint in amount of days differentiated for hospital unit.

A '4' on the horizontal axis means that four days before the patient was *medical ready* the *admission form* was present at the *transfer point*. '-4' means four days after *medical ready*. '4' at the vertical axis means four patients were admitted at that specific moment in time.

The moment of enrolment is important because *transferpoint* employees need a specific amount of days to arrange aftercare, whether or not there is a queue list. It differs per type of aftercare necessary but enrolments at the day of *medical ready* or each day after that date means a *blocked bed*. This means that at hospital department A5 (orthopaedics) a minimal of seven *blocked bed*s exist due to requests out of time. Overall 42 *beds* were *blocked* by this reason. The specialist plays an important role in this project since they should inform the nurses in time about the date a patient is *medical ready* for aftercare.

11.2 Step 2: Transferpoint

In 78% of all enrolments a short *CIZ* indication is requested. Otherwise a general indication is needed. The patient could not be discharged to aftercare before the *CIZ* approves the indication. Duration to approval may be two workdays. Based on registration the time *CIZ* need is on average 2,4 workdays with a maximum of five days. So it could be a reason of delay in the process.

The patients with cognitive disorders will be visited by *CIZ* to criticize if the patient needs care in a separate unit of a nursing home. A *CIZ* employee visits the hospital at a specific day of the week. At the interview *transferpoint* employees indicated that this feels like delay. It is good to realize why and how the *CIZ* delays the process and how this could be improved. During this research it was not the factor which leads to a high amount of *blocked beds*.

11.3 Step 3: Queue list

The time patients are on the queue list differs from zero till 20 days based on the registration. Cause of the waiting time is not clear but it might be because of a combination of factors. Different characteristics of the patients on the waiting list were combined as argument before at 'methods' (page 17). Results are shown as amount of days *blocking* a *bed* per typical characteristic of the enrolment.

First the types of enrolments were discussed. 85% of the patients go for short rehabilitation after hospitalization. In eight cases this is not possible thus the patients should be admitted at a transition unit. The throughput time for this type of patients is possibly higher because of the *CIZ* request which takes more time and it takes a few days till approval. Besides, the patient flow at transition units of aftercare is low because of the long queue lists for nursing homes. Possible these consequences are noticeable at the hospital regarding to the average amount of *blocked beds* for this type of enrolments.

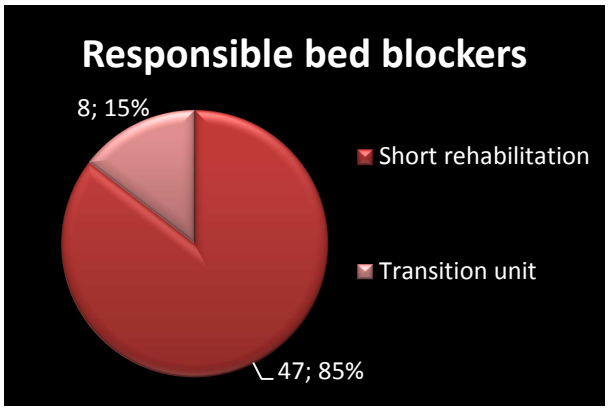


Figure 6: Responsible bed blockers

Type of aftercare requested	# Patients responsible for blocked beds	Percentage (%)	# blocked beds	Mean days of bed blocking
Short rehabilitation unit	47	85,5%	202	4,30
Transition unit	8	14,5%	55	6,88
Total	**55**	**100,0%**	**257**	**4,67**

Table 6: Number of patients responsible for the amount of blocked beds differentiated for type of enrolment

Second, *complexity* is one of the aspects which logically leads to delay in patient flow. Complexity is measured based on criteria. These criteria are elaborated in the glossary on page 6.

67 *beds* were *blocked* due to *complexity*. Looking to the average amount of days a *bed* is *blocked,* as provide in table 7, it is more or less a duplication of the patients who are not *complex*.

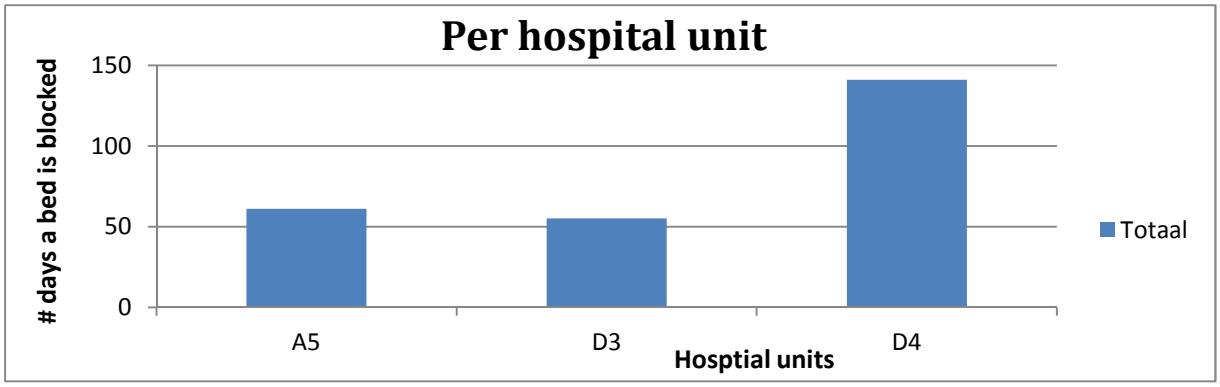
Complex?	# patients	# days bed blocking	% bed blocking	Mean days of bed blocking
Yes	9	67	26,1%	7,44
No	46	190	73,9%	4,13
Total	**55**	**257**	**100%**	**4,67**

Table 7: Complexity related to the amount of blocked beds.

Seven of these *complex* patients were admitted for short rehabilitation (together responsible for 50 *blocked bed* days). Just two patients were admitted for a transition unit, which are together responsible for 17 *blocked bed*s. So, the group *complex* patients include all types of patients.

This overview learns that *complexity* definitely increases the throughput time in the process and therefore the amount of days a *bed* is *blocked* on average. Although it is just a small percentage of all patients who are *complex* and create *blocked beds* for that reason. So it contributes to *bed blocking* but is not the fundamental problem.

As shown in graph 2 has Neurology (D4) the most *blocked bed*s during the timeframe of this thesis. At this unit 18 of the 21 patients have a *CVA* as main diagnose. At the other units no *CVA* patients were admitted.



Graph 2: Amount of blocked beds per hospital department

Table 8 shows that *CVA* patients on average were responsible for the most days of *bed blocking*, compared with other main diagnoses. Due to the fact that hospital department D4 is specialized in Neurology this unit create the most *blocked beds* during registration. Of the eight enrolments for a transition unit (see table 6 on page 32) were seven patients with the main diagnose *CVA*.

