Success of the implementation of complication registrations in the Deventer Hospital

A comparative study on the success of the implementation of the complication registrations in medical profession groups in the Deventer Hospital

Alexander Rengelink, 2008
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Master thesis

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Management Summary

This thesis is the result of a Master research project Health Sciences at the University of Twente. The research was carried out in the Deventer Hospital and compares medical profession groups with regard to their complication registrations and provides recommendations to implement or improve these complication registrations.

Complications are unwanted outcomes of medical treatment. Complications are taxing, both for the patient and the delivery of healthcare itself. A reduction of the number of complications will increase the health of patients and increase efficiency of healthcare delivery. A complication registration provides the possibility to gain insight into the factors that cause complications. Based on a complication registration, complications can be analysed and might be prevented in the future.

**Cause**
The board of medical specialists in the Deventer Hospital wants to improve the complication registrations of the different medical profession groups. The complication registration of the profession group OBGYN (Gynaecology, obstetrics and reproductive medicine) is seen as an example for other profession groups. The board of medical specialists wants to use this complication registration to improve the complication registrations of other profession groups. To do this, it is necessary to know the current situation in the other profession groups in the Deventer Hospital and the factors that influence the success of a complication registration. Based on this, the following research question was formulated:

*What lessons can be learned from a comparison of the complication registration system of the profession group OBGYN with those of the other profession groups in the Deventer Hospital?*

**Research**
Medical specialists from seven selected profession groups were interviewed. These profession groups were selected based on four types of specialisms:
- Invasive (OBGYN, Surgery and Ophthalmology)
- Observing traditional (Paediatrics and Internal Medicine)
- Observing technical (Gastroenterology)
- Supporting (Radiology)

**Theory**
In order to use the complication registration successfully, it is necessary to go through the complete "Plan, Do, Check, Act" cycle. If this is not done, the complication registration will not result in structural quality improvement, because it is in the analysis of complications that there is the opportunity to learn from complications and improve the quality of delivered healthcare. If this analysis is not done, quality improvement will be incidentally. The complication registrations of the studied medical profession groups differ significantly from each other. This is explained by the existence of 'vertical barriers' between the profession groups. These barriers result in the isolated functioning of profession groups and thus a lack of communication concerning complication registration. The choice what complication registration to use, is made by the medical specialists that are organised into profession groups. These weigh their perceived benefits and costs of using the complication registration which determines their attitude and likelihood to accept and successfully implement a complication registration. A model based on the Health Belief Model is used to visualise this decision process. This model is created using seven categories that are divided into three groups. A group of three categories that concern the way in which medical specialists view the complication registration, a group of two categories that concern the conditional attributes for the complication registration and a group of two categories that concern the social and organisational environment in which the complication registration is used. The seven categories are:
- Relative advantage
- Risks
- Change in way of working
- Speed of acceptance
- Infrastructure
- Social commitment
- Authority and Seniority
Results
The results indicate that the profession groups OBGYN, Ophthalmology and Gastroenterology have complication registrations that are used to improve the quality of delivered healthcare. The profession group Surgery does not use the complication registration as a basis for the analysis of complications. The profession group Radiology encounters very few complications each year and finds it difficult to use the complication registration successfully. Both the profession groups Paediatrics and Internal Medicine do not use a complication registration, but both are in the process of developing one. Several remarkable patterns have been identified:

- Profession groups consisting of the same type of specialists have similar complication registrations.
- Uncertainty as to what is done within the information stored in the complication registration is an important reason for medical specialists to have a negative perception of the complication registration.
- The complication registration itself is not a 'complicated' instrument. The registration system itself can be implemented using existing ICT infrastructure.
- The successful implementation of the complication registration is dependent on the perception medical specialists have of the benefits and costs of the complication registration. If the medical specialists have a negative perception of the advantages of the complication registration, it will not function.
- The existence of a person with the authority and seniority to be respected by the other members of the profession group and who is positive towards the complication registration is vital for a complication registration to be successful.
- The complication registration can only lead to structural quality improvement if the complete PDCA cycle is followed, otherwise, quality improvement will be incidental.

Recommendations
Recommendations to implement or improve the complication registration are given that apply to all profession groups and recommendations are given that apply to certain clusters of profession groups.

Recommendations that apply to all profession groups:

- Appoint a person responsible for the complication registration in each profession group.
  Preferably a profession group member. This person facilitates the complication discussions and analysis.
- Have a supporting staff member input the complications into the complication registration database.
  This reduces the time medical specialists need to register complications.
- Organise information sharing opportunities.
  This creates opportunities for profession groups to learn from each other.
- Keep complication data internal if possible.
  Information regarding complications should only be released if this is first approved by the members of the profession group.

Recommendation for profession groups that have successfully implemented a complication registration:

- Ensure continuity of the registration of complications.
  This increases awareness of the complication registration. In order to do this, all medical specialists need to be involved in the registration process.

Recommendations for profession groups that are in the process of developing a complication registration:

- Make sure the complication registration is started as soon as possible.
  This reduces the risk of medical specialists losing interest in the complication registration.
- Update the ICT infrastructure that is used for the registration of complications.
  Outdated ICT infrastructure leads to annoyances and an underreporting of 'smaller' complications.

Recommendation for profession groups that have severe social resistance to using the complication registration:

- Increase positive perception of the complication registration by coupling its use with the education in the profession group.
  Coupling the complication registration with the education program increases awareness of the positive elements of the complication registration and increases willingness to use the complication registration.