Main diagnose	# days of bed blocking	# patients	Mean days of bed blocking
CVA	112	18	6,2
Other trauma	42	9	4,6
Collum #	23	10	2,3
THP	15	4	3,75
luxuriance collum	11	2	5,5
TKP	9	3	3
femur #	1	3	0,33
Other	44	6	7,33
Total	257	55	4,67

Table 8: Bed blocking per main diagnose

61% of the *CVA* patients have health care demand 'short rehabilitation'. So not all *CVA* patients need aftercare at a transition unit, but the greater parts of the enrolments for transition are *CVA* patients. Since it is a great target group for aftercare the hospital made special procedures with aftercare organization AZP. This organisation has so called *CVA* Rehabilitation Units (CRUs) a type of short rehabilitation units especially for *CVA* patients. These units are reserved for this type of patients and deliver the accurate care for *CVA* patients. Not all *CVA* patients were admitted to this unit because of the individual choice of the patient. There is not always enough capacity at these units. Only 50% of the eight enrolments for CRU were actually admitted at this unit. Other patients go to a general short rehabilitation unit. These eight patients together are on an average responsible for 5,375 *blocked beds*. Compared to the average of *blocked beds* for short rehabilitation units is this relatively high. So while CRUs should lead to a faster patient flow it leads to a longer waiting time to aftercare and on average to more *blocked beds*.

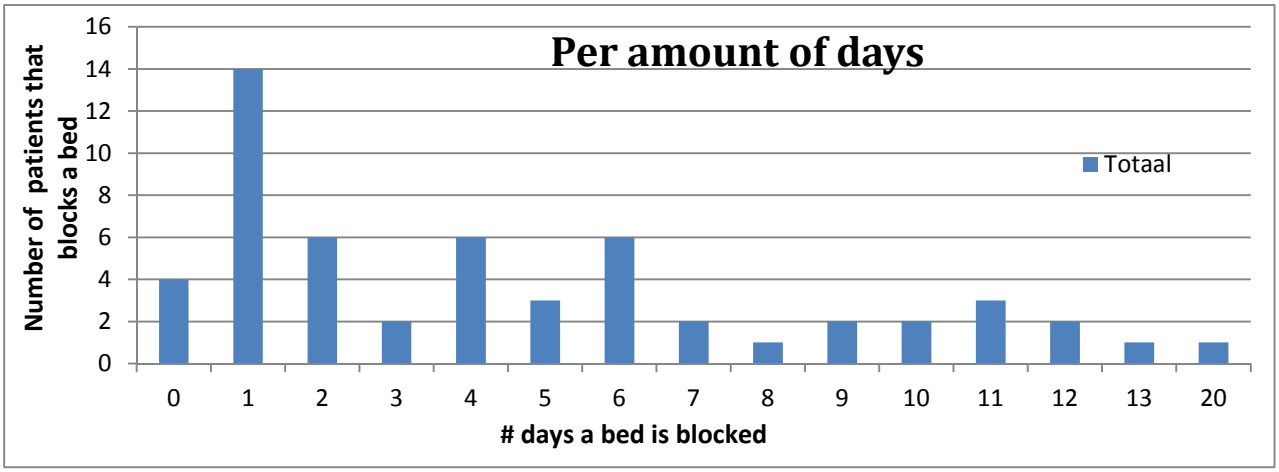
11.4 Step 4: Contact aftercare

The Aftercare organizations and *transferpoint* employee's has to contact daily about the queue list. The planners of aftercare are depending of their colleagues of the departments about the available capacity. To discover this internal process the planners of aftercare were asked to registry some facts regarding to this internal process. Result of this is that Livio knows availability in time and inform the MST as soon as possible. The intern processes at Livio have therefore no consequences for mediation at the MST.

At ZSM located in Losser there is sometimes a difference of 30 minutes till one hour between they know availability and the *transferpoint* is informed about it. Maybe the planners discover the possibilities to admit a patient from another location during that time. At the location in Oldenzaal no beds became available during the four weeks of observations. So no mediation took place. Regarding to AZP this process is more difficult. Mostly AZP is not a first choice for patients. So it occurs quit often that another organization takes a patient over from AZP. Due to this high amount of mutations the capacity changes frequently. This is not always predictable on forehand. Therefore planners of AZP inform the *transferpoint* several times per day about the available capacity. Based on this it could state that an optimal internal process at the aftercare organisations is important to optimize the process of mediation at the MST.

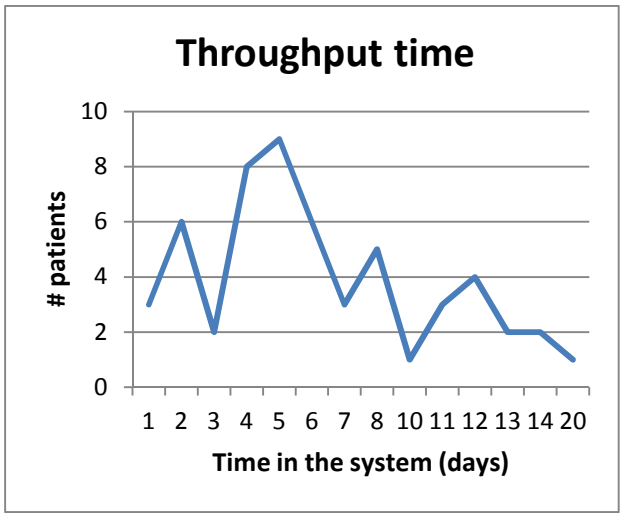
11.5 Step 5: Discharge

When a patient is discharged the amount of *blocked beds* could be calculate as shown in graph 3.

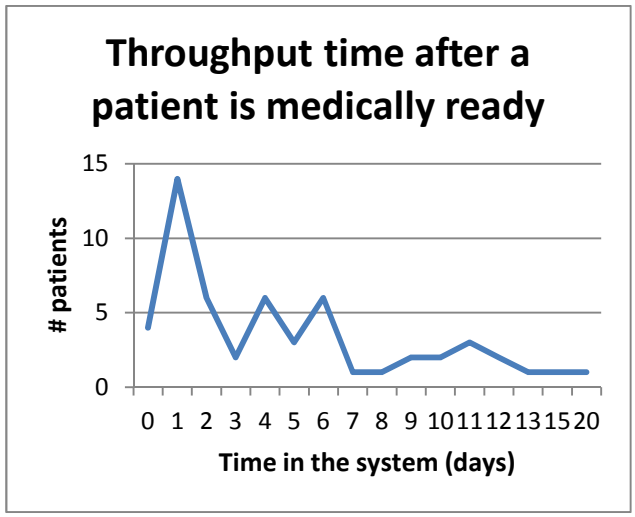


Graph 3: Number of patients which blocked a bed per amount of days a bed is blocked.

A '1' on the horizontal axis means that the patient *blocks* a *bed* for just one day. The number '4' at the vertical axis means that four patients were responsible for *bed blocking*. So, one patient is responsible for 20 days *blocking* a *bed.* Fourteen patients are responsible for one day *blocking* a *bed.* So, these fourteen patients *block* together a *bed* for two weeks. In the timeframe of this research were just four patients who did not *block* a *bed* during hospitalization. Even so the throughput time a patient is in phase two could be calculated and visualised as shown in graph 4 (page 33). The throughput time differs from three patients who are one day in the system till one patient who is 20 days in the system. It is interesting to compare graph 3 and graph 4 to realise the amount of days a *bed* is *blocked* related to the total throughput time. Therefore graph 5 on the next page shows the same as graph 3, but for comparison the graph is shown again on the next page.



Graph 4: Throughput time



Graph 5: Throughput time after a patient is medically ready

Compare graph 4 and 5 learns that most of the time a patient is in the system is when the patient is *medically ready* so fit for discharge. All days a patient is in the system after *medically ready* is referred as *blocking* a *bed*. Based on this comparison could state that reduces the time a patient is in the system when fit to discharge means a reduction of the amount of *blocked beds* and will improve the overall throughput time.

DISCUSSION

Some researchers blame *bed blocking* to epidemiologic and demographic changes together with internal- and external organizational changes. Anyhow *bed blocking* increases the pressure on healthcare resources with all kind of consequences for the hospital and aftercare. This might be caused for example by the increasing number of women who need care since they live generally longer as men so there is no help possibly by partner (Wong et al., 2010).

The importance of an efficient patient flow is increasing nowadays, while discharging patients is becoming more and more complex. Long queue lists for aftercare exists, resulting into *blocked beds* in the hospital. Lim et al., (2006) recommended early identification of social issues and prompt discharge planning. Expediting the transfer of patients when acute care is no longer needed (Gubitz, Phillips & Aguilar, 1999) and rapid response at the time of fit to discharge (Jasinarachchi et al., 2009) are also recommendations from literature. The MST wants to reduce the amount of *blocked beds* due to the high costs of prolonged hospitalisation. This research takes demographic and policy changes into account but focussing on the possibilities to improve internal processes. The purpose of this research is to come up with useful recommendations on how to reduce the total throughput time for patients from enrolment (to an aftercare institution) till the physical discharge (out of the hospital).

12. Discussion per research question

- After investigation of **RQ1** into more detail could state that the current throughput time of the transition process takes approximately one week (including all inefficiencies). Theoretically the actual physical work could be done in less than one hour as shown in figure 5 (page 27). Analyse the patient flow learns that aftercare organisations Livio and ZSM mostly admits patients from AZP instead of directly from the hospital which indirectly leads to stagnation in patient flow. Furthermore was learned that the total transition process could be distinguished into five steps: **1.** Enrolment, **2.** Transferpoint, **3.** Queue list, **4.** Contact, **5.** Discharge.
- In **RQ 2** is per step identified what the main types of *variation* and *waste* are:
  - **Step 1:** The method of enrolment to an aftercare institution together with the method of collecting the *admissions forms* delays the process with more than one day.
  - **Step 2:** The incompleteness of *admission forms* (in 34,5% of the cases) together with the indication request contributes to a few days of delay.
  - **Step 3:** The moment a patient is placed at the queue list, communication disorders and admission limitations leads to one hour till a few days of delay.
  - **Step 4:** Visiting the patients by aftercare increases the throughput time with a few days.
  - **Step 5**: Unexpected changes during the enrolment step and the registration of patient data leads to delay of many days.

  These typical findings are explained in more detail on page 27 (figure 5).
- After an investigation of the patient database of MST in **RQ 3** was figured out that the typical characteristics for patients on the waiting list are:
  - 33% of the registered patients has the main diagnose *CVA* with an average of 6,2 days of *bed blocking* instead of the overall average of 4,67 days.
  - 26% of the blocked beds were a consequence of complex cases.
  - In 46% of the cases the *admission form* was handed in too late.

Lim et al (2006) describes that early identification of social issues are from great influence on the transition process. When social issues are unknown patients frequently were not in time subscribed at the *transferpoint*. Based on registration is delay in enrolment the most important reason with a contribution of 46% to *blocked beds*. When a patient is subscribed, but the social situation is not really clear, it could also describe as unclear health care demand. This contributes for 7% of the *blocked beds*. Lim et al. (2006) also mentioned prompt discharge planning. This is influenced by the doctors on the hospital departments. The nurses were responsible in preparing the patient for discharge while *transferpoint* arrange aftercare. If the date of *medical ready* is in the near future the process of arranging aftercare will be expediting by *transferpoint*. Rapid response of nurses and *transferpoint* at time of fit to discharge is necessary to realize a reduction of the throughput time. But it only works when there is no waiting list.

The combinations of characteristics learns also that *complexity* increases the throughput time in the process but is not the fundamental problem since just 16% of the patients were *complex* and create *blocked beds* because of this reason. The moment of enrolment is even so a characteristic which influence the duration of the whole process. Often patients were too late admitted to the *transferpoint* since the most wrong bed days are when a patient is already fit for discharge. This could be simply improved by clear procedures about the moment of enrolment related to the amount of days necessary for arrange aftercare distinguished per type of aftercare needed.

RQ3 learns also that *CVA* patients contribute to the most *blocked beds* in the hospital. 33% of the enrolled patients have the main diagnose *CVA*. They *blocks* a *bed* 6,2 days while on average a *bed* is 4,67 days *blocked*. This type of patients discovers the most consequences of prolonged hospitalisation due to inadequate health service in the hospital or at aftercare organisation elsewhere (Rinkel, Visser & Speelman, 2004). Special CRUs could not fulfil the supply of *CVA* patients. So it is a big target group that has a relatively high contribution to days of *bed blocking*. Analysis of the capacity of aftercare beds for these types of patients should be useful. Should the available capacity within the facilities be the only delaying factor, then this would constitute a task for the regional care office (Rinkel, Visser & Speelman, 2004). Besides that, *variation* and *waste* leads also to longer throughput times. Therefore it looks like a combination of factors which contribute to *bed blocking* in the hospital: the characteristics of patients in combination with the *variation* and *waste* in the process of arranging aftercare.

Based on these results it became clear that the impact of delaying aspects differs from once a week till daily occurrence. Based on the calculation 'frequency times delay' the four reasons of delay with the greatest contribution to *bed blocking* at MST are:

1. In 46% of the cases an ***admission form*** **was handed in too late**. This contributes to delay with a maximum of **nine days**. Based on the interview it is known that this increase the throughput time frequently. Mostly because the *transferpoint* is not known about the situation and could therefore not react on this fact. Because patients are only known at the moment the *admission form* is handed in.

2. Based on the interviews and registration is known that **no weekend service** leads to delay with a maximum of **three days a week**. Work (a few hours) in the weekend will lead to process improvements. This relatively simple recommendation influence the throughput time positively.