Recommendations for further research:

- Include all profession groups from the hospital.
  Such a study provides more complete information about all the complication registrations in the Deventer Hospital.
- Study a single profession group on a national level.
  A national study will identify profession group specific problems.
Management samenvatting (Dutch)

Deze thesis is het resultaat van een Master onderzoeksproject Health Sciences aan de Universiteit Twente. Het onderzoek is uitgevoerd in het Deventer Ziekenhuis en betreft de vergelijking van de medische vakgroepen op het gebied van complicatieregistratie. Dit rapport geeft aanbevelingen om de complicatieregistratie in te voeren of te verbeteren.

Complicaties zijn ongewenste uitkomsten van een medische behandeling. Complicaties zijn belastend voor zowel de patiënt als de geleverde gezondheidszorg. Een vermindering van het aantal complicaties levert gezondheidswinst op voor patiënten en efficiëntiewinst voor de gezondheidszorg. Een complicatieregistratie biedt de mogelijkheid om inzicht te krijgen in de factoren die complicaties veroorzaken. Aan de hand van de complicatieregistratie kunnen de complicaties geanalyseerd worden en kunnen complicaties in de toekomst worden voorkomen.

Aanleiding
Het bestuur van de Medische Staf van het Deventer Ziekenhuis wil de complicatieregistratie van de verschillende vakgroepen verbeteren. De complicatieregistratie van de vakgroep Gynaecologie, verloskunde en voortplantingsgeneeskunde (Gynaecologie) wordt gezien als een voorbeeld voor andere vakgroepen. Het bestuur van de medische staf wil deze complicatieregistratie gebruiken om de registratie van complicaties bij andere vakgroepen te bevorderen. Daartoe is duidelijkheid nodig over de fettelijke situatie bij andere vakgroepen in het Deventer Ziekenhuis en inzicht in de factoren die het succes van de complicatieregistratie beïnvloeden. Op basis hiervan is de volgende onderzoeksvraag geformuleerd:

Wat kan er geleerd worden van een vergelijking van de complicatieregistratie van de vakgroep Gynaecologie met die van andere vakgroepen in het Deventer Ziekenhuis?

Onderzoek
Er zijn interviews afgenomen bij medisch specialisten van 7 vakgroepen in het Deventer Ziekenhuis. Deze vakgroepen zijn geselecteerd op basis van vier typen specialismen:
- Snijdend (Gynaecologie, Chirurgie en Oogheelkunde)
- Beschouwend traditioneel (Kindergeneeskunde en Interne geneeskunde)
- Beschouwend technisch (MDL)
- Ondersteunend (Radiologie)

Theorie
Om de complicatieregistratie succesvol te gebruiken is het noodzakelijk om de gehele "Plan, Do, Check, Act" cyclus te doorlopen. Een registratie zonder gekoppelde analyse zal niet tot structurele kwaliteitsverbetering leiden, omdat juist in de analyse van complicaties de mogelijkheid ontstaat om te leren van complicaties en de kwaliteit van de geleverde zorg te verbeteren. De complicatieregistraties van de vakgroepen verschillen sterk van elkaar. Dit wordt verklaard door het bestaan van 'verticale barrières' tussen de vakgroepen. Deze zorgen ervoor dat de vakgroepen erg individueel werken en op het gebied van de complicatieregistratie weinig met elkaar communiceren.

De keuze wat voor complicatieregistratie te gebruiken wordt gemaakt door de medisch specialisten. Deze maken een afweging tussen de verwachte opbrengsten en kosten van het gebruik van de complicatieregistratie. Een model gebaseerd op het Health Belief model wordt gebruikt om deze afweging zichtbaar te maken. Het model wordt gemaakt met 7 categorieën die zijn opgedeeld in drie groepen. Een groep van 3 categorieën die gaat over opstelling van medisch specialisten ten opzichte van de complicatieregistratie. Een groep van 2 categorieën die gaan over de systeemfactoren van de complicatieregistratie. En een groep van 2 categorieën die gaat over de sociale en organisatorische omgeving waarin de complicatieregistratie wordt gebruikt.

Deze 7 categorieën zijn:
- Relatief nut
- Risico's
- Mate van verandering
- Snelheid van acceptatie
- Infrastructuur
- Sociale betrokkenheid
- Autoriteit en seniortitel
Resultaten
De resultaten geven aan dat de vakgroepen Gynaecologie, Oogheelkunde en MDL over complicatieregistraties beschikken die gebruikt worden om de kwaliteit van zorg structureel te verbeteren. De vakgroep Chirurgie gebruikt de complicatieregistratie niet als uitgangspunt voor de analyse van complicaties. De vakgroep Radiologie heeft met een zeer gering aantal complicaties te maken. De vakgroepen Kindergeneeskunde en Interne geneeskunde beschikken beide nog niet over een complicatieregistratie, maar zijn bezig om deze te ontwikkelen. De patronen die opvallen in de resultaten zijn de volgende:
- Vakgroepen die bestaan uit hetzelfde type specialisme beschikken over vergelijkbare complicatieregistraties.
- Onduidelijkheid over wat er met de gegevens van de complicatieregistratie wordt gedaan is een belangrijke reden voor medisch specialisten om een negatieve perceptie te hebben van de complicatieregistratie.
- De complicatieregistratie zelf is geen ingewikkeld instrument en 'moeilijkheid' is geen reden om de complicatieregistratie niet in te voeren, of te gebruiken. De complicatieregistratie kan geïmplementeerd worden op beschikbare ICT infrastructuur.
- Het succes van de complicatieregistratie is afhankelijk van de perceptie die de medisch specialisten hebben van het nut van de complicatieregistratie. Als deze een negatief beeld hebben van de complicatieregistratie, zal het systeem niet werken.
- Het bestaan van een persoon in de vakgroep die wat betreft kennis en kunde zich onderscheidt van de rest en zich inzet voor de complicatieregistratie is essentieel voor het succesvol gebruik van de complicatieregistratie.
- De complicatieregistratie kan alleen tot structurele kwaliteitsverbetering leiden als de volledige PDCA cyclus wordt doorlopen. Als dit niet het geval is, zal kwaliteitsverbetering incidenteel zijn.