3. The units of AZP located in the MST contribute to a reduction of the amount of blocked beds in the hospital. If a patient is discharged out of the hospital they block no longer a bed in the MST and costs are for AZP. Although it could be seen as a kind of '**stock location'** where patients are waiting for the aftercare location of first choice. Despite of the patients the accurate health care delivered at those locations it is not patient friendly. It is better to improve the discharges to locations of first choice.
   So on the one hand it improves the reduction of *bed blocking* in the hospital, on the other hand it stagnate the patient flow since other aftercare locations admit firstly patients from these locations. So it supports to bed blocking indirectly.

4. It takes a lot of time to **request patients first choice** like they do is at this moment. The first choice second best protocol leads also to discussions between health care employees and patients. Per enrolment it delaying **a few days** while the percentage 'first-choice-discharges' is low.

For all of these reasons for delay are improvement recommended. See therefore chapter 14.

13. Methodological quality of the study

Assessment of the methodological quality of this research.

13.1 Method

The use of different methods to collect data has positive effect on the validity of the results (Babbie, 2007). The used methods in this study are: observations, interviews and the registration of patient data. Interviews were done with two respondents. If the results of this interview were not useful or incomplete there is the possibility to interview other employees without foreknowledge.

13.2 Scope

First, the Roessingh rehabilitation centre is a kind of monopoly in rehabilitation care in this area. They are responsible for ~10% of the patients who needs aftercare after hospitalisation. Therefore this organisation was meant to be involved in this research. Although an interview with this organisation learned that the patient registration about the transfers from the MST to the Roessingh was not clear. During the same time period, the number of patients who transfer from MST to the Roessingh registered by the MST differs from the registered data of the Roessingh. The registration of this logistic process was therefore not useful for this research. Conversations with nurses and planners learned that it is expected that the Roessingh contributes to a high amount of *blocked beds*. It is important to digitalize this logistic process and make it possible to analyse this situation. Because results of this research could possibly be different if the Roessingh was involved. Other kind of problems plays a role in transfer to this type of aftercare organisation. Even so it is expected that the waiting time to the Roessingh is mostly a few weeks instead of the few days regarding to other aftercare organisations.

Second, frequently patients are situated at the wrong department of hospital based on their main diagnose. For example a *CVA* patient who is admitted on a department for lung diseases. It means that the amount of *blocked beds* per main diagnosis could be not representative for the whole hospital.

Third, the external validity of six weeks of observations is finite. In general it is known that the more observations the more reliable the research. For this research it looks like a well-chosen amount of observations regarding to the concrete results. Even so due to the prospective method of data collection this was the maximum prolongation possible. The prospective method of data collection increase validity and reliability than a retrospective method of data collection.

Fourth, despite of a small research scope useful recommendations are given. Possibly a broader scope leads to better recommendations.

13.3 Per RQ

RQ1

The description of the current process was checked afterwards by *transferpoint* employee to validate it. This makes the description more reliable. The registered facts are discussed on forehand with the relevant stakeholders.

RQ2

Pitfall of using the methods *Six Sigma* and *Lean Thinking* is that it is never sure that all *variation* and *waste* in the process is discovered. Although, this methods leads to a many new insights about factors which contribute to *bed blocking*. Other remark: since the factors are not measurable it is not be clear which part is responsible for the most *blocked beds*.

RQ3

The *transferpoint* database consists of patient related facts and additional information like the reason why a patient *blocks* a *bed*. This reason is based on the opinion of a *transferpoint* employee. There is no uniform process on how to identify this reason. There are even so no rules about the time, before a patient is *medical ready,* an *admission form* should be filled in. So this fact is also based on individual opinions. It could differ per employee and is therefore biased. The observations learn that the data in the database is not always well filled in. It is easy to commit fraud in advantage of the *transferpoint*. So despite of the data gathering in the time frame of this thesis it is not possible to rule out biased totally.

13.4 Generalization

Based on literature search it is known that *bed blocking* is a general problem in the Netherlands. This research could be generalized with other hospitals in the Netherlands. The procedure is in the whole country the same regarding to the CIZ indication which should be requested and approved before a patient could be discharged to aftercare. So this research could be useful on the national level. The internal process of hospitals could differ from each other, but most delay in terms of *variation* and *waste* is a problem in general so recommendations could also improve the patient flow at other hospitals. Since the procedure is different organised in other countries it is not known if *bed blocking* is even so a big problem over there and if recommendations are relevant on the international level. In some countries it is possibly normal to take care of the grandparents so *bed blocking* could possibly occur less often over there.

Recommendations

The recommendations on this thesis are split up for use into practice and for further research.

14. Recommendations for in practice

The recommendations for in practice are based on the delaying factors as mentioned per research question. The recommendations aimed to reduce the throughput time of the process. Furthermore is keep in mind the six core aspects of quality in Health Care as described in the report of the Institute of Medicine (IOM), named 'Crossing the Quality Chasm'. This is done because it is important to prevent that the recommendations harms the overall quality. Madhok (2002) describes these six key dimensions as follow:

- **Safety**: avoids injury to patients from the care that is intended to help them.
- **Timeliness**: reduces waits and harmful delays.
- **Effectiveness**: provide services based on scientific knowledge to all who could benefit and refrain from providing services to those not likely to benefit (avoiding overuse and underuse, respectively).
- **Efficiency**: avoids waste.
- **Equitability**: provides care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographical location, and socioeconomic status.
- **Patient centeredness**: provides care that is respectful of and responsive to individual patient preferences, needs, and values.

This leads to the next recommendations per step of the process:

Step	Recommendation	Frequency	Effort	Effect
< 1	Digitalization of admission form	Per form	A few ICT improvements	Less work intensive
	Knowledge improvement nurses of enrolment procedure	Per form	Education	More complete admission forms in time
	Knowledge improvement nurses of limitations aftercare locations	Per case	Education and a folder for patients with collected information of aftercare and limitations.	Nurses could discuss choices with the patient earlier in the process. Options for complex cases are clear.
	Nurses ask for first choice	Per case	Flowchart of social services	Less work intensive
	Uniform enrolment procedure	Per form	No admission forms per fax	Effectiveness
	Avoid early enrolments and admissions forms which are hand in too late	Per case	Accurate moment of subscription.	Clear queue list
	Pick up the forms more times a day	2 times per day	Only If ICT improvements could be. Otherwise it takes too much time.	Accurate overview of admitted patients
1: Enrolment	No message transfers	Each day	React on sender queue list	Less delay by resend messages
2: Transfer point	Effective mediation method	Per case	Insight in transfer database for aftercare and CIZ	Less mail contact. Fast and focussed reactions.
	Guide of social services	Per case	Made a guide	Nurses could discuss first choice with the patient at an accurate moment in the process.
	Optimize intern communication	Per case	Avoid CIZ notifications	Less communication failures
3: Queue list	Send lists more times a day	2 or 3 times per day	Mail more often	Aftercare get an accurate overview
	Avoid stock at the locations AZP in the hospital	Daily	Learn patients that AZP is no transfer unit, but a location of first choice	Firstly: longer waiting lists, after that an improved patient flow.

4: Contact aftercare	Uniform enrolment procedure aftercare	Each week limitations leads to delay	Reduce admission limitations	Easier to mediate
	Improve patient-friendliness(1)	Weekly	Improve admissions of first choice	Less moves by patients. Higher quality. Optimal and accurate care.
	Improve patient-friendliness(2)	Weekly	Uniform procedure by disagree second option	Less stagnation in patient flow.
	Improve accessibility	Daily	Less telephone contact	Efficient method to communicate
	Fulltime work	Daily	No delay in introduce cases. Clearer overview of case.	
	Take care of accessibility in case of absence	Daily	Contact possible to mediate. Less time consuming.	
	Work weekends and holidays	Weekly	No delay due to working times	
	No visits by planners aftercare	ZSM: per case Livio: per complex case	No delay by aftercare procedures or preferences	Optimization of patient flow. Accurate patient care.
5: Discharge	Weekend and holiday service or change procedure that admission is possible without a physician	Weekly	Improved accessibility aftercare physician	No stagnation due to limitations in case of available capacity
> 5	Improve intern process aftercare	Daily	Optimize intern procedure to inform transferpoint about accurate capacity	Accurate mediation possible. Fewer patients go first to second best option.
Other	Analyse amount of typical aftercare beds	Monthly / annual	Consultation with care admission office	Accurate amount of aftercare beds per type of care (like CVA)
	Make procedures	Monthly / annual	Uniformity in communication and processes	Efficient method to communicate. Accurate queue list. Less time consuming.
	Reduce the amount of stakeholders in the process	Overall	Short contacts with the right people.	Improve communication
	Improve the amount of patients who won't block a bed.	Monthly	Earlier subscription in case of pre-operative screening and accurate mediation aftercare	Optimization patient flow
	A tracking and tracing system	Per case	ICT improvements	Optimization of patient flow. Insight. And reduce throughput by accurate reaction on up-to-date information.

Table 9: Recommendations for in practice

14.1 Recommendations for < step 1

Digitalization of the whole enrolment procedure will reduce the throughput time of the process. By implement a few ICT improvements it should be possible to hand in the *admission form* digital including the signature of the patient. Digitalization could prevent uncompleted *admission forms* and are always readable. Tasks of the secretary are less time consuming in this way and *admission forms* can directly be used by *transferpoint* employees.

If ICT improvements could be realised *transferpoint* employees do no longer pick up the forms from the units and save a lot of time. The *admission forms* could be handed in all times which reduce delay due to 'pick up time'. It means only that more times a day new enrolments will be checked. Without ICT improvements it is difficult to reduce this delay.

-Walk two times a day to all hospitals takes too much time and is possibly not efficient. Than it is more effective if one employee makes this transfer and will be picking up all *admission form*s per location. That employee is longer away but overall it is faster and accessibility will be improved.

In the future new procedures will be made to inform nurses about the amount of days necessary for arranging the different types of aftercare to reduce requests out of time.

Nurses should have better knowledge about the possibilities of the different aftercare organisations. Then they could have a more important role in arrange aftercare. It is too much to know all social services and type of care they deliver. But it could be useful to make a kind of flow chart for it. This chart should help to make a decision about a first choice of possible aftercare organisations. The nurse could discuss these options with the patient. When they were also educated in which information the *transferpoint* needs for request an indication the whole procedure will be improved.

When the patient and nurse discuss the different options together a patient and his family may possibly agree earlier with the situation. They have the knowledge about the possibilities and limitations of aftercare. In that case *transferpoint* employees should stimulate aftercare to admit first choice patients, because it is a considered choice of the patient.

This is more patient-friendly. It is an advantage of the aftercare locations of AZP which have a lot of mutations in the current situation. It is also better for the whole chain of care.

14.2 Recommendations for step 1

Direct mail is preferred above mails via secretary and telephony.

14.3 Recommendations for step 2

A clear database which is also accessible for aftercare and *CIZ* will improved the communication. Also *waste* activities like the *CIZ* notification in the database should be ruled out to prevent miscommunication.

If a guide of social services was made on the internet nurses could make the decision for first choice based on a kind of flow chart. Even so they could discuss this situation much earlier in transition process. This change could result in an improvement of the process flow and reduce the *waste* in waiting time.

14.4 Recommendations for step 3

If aftercare is updated about the accurate queue list more times a day it will improve the throughput time. The process will be improved if the *admission forms* can be filed out online. The *transferpoint* has more updates per day which could be directly known by aftercare. It reduced the time between step one and two. Implementation of the recommendation makes it possible for *transferpoint* and aftercare to react accurate on current queue list.

Aftercare should trust on information and admit patient without visits provided that they are able to deliver the accurate care. This should be criticized by *transferpoint* employee based on accurate information of the admission limitations of aftercare.

14.5 Recommendations for step 4

Clear procedures, methods and rules concerning the information exchange about the patients on the queue list should be made.

Aftercare should react on the email of queue list manager instead of the secretary. It prevents delay and mails will always be sending to the right person.

The communication at aftercare should also be improved to optimize the intern processes in advantage of the mediation. Actual knowledge about the available capacity is necessary.

The admission limitations of aftercare should be reducing. It makes mediation more difficult when only men or women can admitted or when there is a maximum amount of admissions possible due to the amount of physicians accessible. When aftercare is more flexible it makes mediation easier.

Also visits by aftercare employees delay the process unnecessary. Aftercare should trust on the information of the *transferpoint* and make decisions based on that knowledge. Aftercare should not handle based on own preferences but should deliver care to all kind of patients if they are able to deliver the accurate health care.

A uniform process means a comparable treatment for all patients. This is patient friendly and qualitatively high. In practice this means for example that all patients who disagree with second best option should be discharged within a comparable amount of days.

14.6 Recommendations for step 5

If physicians work weekends and holidays less stagnation occurs due to limitations in case of available capacity. Another option is to change the current procedure and make admissions possible without the presence of a physician.

14.7 Recommendations for > step 5

The intern processes of aftercare should be optimized to inform the *transferpoint* accurate about capacity. Only than efficient mediation is possible so fewer patients will go to a second best option.

14.8 Other recommendations

Improve the knowledge of all different stakeholders should also improve the communication between them. If nurses were educated in how to request a *CIZ* indication they realise which facts on the *admission form* are important to elaborate precisely. Also knowledge about the types of aftercare, the possibilities and limitations will improved the overall communication between hospital department and *transferpoint*. This will also change the opinion of both employees leading to cooperation and better teamwork.