Aanbevelingen
Aanbevelingen worden gegeven om de complicatieregistratie in te voeren of te verbeteren. Sommige aanbevelingen gelden voor alle vakgroepen terwijl anderen gelden voor specifieke clusters van vakgroepen.

Aanbevelingen die gelden voor alle vakgroepen:
- Stel een complicatieregistratie verantwoordelijke aan in elke vakgroep.
  Bij voorkeur is dit een lid van de vakgroep. Deze persoon kan de complicatiebesprekingen en analyses organiseren.
- Laat de complicaties invoeren in de registratie door een ondersteunende staf medewerker.
  Dit zal de tijd die het de medisch specialisten kost terugdringen.
- Organiseer informatiebijeenkomsten
  Informatie over complicatieregistraties kan zo gedeeld worden. Dit creëert de mogelijkheid voor vakgroepen om van elkaar te leren.
- Houd informatie over complicaties intern
  Informatie over complicaties zou alleen vrijgegeven mogen worden als dit is goedgekeurd door de leden van de betreffende vakgroep.

Aanbevelingen die gelden voor vakgroepen die een complicatieregistratie succesvol hebben geïmplementeerd:
- Zorg voor continuïteit van de registratie van complicaties.
  Dit verhoogt de kennis van de medisch specialisten met betrekking tot de complicatieregistratie. Om dit mogelijk te maken is het nodig dat alle medisch specialisten betrokken zijn bij het registraties proces.

Aanbevelingen die gelden voor vakgroepen die bezig zijn met het ontwikkelen en implementeren van een complicatieregistratie:
- Start zo snel mogelijk met registreren van complicaties.
  Dit voorkomt dat medisch specialisten de interesse in de complicatieregistratie verliezen.
- Zorg dat de ICT infrastructuur toegankelijk is voor het gebruik van een complicatieregistratie.
  Verouderde ICT infrastructuur leidt tot irritatie en een onderrapportage van 'kleine' complicaties.

Aanbevelingen die gelden voor vakgroepen waar sociale weerstand bestaat tegen het gebruik van de complicatieregistratie:
- Verbeter de perceptie van de chirurgie ten opzicht van de complicatieregistratie door het koppelen van de complicatieregistratie met de opleiding in de vakgroep.
  Een koppeling van de complicatieregistratie met de opleiding in de vakgroep vergroot het inzicht in de positieve elementen van de complicatieregistratie en verhoogt de bereidwilligheid om te werken met de complicatieregistratie.

Aanbevelingen voor verder onderzoek
- Breid het onderzoek uit naar alle vakgroepen in het ziekenhuis.
  Dit zal een uitgebreider beeld geven van de complicatieregistraties in het Deventer Ziekenhuis.
- Onderzoek een vakgroep op nationaal niveau.
  Een onderzoek op Nationaal niveau zal vakgroep specifieke problemen aan het licht brengen.
Preface

Quality and safety management in hospitals have been an interest of mine from the moment I started to learn about these subjects. There are a lot of processes in hospitals that seem very simple, but are in fact not. As one’s understanding of the subject grows, the complexity of these processes becomes visible. After my bachelor thesis, I knew I wanted to do another assignment in a hospital setting. I thank the Deventer Hospital for providing me with the opportunity to learn and work in their hospital. With this research report, I hope to have contributed to the overall understanding of the processes concerning safety and quality in healthcare. I hope that eventually, this report contributes to the reduction of medical complications though the successful use of a complication registration.

I want to thank my graduation committee: Dr. H.G.M. Oosterwijk and Ir. E. Bredenhoff, for guiding me during this research and the writing of this report. Special thanks to Prof. Dr. W. van Rossum, for guiding me during the initial stages of this report.

M. Berends and C Kok have my thanks for being my external graduation committee and helping me find my way around the Deventer Hospital. At all times there were opportunities to ask questions, or discuss about the results of my study. Without their help, I could never have finished this report.

I want to thank all the medical specialists that took the time to provide me with the necessary information. These interviews were the most fun and educational part of this study for me.

My family, girlfriend and friends all deserve my sincere thanks for supporting me throughout this research. They provided me with the incentives to keep going and do my best.

I believe that this report contributes to improving the quality of care in the Deventer Hospital. I hope you enjoy reading it.

Wherever ‘he’, is written, also ‘she’ can be read and visa versa.

Enschede, August 8th 2008

Alexander Rengelink
List of Definitions

The terms used in this report are defined in this chapter. The names of the terms are in English. The Dutch translation is given next to the English one.

In literature regarding patient safety, a lot of different definitions can be found that seem, but are not completely similar to each other. For the purpose of clarity in this report, the following definitions will be used (Wagner 2005):

**Adverse Event - Ongunstige gebeurtenis**
An undesired outcome caused by the (not) acting of a healthcare provider and/or the healthcare system damaging the patient such that there are temporary or permanent limitations, increased length of treatment, increased severity of treatment or the death of the patient.

**Blameworthy - Verwittbaar**
An event, complication or adverse event is in retrospect blameworthy if after systemic analysis of the events is proven that the healthcare provider did not come up to the mark and / or has been careless when compared to a reasonably experienced comparable colleague in the situation under the same circumstances

**Calculated Risk - Afgewogen Risico**
A calculated risk as assessed by the health care provider or calculated side effect of a treatment, which is described in relevant literature and of which the expected effect is seen as being more important than the severity of damage or chance of this damage happening.