It is recommended to discuss with the care admission office about the capacity of specific aftercare beds. It looks like that distribution of aftercare beds could be optimized and focus should be more on *CVA* rehabilitation units. Even so related to the distribution of aftercare beds is the fact that in February 2010 ZSM opened 33 extra short rehabilitation beds at the location in Oldenzaal, an area near to Enschede. There is a strong preference from people from Oldenzaal to rehabilitate there. To realize this preference the ZSM admit first patients from Oldenzaal before other patients from the MST will be admitted. Therefore fewer patients go directly from MST to the aftercare location from first choice. This leads indirectly to stagnation in patient flow. Based on this fact it is uncertain whether the capacity is a problem. Maybe if 33 extra beds opened nearby the hospital had a bigger and positive influence on the amount of *blocked beds*. So while capacity looks like not the fundamental problem it could be useful to analyse the distribution of hospital beds over the area compared with the demand of patients. To realise if the available capacity of aftercare beds within the facilities contributes to *bed blocking*.

Other improvement could be the accessibility of *transferpoint* database for *CIZ* and aftercare, resulting in less communication and insight in the situation from both stakeholders. Working weekends and holidays result in a faster throughput time, if planners and employees of *transferpoint* are present. Also physicians should co-operate in this.

With the use of a kind of tracking and tracing system it should be possible to follow the status of mediation: A nurse filled in an *admission form* on the computer. This *admission form* is connected with the hospital database. So all personal information is automatically filled in and mistakes are ruled out. If nurse hand in the request it will automatically be mentioned at the *transferpoint*. *Transferpoint* employee does the same tasks as usual. The database should fill in to show all stakeholders in what stadium the request is. These stakeholders could react on the situation and follow if there is an availability to discharge. Even so unexpected changes could be mentioned in this system. *Transferpoint* read the important message at the moment they work. Telephone contact is not necessary anymore. If patients could be discharged it will be mentioned in the system. The nurse gets a notification of it. So nobody should wait on each other. It is a 24 hours business and throughput time will reduced by the possibility to react accurate on up-to-date information. This could only be possible if all activities were digitalized.

Fewer stakeholders in the transition process will improve the throughput time.

And last but not least, it is recommended to analyse why only four patients do not *block* a *bed* during registration period.

At all recommendations definitive stakeholders should take in to account. They should be involved in the process of implementation to have the greatest influence for now and in the future.

15. Recommendations for further research

For further research it could be useful to focus on one of the next topics:

As mentioned before it could be useful for further research to broaden the scope of the research. For example by taking into account the rehabilitation centre 'The Roessingh'. The expectation that this rehabilitation centre has a high contribution to bed blocking makes it really important and interesting to involve this organisation in further research. Based on interviews and conversations it is know that logistic employees of the Roessingh are able to co-operate and willing to change related to this topic.

Also other aftercare organisations could be involved in research to have a broader overview of the situation. Recommendation is for example TMZ located in Hengelo and Almelo. It looks like patients prefer to admit to the MST instead of a hospital in the neighbourhood but rehabilitate in the own region.

It could be useful to combine the three phases of the transition process to have a complete view of the situation. An overview of all steps a patient made in the process from admission till discharge will give a clear view of the bottlenecks and therefore possible improvements. Also bottlenecks between the phases could elaborate in that way. Involve other hospitals of the neighbourhood improves also the research and learns how other hospitals handle with this problem. Especially hospitals where a digital track and tracing system is implement recently.

It is essential to do research afterwards when recommendations are implemented. To check if forecasted improvements of reduced throughput time were gain.

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APPENDIX I
LITERATURE RESULTS

In this appendix the way of searching, selecting and elaboration of the literature is described.

PubMed:

Keywords	Result	Included
Patient transfer [Mesh] AND bed occupancy [Mesh] AND delay	6	1
Patient discharge [Mesh] AND delay	49	21
Total PubMed:	22 articles	

Table 10: Literature results PubMed

FindUT:

Keywords	Result	Included
Patient transfer delay AND bed blocking	42	2
Patient discharge delay	109	5
Total findUT:	7 articles	

Table 11: Literature results FindUT

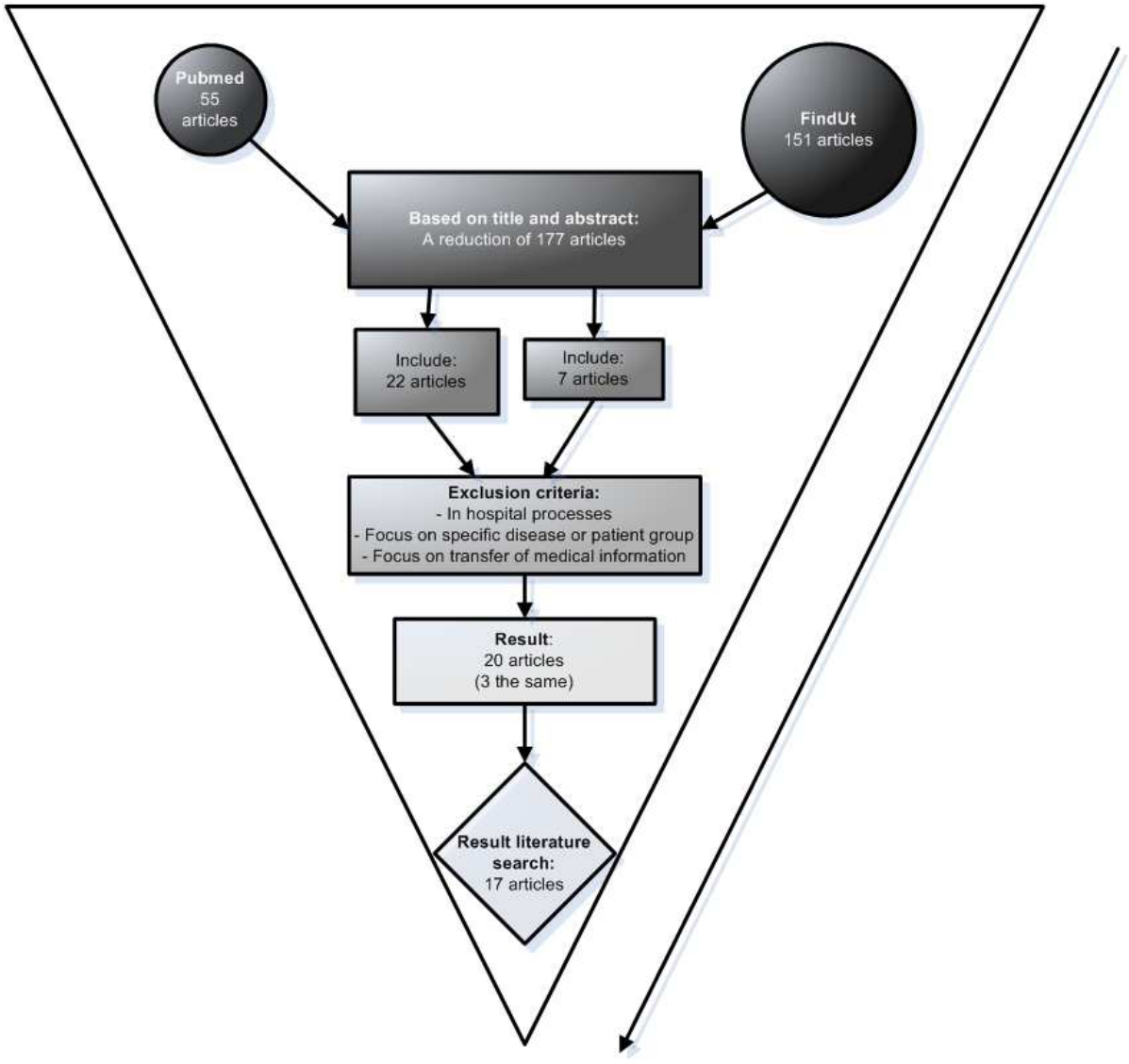


Figure 7: Literature search

The 17 articles are fully read. Most authors are more interested in predictors and affecting influences or possible improvements instead of *variation* and *waste* in business processes. Only four articles were relevant and used in research. Most important literature results are mentioned below.

Author:	Question:	Answer:	Comments:
Wong et al., 2010	What are predictors of Long-Term Care Utilization by Dutch Hospital Patients aged 65+?	The impact of age, disease, absence or presence of a spouse and living in the household of a child are predictors of long-term care utilization by Dutch hospital patients aged 65+.	Women are more likely to be admitted to a nursing home than men. This effect may in part be related to the determinants, age and living alone, when women have a higher life expectancy and tend to outlive their partner. Future health care should anticipate on these needs.
Bey, Huijsman & Cammen, 2004	Which factors affecting the length of stay and delayed discharge of older patients from the Department of Geriatric Medicine of the Erasmus Medical Centre?	The process of transfer from hospital to aftercare became more complex due to changes in time in intern- and extern processes.	
Rinkel, Visser & Speelman, 2004,	How to improve the transfer to an additional-care facility.	The chance of independence of patients after a CVA increased when fast discharge and adequate aftercare is arranged.	The negative influence of delay in transfer and therefore the inadequate health service could for example result in dependently of patients after a cerebrovascular accident (CVA).
Nave (2002)	Explains the effect of *variation* and *waste* in business processes	If this method improves the patient flow it is not fully clear what aspect contributes to the overall improvement. It could only state that six sigma will be effective by remove *variation* and lean thinking by reduce *waste*. Both methods look useful in this situation based on the assumptions. Therefore they are chosen to use these methods in this research.	Since both concepts are difficult measurable it is difficult to find clear values of improvements by six sigma or lean thinking in the context of patient flow

Table 12: Literature research per author

APPENDIX II
INVOLVED ORGANISATIONS

Medisch Spectrum Twente(MST)

The MST is a general hospital located in Enschede and Oldenzaal with external out-patients clinics in Haaksbergen and Losser. Primary service area covers the municipalities Dinkelland, Enschede, Haaksbergen, Losser and Oldenzaal which count 264.000 residents. Besides general hospital care they have a dialysis centre inside, a radio therapeutic centre, trauma centre, thorax centre and an HIV-treatment centre. Therefore MST treats also patient outside this primary service area. This makes the MST a top clinic hospital, a teaching hospital, a regional centre for traumatic care and it is an important factor in the transmural chain of care. Mission is to improve the health of residents of the region Twente by provide curative care. Besides MST differentiate them by a top clinic profile with focus also outside the region. The hospital wants to be patient-centred, provide hospitability and service and deliver effective and efficient health care and a safe environment for those patients. Vision is demand focused health care with focus on service to healthcare professionals (MST, 2009).

Livio

Livio is an organisation focused on health (care), living and vitality of the elderly and / or disable human. Livio has got a broad supply of service to deliver on different locations in Twente. (Livio, 2009).

Ariëns Zorgpalet (AZP)

AZP is a professional, society organisation based on general Christian and Catholic principles. They take care of elderly and disable people and deliver demand-driven health care, treatments, well-being and a residential environment. AZP takes especially care for patients after a CVA on the so called CRUs. Therefore, AZP is an important factor in the chain of care for rehabilitation after a CVA. They have even so the possibilities to deliver terminal health care. (AZP, 2009).

Zorggroep Sint Maarten(ZSM)

ZSM is a national health care institution which aims to be known in the region as an organisation which delivers perfect service, health care, treatment and accommodation to their clients. This organisation works together with the MST by delivering aftercare service to patients discharged from the MST. They deliver also other intramural health care facilities (ZSM, 2009).

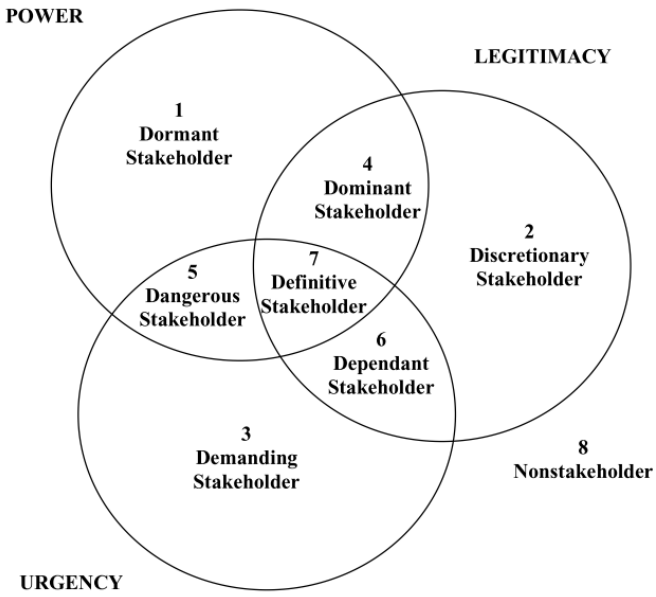
Organisation	Type and name unit	Location	# beds
Livio	Short rehabilitation unit 'De Pendel'	Haaksbergen	34 beds
	Short rehabilitation unit 'Rutbekerveld'	Enschede	31 beds
AriënsZorgpalet	Short rehabilitation unit 'Singraven-Warmelo'	Enschede	32 beds
	Short rehabilitation unit 'G2'	Enschede (at the MST)	20 beds
	Transition unit 'G4'	Enschede (at the MST)	31 beds
Zorggroep SintMaarten	Short rehabilitation unit 'Drieland'	Losser	18 beds
	Transition unit 'Schakelafdeling Oldenzaal'	Oldenzaal	14 beds
Total	5 Short rehabilitation units	Enschede,losser, Haaksbergen.	135 beds
	2 transition units	Enschede, Oldenzaal	45 beds

Table 13: Overview of aftercare organisations

APPENDIX III
STAKEHOLDE ANALYSIS

Stakeholder analysis is based on the attributes power, legitimacy and urgency.