**Complaint - Klacht**
A filed complaint by the patient considering the acting or functioning of a healthcare provider.

**Complication - Complicatie**
An undesired outcome during or after medical specialist acting that is harmful to the patients’ health in such a way that adjusting the (way of) treatment is necessary or there is irreversible damage.

Further criteria of a complication:
A complication has been ascertained during treatment, during the first following polyclinic control or within a time period as set by the relevant medical scientific association starting at the beginning of treatment.
NB: the result of the treatment, probability of the complication or presence of fault is not relevant in this report.

**Error - Fout**
Not implementing a planned action (error in implementation) or applying a wrong plan to achieve the desired outcome (error in planning).

**Incident - Incident**
An unwanted event during the healthcare process that led, could lead, or can lead to patient damage.

**Healthcare provider - Zorgverlener**
Someone who provides healthcare; typically a medical specialist.

**Injury - Schade**
A disadvantage for the patient that, because of its severity, leads to lengthening, or increasing treatment, temporarily, or permanent physical or psychological and or social loss of function or death.
Medical partnership - Maatschap
A group of medical professionals that work together on a financial basis (in the healthcare sector).

National scientific organization - Wetenschappelijke verenigingen
National organisations that promote and support medical profession groups and specialists in a specific field of medicine.

Near Miss - Bijna Incident
An undesired event that does not lead to disadvantages to the patient, since the effects of this event have been established on time and have been corrected or of which the effects do not influence the physical, psychological or social functioning of the patient.

Patient safety - Patiëntveiligheid
The (almost) absence of the (chance of) damage to the patient (physical or psychological) that originated by the not acting according to professional medical standards by healthcare providers and / or shortcomings in the healthcare system.

Performance indicator – Prestaties indicator
An indicator (measure) that represents quality of health care.

Preventable adverse event - Vermijdbare ongunstige gebeurtenis
An adverse event that could have been prevented by consistent implementation of professional standards.

Preventable - Vermijdbaar
An event, complication or adverse event is in retrospect preventable, if after systemic analysis of the event, it is proven that certain actions would have prevented its occurrence.

Process deviation - Procesafwijking
Deviation from the planned expected or demanded process by the (not) acting of a health care provider.

Profession group - Vakgroep
A group of medical specialists of the same specialism organised into an organisational unit.

Professional Standard - Professionele standard
The best way of acting in a specific situation, taking into regard recent insights and evidence as it is based in directions and protocols of the occupational group and acting as can be expected from a reasonably experienced comparable colleague in the situation under the same circumstances.
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1. Introduction

Complications are undesired outcomes of a medical treatment (Orde 2006). Complications are taxing for the patient, because he will incur permanent damage or will need additional treatment. Also, complications are taxing for the healthcare system itself. Extra treatments will require extra costs and time, which cannot be allocated to other patients. Reducing the number of complications will be beneficial to the patients and will provide an increase of efficiency to the healthcare system. To reduce the number of complications, it is necessary to know how often complications occur and which elements have led to these complications. Insight into these elements will provide a vantage point from which to analyse complications. The results of this analysis may provide the opportunities to reduce the number of complications. A complication registration makes obtaining this insight possible.

1.1 Cause

In order to improve the quality of healthcare in the Deventer Hospital, the board of medical specialists wants to improve the complication registration of the medical profession groups. The term quality refers to the reduction of the number of preventable complications. The profession group Gynaecology, Obstetrics and Reproductive Medicine (OBGYN for short) has a successful complication registration at the Deventer Hospital. The board of medical specialists regards this system as an example for the other profession groups.

The board of medical specialists regards the registration and discussion of complications as a useful instrument to improve the quality of the provided healthcare. In its view, every profession group should have a complication registration. However, this is not the case. The board of medical specialists wants to use the experience of the profession group OBGYN to improve the registration of complications in other profession groups. To do this, it is necessary to understand the current situation in other medical profession groups. Furthermore, it is necessary to gain insight into the factors that contribute to the success of the complication registration in the profession group OBGYN. The board of medical specialists also wants to know if it is possible to transfer the system of the complication registration of the profession group OBGYN to other profession groups and what adaptations would be required.

1.2 Research questions

To guide this research, the following research question is formulated:

What lessons can be learned from a comparison of the complication registration system of the profession group OBGYN with those of the other profession groups in the Deventer Hospital?

In order to answer this question, the current situation in the Deventer Hospital with regard to the complication registration needs to be determined first. Second, the factors that influence the success of the complication registration in medical profession groups need understood. In order to do this, the following sub questions are formulated:

1. What is a complication?
   a. What is a complication registration?

2. In what context is a complication registration used?

3. Which factors influence the success of a complication registration?

4. How do the complication registrations of the Deventer Hospital operate?
   a. How do the complication registrations operate in the different medical profession groups in the Deventer Hospital?
5. Which differences and which similarities exist between the complication registrations of the profession groups within the Deventer Hospital?

6. Which factors govern the success of the complication registration?

1.3 Research design

A literature study is used to draw an analytic framework, and will answer the first three sub questions. In order to answer sub-questions four and five, medical specialists are interviewed. Medical specialists will be selected for interviews, based on the distribution among the medical profession groups and their availability. Sub question six is answered by analysis of literature and the data collected in the interviews. Figure 1 depicts the coherence among the different elements of this research.

Figure 1 - Coherence of the elements of this research report

Theory was used to structure the interviews. When interviews provided extra information, additional literature was consulted.
2. The complication registration in the hospital

2.1 Complications

"A complication is an undesired outcome during or after medical specialist acting, that is harmful to the patients' health in such a way that adjusting the (way of) treatment is necessary or there is irreversible damage" (Wagner 2005).

Two elements of the above quote are of particular importance, these are: "medical specialist acting" and "harmful to the patient".