The power of a stakeholder is the influence to change the organisation. Legitimacy means the connections of a stakeholder with the organisation. The attribute 'urgency' means how soon the situation should change, regarding to the stakeholder. Combine these attributes identifies the type of stakeholder. One attribute means low priority from the point of view of that type of stakeholder. The priority is high when all three attributes are present. Then the stakeholder can be defined as definitive (Vries, Verheul & Willemse, year unknown, pp. 100 and Elias & Cavanna, year unknown).



Mitchell et al. (1997)

Figure 8: Stakeholder Analysis

The focus is on the improvement of the transition process, not only on the reduction of *blocked beds.*

Stakeholder	Power	Legitimacy	Urgency	Type Stakeholder
Board directors MST	+	-	+	Dangerous *Stakeholder*
Physicians MST	+	-	+	Dangerous *Stakeholder*
Nurses MST	-	+	+/-	Dependant- / Non *Stakeholder*
Head of the traumatology MST	-	-	+	Demanding *Stakeholder*
Transition point MST	+	+	+	Definitive *Stakeholder*
Board directors Aftercare organizations	-	-	+	Demanding *Stakeholder*
Physicians Aftercare organizations	-	-	+	Demanding *Stakeholder*
Planners aftercare	-	+	+	Dependant *Stakeholder*
Heads of the aftercare units	-	-	+	Demanding *Stakeholder*
Nurses aftercare	-	+	+/-	Dependant- / Non *Stakeholder*
'Care-office'	+	+	+/-	Dominant *Stakeholder*
Patient	+/-	+/-	+	Dependant *Stakeholder*
Employees of the different organisation as individuals	+	-	+	Dangerous *Stakeholders*

Table 14: Stakeholder analysis

APPENDIX IV
INTERVIEW TRANSFERPOINT

Toelichting:
Hoofddoel van het project 'zonder drempels' is het analyseren en in kaart brengen van het proces van opname in MST tot ontslag bij nazorg om zo de knelpunten helder te krijgen en een voorstel te doen. Het interview is bedoeld ter verduidelijking van het proces. Het interview wordt opgenomen. Deze opnamen worden na gebruik vernietigd en zal door niemand anders gehoord worden. De uitwerking op papier zullen voorgelegd worden ter controle. De informatie wordt gebruikt voor onderzoek, de uitwerkingen aan zich blijven anoniem.

Vraag 1 – Wat zijn de specifieke taken van de verschillende transferpuntmedewerkers?

Vraag 2 – Op basis waarvan worden deze taken verdeeld?

➔ *Wat betreft vaste afdelingen per transferpuntmedewerker en vaste vervanging??*

Vraag 3 – het ophalen van de formulieren

Noem 2 voor- en 2 nadelen van het ophalen van de aanmeldformulieren.

Wat is het voordeel van het ophalen van je eigen formulieren?

(medewerkers werken per setje, dus gaan elk naar eigen afdelingen en vragen daar gegevens na).

Vraag 4 – het verwerken van de gegevens

Waarom doet de secretaresse dit en wat is het voordeel er van?

Worden altijd alle formulieren die binnen komen dezelfde dag nog verwerkt?

Welke wel / welke niet? En waarom?

Is het handig dat de taken verdeeld zijn over 3 personen (secretaresse, transfermedewerker, wachtlijstbeheer) waarom wel / waarom niet? Noem enkele redenen.

Vraag 5 – doorstroom bevorderende aspecten

Noem 3 punten die, naar jouw mening, de doorstroom van patiënten bevorderen van moment van opname in het MST tot moment van ontslag uit het ziekenhuis naar een van de nazorg instellingen.

Vraag 4 – doorstroom belemmerende factoren

Noem 3 punten die, naar jouw mening, de doorstroom belemmeren van patiënten van moment van opname in het MST tot moment van ontslag uit het ziekenhuis naar een van de nazorg instellingen. Met uitzondering van capaciteitsproblemen.

Vraag 7 – interventies

Noem 3 interventies die, naar jouw mening, er voor zorgen dat er minder verkeerde bedden binnen het MST zullen zijn in de toekomst.

Vraag 8 – huidige interventies

Er zijn per 18 april 3 interventies ingevoerd:

- De wachtlijst wordt om 9 uur rond gestuurd naar de 3 betrokken nazorg instellingen.
- Nazorg instellingen reageren voor 11 uur per mail hoeveel lege bedden er beschikbaar zijn op welke data.
- De bereikbaarheid van wachtlijst beheer is vergroot door de mobiele telefoon tussen 9 en 11u aan te hebben.

Wat is jullie ervaring betreffende deze interventies tot nu toe?

Noem 2 positieve en 2 negatieve aspecten. Wat loopt wel goed en wat loopt niet zoals gepland.

Appendix V
CHARACTERISTICS OF REGISTERED PATIENTS

Table 15 shows an overview of some characteristics of the registered patients for this research. These characteristics aren't mentioned elsewhere since no relation was expected between these facts and *bed blocking*. It indicates only the target group for aftercare.

Characteristics	Value	Characteristics	Value
Age, in years		**Type of aftercare need, no. (and %)**	
⇨ Mean	80.8	⇨ **Short rehabilitation**	47 (85,5%)
⇨ Range	61-98	*Subdivided in:*	
Sex, no. (and %)		- *'general' short rehabilitation*	*22 (40,0%)*
⇨ Male	17 (31%)	- *Collum # care*	8 (14,5%)
⇨ Female	37 (69%)	- *Elective orthopaedics*	9 (16,4%)
Hospital department, no. (and %)		- *CVA rehabilitation unit*	8 (14,5%)
⇨ A5 - Orthopaedics	15 (27,3%)	⇨ **Transition unit**	8 (14,5%)
⇨ D3 - Traumatology	19 (34,5%)	**Method of admission, no. (and%)**	
⇨ D4 - Neurology	21 (38,2%)	⇨ Fax	16 (29,1%)
Admission indication, no. (and %)		⇨ pick the form up at the unit	39 (70,9%)
⇨ CVA	18 (32,7%)	**Complete, no. (and %)**	
⇨ Collum #	10 (18,2%)	⇨ Yes	36 (65,5%)
⇨ Other trauma	9 (16,4%)	⇨ No	19 (34,5%)
⇨ THP	4 (7,3%)	**Complex, no. (and %)**	
⇨ TKP	3 (5,5%)	⇨ **Yes**	9 (16,4%)
⇨ Femur #	3 (5,5%)	⇨ **No**	46 (83,6%)
⇨ Luxuriance collum	2 (3,6%)		
⇨ Other*	6 (10,9%)		

Table 15: Study population

* Other means: back pain, RIP, luxuriance patella, thrombosis, contusion column or arthritis knee.