The words "medical specialist acting" restrict complications to the medical specialist actions. If a patient bleeds internally as a result of a medical intervention, this is an example of a complication. The patient has to stay in the hospital for a longer time. The complication is caused by medical specialist acting in such a way that it is damaging for the patient. It is often said that a complication is the result of an error (Wagner 2007). This can, but does not have to be the case. A complication can, and often is the consequence of underlying health issues. It is not relevant to determine if a complication can be blamed on anyone or if it is the result of an underlying condition. However, it is relevant to determine in what way the complication could have occurred in order to prevent or reduce its occurrence in the future.

As a result of the definition, a nurse can not cause a complication. It is however conceivable that a nurse causes damage to a patient, for example by giving the patient the wrong medicine. Such a situation is referred to as an incident. In literature, (Legemaate 2006), the terms incident and complication are often used interchangeably. However, this is not correct. An incident is defined as: "An unwanted event during the healthcare process that leads to, can, or could have lead to damage to the patient." (Wagner 2005). Box 1 provides a better understanding of the difference between an incident and a complication:

Box 1 - Example of an Incident

A patient falls from his bed and as a result of this, starts bleeding internally. This event is regarded as an incident, and not a complication, because the fall of the patient is not related to medical specialist care or a specific affliction. It is ’just’ an incident. Would the patients develop internal bleeding after a medical specialist treatment, and has to receive additional treatment; then the situation is regarded as a complication.

Incidents are registered in the MIP registration (Legemaate 2006). A MIP committee is responsible for the registration and analysis of incidents. Both the MIP registration and the complication registration are instruments that are used to improve the quality of the care that is provided by the hospital, but they function separately. The difficulty lies in the fact that it is possible that an incident results in a complication. For example: if a patient is given wrong medication by a nurse, prior to an invasive operation, this can result in bleeding during the intervention, which could be damaging to the patient. The bleeding is a complication, but the complication is the result of a prior incident (the wrong medication).
2.2 The complication registration

A complication registration is a registration system in which specific features of complications, the patient/affliction and the consequences for the patient are registered. These features provide insight into the number of complications and the circumstances in which they occur. This provides a vantage point, from which risks and possible improvements can be discussed and analysed. The medical specialists that use a complication registration can use this analysis to learn from complications. If no structural complication registration is used, an important opportunity for learning is lost. Without a registration system, learning from complications will be irregular and infrequent. The complication registration also provides the possibility to inform patients about the risks of various treatments (IGZ 2007).

The complication registration itself consists of a piece of software in which information concerning complications can be entered and retrieved quickly. Usually, software such as MS Excel or MS Access is used, but there is also registration software specifically tailored to particular profession groups. If a complication is identified, a medical specialist (usually the attending) enters the information regarding this complication into the registration system. This can also be done by a secretary or other supporting staff members. The data is entered into data fields that require information concerning the complications and actions that were taken after a complication has occurred. Examples of these fields are: date, type of intervention, type of complication, and the age of the patient. Other examples of types of data that are registered can be found in the complication registrations of the national scientific organisations (Orde 2007). The database fields that have to be filled in and the types of complications that can be selected can be provided by the national scientific organisations, but they can also be determined by the medical specialists themselves. This also applies for the complication registration system itself. Some are developed by the national scientific organisations and some by the medical profession groups themselves.

The way in which different types of complication registrations relate to each other on a national level is depicted in figure 2 (Snellertbeter 2007). The figure shows that on average, only one third of all the Dutch specialisms use a nationally developed complication registration (both according to the standards of the national scientific organisations as other not further specified national systems). Most of the specialisms use a local complication registration or do not use a complication registration at all.
It is obvious that there is a big difference among the systems of complication registration that medical profession groups use in the Netherlands.
Figure 2 – Availability of a complication registration per Dutch Hospital. (Snellerbeter 2007)

All the Dutch Hospitals are depicted on the vertical axis. The horizontal axis depicts the number of medical specialisms in these hospitals. The colours of the graph correspond with different types of complication registration systems.

- **Dark blue**: National complication registration according to standards set by the national scientific organisations.
- **Blue**: National complication registration (not specified).
- **Light blue**: Local complication registration.
- **Gray**: No complication registration.
- **White**: Specialism is not present in hospital.
2.3 Quality improvement by using the complication registration

The main goal of a complication registration is to improve the quality of care and increase the transparency of healthcare. A complication registration leads to an improvement of the quality of care through reducing the amount of complications. To improve the quality of care it is essential that the complication registration process does not stop at the registration of complications itself. Quality improvement is only possible if the complication registration is used as a starting point to analyse and discuss the complications, and if the results of this analysis are used to improve the healthcare process. These steps of quality improvement are best described by the quality circle of Deming (Stadlander 2003). This circle consists of four steps and is shown below in figure 3.

![Quality improvement circle](image)

**Figure 3 – Deming quality improvement circle (PDCA cycle)**

The four steps in the Deming circle are: Plan, Do, Check and Act. These steps describe the following elements of quality improvement (Stadlander 2004):

- **Plan**: Anticipate and plan, before an activity is undertaken (policy development and determination). This step encompasses the decision to develop the complication registration itself and to make arrangements as to how the complication registration will be used.
- **Do**: Execute the planned activities (policy execution). The second step encompasses the actual introduction and implementation of the complication registration.
- **Check**: Measure and interpret the results (policy evaluation). This step encompasses the use of the complication registration as a vantage point from which to analyse complications. Are the results in line with the plans?
- **Act**: React to the results (policy preparation). Using the outcome of the analysis to take measures to prevent and/or reduce the occurrence of complications in the future.

Quality improvement can be achieved only if the Deming circle is used completely and continuously. It is not sufficient to have ‘just’ one full ‘rotation’ of the circle. The registration, analysis and adaptation of processes are continuous processes. It can therefore be said that the Deming circle is actually a continuous cycle of steps that facilitates quality improvement. Quality improvement is only possible, if the complete cycle is used.
If complications are registered, but the complication registration is not used to analyze complications, structural quality improvement can not occur. Omitting the 'check' step of the Deming cycle prevents quality improvement from actually being achieved. Without the 'check' step, the 'act' step cannot be taken. It is the 'act' step that actually leads to quality improvements. The steps; 'Check' and 'Act', the analysis of the complication and the reaction on the results of this analysis are thus essential to close the quality improvement cycle and improve the quality of care by reducing the number of complications in the future.

The way in which the complication registration functions is depicted in figure 4. The figure is developed by the researcher in order to illustrate the functioning of a complication registration.

Figure 4 - Theoretical optimal complication registration

Figure 4, shows a theoretical optimal situation. In practice, many complication registrations are still in development and do not function as depicted in figure 4 (Legemaate 2006). Profession groups that have a complication registration adhering to national standards (see figure 7) are closest to the situation as depicted in figure 4.

The registration of complications starts on the left side of the figure in the local medical profession group. If a complication is identified as such, the case is entered into the complication registration by a member of the medical profession group. When complications are analysed, information is gathered from the local complication registration, as well as from a national database. This analysis will lead to an improvement of the quality of healthcare by reducing the number of complications. The red arrows in figure 4 depict the PDCA cycle as it functions when the complication registration is used.
Box 2 shows an example of the process of identifying a complication to the adaptation of policy.

**Box 2 - Example of the Leids Universitair Medisch Centrum (Hollander 2005)**

Using a patient case, it is shown how the complication registration leads to the learning from complications and how this resulted in an adapted protocol on the perioperative use of acetylsalicylic acid and clopidogrel.

The patient is a 64 year old man with a carcinoma in the recto sigmoid. A week prior to the planned laparoscopic assisted lower anteriel resection, the patient stops using acetylsalicylic acid and clopidogrel, according to standard norms. The postoperative course is complicated on the first day by bleeding of a perforating artery near the Pfannenstielincision. On the fifth day, the patient reports reduced strength in his right arm and progression of his pre-existing dysentery. The acetylsalicylic acid and clopidogrel have not been resumed until then.

The neurologist is asked for a consult. It is recognised that there is a relapsing cerebral infarct in the basin of the arteria cerebra media left. Consecutive analysis by the neurologist and the cardiologist does not, with exception of scleroses of the heart valves, provide a clear source of embolus.

During the weekly complication discussion, the case is explained and further discussed using a set system. Conclusion: It is possible to learn from this situation. Adapting the peri operative policy regarding acetylsalicylic acid and clopidogrel, a complication such as this one can be prevented in the future. The next step was to search for available evidence on this policy adaptation. Because this analysis is mainly aimed at quality, and not at scientific research, first local and national guidelines were retrieved and evaluated. After this, the internet was searched for guidelines. Literature was searched through Pubmed, for additional data on acetylsalicylic acid. Articles from the last five year were searched, focussing on meta analysis, randomised studies and review articles.

The preliminary conclusion during the complication discussing was that the acetylsalicylic acid and clopidogrel were resumed too late during the postoperative phase. And because of this learning is possible. Resuming acetylsalicylic acid and clopidogrel earlier could have prevented the relapsing cerebral infarction. The decision was made to evaluate the perioperative policy of the LUMC using a question: "Can acetylsalicylic acid and/or clopidogrel be continued perioperative, taking into account the risk of bleeding on one side and the possible damage due to cardiovascular en/or cerebra-vascular thrombi-embolic complications on the other side? The general advice from the departments Neurology and Anaesthesiology was to stop acetylsalicylic acid and clopidogrel five to ten days preoperative. An exception can be made for patients that have to prevent (severe) thrombo-embolic processes and need to continue acetylsalicylic acid and clopidogrel. If a neuroaxisblockage is indicated, this patient category is advised to be sure to not be given Nadroparine on the day of the operation, despite of the fact that there is no hard evidence to reject the combined use of acetylsalicylic acid and clopidogrel without an elevated risk of bleeding.

The hospital facilitates the complication registration. It ensures there is an ICT infrastructure present in which the complication registration can be used. The national scientific organisations can compare information with complications documented on the national level and adapt the information that is provided to patients. The national scientific organisations also provide the structure of the dataset for the local complication registration system. This dataset contains demands on what needs to be registered.

The National Healthcare Inspection agency added the use of a complication registration to the base performance indicators in 2007 (IGZ 2007). Medical profession groups are tested during visitations by the national scientific organisations on the use of their complication registration. Box 3 provides a description of these visitations.
Box 3 - What are visitations? (Brouwens et al 2006)

"Lombarts et al (2005) say that a visitation is a model to guard and improve the quality of healthcare and has been developed by medical specialists. Visitation is a type of collegial control. This notion regards the professional standard to which the government, law and judge like to refer.

According to a predetermined protocol, the local profession group is visited by colleagues. A quality visitation normally takes a day. At the end of this day, the visitation commission discusses their preliminary findings with the visited profession groups. Strong and weak elements are pointed out and if necessary, recommendations to improve upon the situation are formulated. Some time after the visit, the medical profession group will receive a visitation report as a written representation of the findings, conclusions and recommendations to improve the quality."

2.4 The context of the hospital

Section 2.4 discusses the context in which the complication registration is used; the hospital. The Deventer Hospital is a member of the ‘Samenwerkende Topklinische opleidingsziekenhuizen (STZ)’ (cooperation of top clinical hospitals). Twenty six medical specialisms operate at the Deventer Hospital. These specialisms are part of profession groups, which are divided into eleven clusters (DZ 2008). Every profession group that has a complication registration system, uses it in its own way. A hospital wide complication registration does not exist (not in any Dutch Hospital (Legemaate 2006)). Additional information on the Deventer Hospital is presented in appendix A.

In a hospital environment, two important professional groups can be identified; the hospital board and management on one side and the medical specialists on the other side. The hospital management is held responsible for the quality of healthcare. The management of the hospital will try to increase the quality where possible by managing the processes in the hospital. The medical specialists strive to provide high quality of healthcare, however, from a different perspective. They are professionals and want to provide their patients with high quality healthcare, but want to do this in their own way. There is a lot of friction between these two ‘worlds’. This friction is visible when a quality control instrument such as the complication registration is scrutinized.

2.4.1 Barriers in coordination

As stated in section 2.1, the complication registration needs to be used as a starting point from which complications are analysed, in order to improve the quality of healthcare. This analysis is performed by medical professionals. Freidson (1986), states that professionals have a large amount of professional autonomy. They have the option to organise processes to fit their own needs. This makes it hard for the board of directors to introduce instruments or processes from a top-down perspective. The way in which an organisation such as a hospital is organised, is described by Mintzberg (1992) as a professional bureaucracy. The professionals have the most power, since they are the ones that have the necessary skills and knowledge. In a hospital setting, the medical specialists are the professionals.

The way in which the professional bureaucracy works in the hospital leads to the existence of (fairly) autonomous operating structures within the hospital organisation. However, there are also other groups that influence the medical specialists. The two most important are: the national scientific organisations that promote the use of complication registrations and determine the types of data that need to be registered; and the National Healthcare Inspection Agency (IGZ) that developed performance indicators to measure the performance of hospitals including the use of complication registrations.
Glouberman and Mintzberg (2001-1) describe a model of four ‘worlds’ in healthcare. These four ‘worlds’ outline the four most important groups of people involved in hospital processes. These four ‘worlds’ are:

1. The environment, for example the healthcare inspection agency or patient interest groups, the board of trustees, or volunteers.
2. The managers, like the hospital board, or the board of medical specialists.
3. The doctors, the medical specialists.
4. The nursing staff, both clinical as well as polyclinic.

Figure 5 depicts these four ‘worlds’ and the position they have relative to each other.

Glouberman and Mintzberg (2001-1) note that there are barriers between the four ‘worlds’. A horizontal barrier exists between the worlds of the environment and the managers on one side and the doctors and nurses on the other side. This barrier is specified by on one side, those who are directly involved with the primary processes in the hospital and on the other side, those who are more distant from it. A vertical barrier exists between those who are intimately involved with the hospital, the managers and the nursing staff, and those whom are more distant from the organisations, the environment and the doctors. The environment wants the complication registration to be used, in order to ensure that the patients receive high quality healthcare. The board (the managers) wants to deliver efficient and high quality care in order to compete with other healthcare organisations. These barriers contribute to the fact that each ‘world’ is organised in its own way. This hampers coordination and communication between these worlds and makes influencing each other difficult.
Globerman and Mintzberg (2001-2) state that the high level of differentiation in the healthcare sector does not only depict the essence of the system, but that it is also the source of the great strength of the medical specialist care. The high level of differentiation makes it possible to implement difficult and complex processes. To reduce the problems of communication and coordination, not the level of differentiation has to be reduced, just, the level of integration has to be increased. Globerman and Mintzberg argue that six mechanisms can be used to make this improvement of integration possible and contribute to the improvement of coordination among groups.

1. **Mutual Adjustment**
   This is the most direct form of coordination and it can be found in the medical profession groups. When two or more specialists work together, they will coordinate among themselves by way of informal communication. This is in what way medical specialists operate.

2. **Direct supervision**
   This mechanism can be seen on several levels. Within a profession group, the senior specialist will supervise the processes and provide steering were necessary. On a ‘higher’ level, it also applies. The management will want to steer the complications registration by influencing the medical specialists. However, the way in which doctors operate within the hospital and the attitude of the professional as described by Freidson (1986) hinder the use of direct supervision by management. Direct supervision therefore does not seem to be an effective way to improve the success of the complication registration from the perspective of hospital management.

3. **Standardization of work**
   Many processes are standardised in the healthcare sector. Treatment is often organised using strict protocols and following clinical pathways. This standardisation makes systematic analysis and adjusting of processes possible.

4. **Standardization of outputs**
   The same can be said for standardisation of output. If outputs are standardised, it is possible to measure the effect of the use of a complication registration on the quality of these outputs.

5. **Standardization of skills and knowledge**
   When skills and knowledge are standardised, different people are trained to know what to expect of each other; they can therefore coordinate in almost automatic fashion (as generally happens between a surgeon and an anaesthetist in an operating room).

6. **Standardization of norms**
   When norms are standardised, socialisation is used to establish common values and beliefs so that people work towards common expectations. Standardising norms means promoting a common system of beliefs, a common culture whereby externalised controls can be replaced by internalised attitudes.
2.4.2 Professional Chimney's

While all the mechanisms described in section 2.4.1 function to some extent inside the profession groups, the last two mechanisms can be applied to a higher level. When the norms of professionals in general dictate that the skills and knowledge relating to the complication registration need to be at a certain level, it will influence the success of the complication registrations in all the profession groups. However, coordination among the four worlds in the healthcare sector is not without problems. Barriers exist between the four worlds, but barriers also exist between the profession groups. These barriers make communication between profession groups difficult.

Cain (2002) states that innovations spread much faster among homophilious groups that have a lot in common than within groups that don’t. This results in much better coordination with regard to the complication registration within the same profession group than between different profession groups. This phenomenon becomes visible, when we zoom in on the ‘world’ of the doctors. The ‘world’ of the doctors is characterized by the existence of ‘professional chimneys’. These chimneys represent the autonomous way of working and the inward focus of the medical specialists in the profession groups. The medical specialists are ‘locked’ in these chimneys because of the high level of specialisation that is required for medical specialist care. As a result the medical specialists will not communicate frequently with medical specialists of other profession groups. The medical specialists will not often ‘look’ in other chimneys and will not easily learn from the complication registration of other profession groups in the hospital.

The education of doctors reinforces the existence of these chimneys. Doctors are taught to adopt a certain doctrine that differs per specialism (Legemaate 2006). The ‘chimneys’ are depicted in figure 6, which is an enlarged version of the ‘world’ of the doctors that is presented in figure 5.
2.4.3 Different types of profession groups

Profession groups consist of medical specialists that practise the same specialism. Sometimes different types of specialists are organised into one profession group. This is for instance the case in the profession groups Radiology, where both general and intervention radiologist are organised in one profession group.

The previous section discussed the functioning of profession groups as separate organisational elements. Each profession group has its own specific social and organisational structure. This makes it hard to transfer a system, like a complication registration, from one profession group to another. However, some profession groups have similarities with other profession groups. In The Netherlands, generally, three types of profession groups are distinguished (Snellerbeter 2006).

- Profession groups consisting of invasive specialists, such as Surgery, Gynaecology and Ophthalmology.
- Profession groups consisting of observing specialists, such as Paediatrics and Neurology.
- Profession groups consisting of supporting specialists, such as Radiology.

In this study, profession groups consisting of observing specialists have been divided into two groups, those of traditional observing specialists such as paediatrics and internal medicine and profession groups that consist of specialisms that use techniques that have a more invasive character, such Gastroenterology. This is done, because it is expected that these profession groups share more similarities with invasive profession groups than with observing profession groups and it is interesting to see if this difference is also exists with regard to the implementation of the complication registration.

There is a lot of difference between different types of medical specialists regarding the complication registration. On a national level, 85% of the invasive specialists use some kind of a complication registration. Only 25% of the observing specialists use a complication registration. Between 25% and 75% of the supporting specialists use a complication registration (Snellerbeter 2006). These clear differences can be explained by the fact that invasive specialists often have a much more clearly defined connection between a medical intervention and a complication. A suture that opens after surgery is easily identified as a complication of a medical intervention. For the observing specialists, this connection is not as clearly identifiable.

Figure 7 (IGZ 2006) shows that there are differences between the profession groups with regard to the complication registration. It shows that the invasive specialisms (up to and including Gastroenterology), use a complication registration in a relatively high percentage of the cases. In the observing specialisms, this percentage is much lower. The complication registrations in invasive profession groups seem to be further developed than the complication registrations in observing profession groups. The specialisms Dialysis and Neonatology differ significantly from the other specialisms in the same types. This can be explained that Neonatology often functions together with OBGYN, which is invasive and Dialysis uses a lot of routine procedures, in which the complication registration has more visible results.
De beschikbaarheid van een complicatieregistratie (landelijk of eigen) per specialisme, gesorteerd naar respectievelijk snijdende, beschouwende en ondersteunende specialismen. Achter de specialismen staat het aantal ziekenhuizen vermeld waar het betreffende specialisme aanwezig is.

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![Figure 7 - Availability of a complication registration (IGZ 2008)](image)

Figure 7 shows the availability of a complication registration (National or local) per specialism in percentages, sorted in invasive, observing and supporting specialisms. The name of the specialisms is reported first, subsequently the number of hospitals that carry this specialism.

The colours represent the following:
- **Dark Blue**: Complication registration following national standards
- **Blue**: National complication registration (not specified)
- **Light Blue**: Local complications registration
- **Grey**: No complication registration
3. Attributes that influence the success of the complication registration

The national healthcare inspection agency considers having a complication registration mandatory. However, the decision how to use and implement a complication registration is up to the medical specialists. How or when do medical specialists decide to use a complication registration, and what does it take to make a complication registration function successfully in a profession group? This can be explained in a model similar to the Health Belief Model.

3.1 Health Belief Model

The Health Belief Model is a psychosocial model that attempts to explain and predict health behaviours. This is done by focussing on the attitudes and beliefs of individuals. It can for example be used to explain sexual risk behaviours and the transmission of HIV/AIDS (Glanz 2002). The Health belief model is based on the understanding that a person will take a health-related action (f.i., use condoms) if that person:

1. feels that a negative health condition (i.e., HIV) can be avoided,
2. has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition (i.e., using condoms will be effective at preventing HIV), and
3. believes that he can successfully take a recommended health action (i.e., he/she can use condoms comfortably and with confidence).

Based on several attributes of sexual risks and using condoms, persons perceive benefits and barriers. Benefits arise from the prevention of contracting the HIV/AIDS virus. Barriers are the costs of condoms and reduction of sexual pleasure. The basic outline of the health belief model is presented in figure 8.

![Health Belief Model](Image)

Figure 8 – Health Belief Model (based on Glanz 2002)
3.2 Categories of attributes

Content attributes regard attributes of the health behaviour, in the example this can be the cost of condoms. The conditional attributes refer to factors without which the behaviour is not possible; condoms must be available for purchase for example. These factors are influenced by the social and organisational conditions in which they function. For example, is the use of condoms prohibited by any organisation (such as the church)? These factors together create the perceived benefits and perceived costs of certain health behaviour, which ultimately determines the likelihood of change.

In medical profession groups, similar decisions are made when the quality improvements of using a complication registration are weighed against the costs and risks of using a complication registration. The Health Belief model can be adapted to describe this decision making process in the medical profession groups. The notion that the decision of the medical specialists is based on ‘perceived’ barriers and benefits is critical. Decisions can be based on barriers and benefits that are perceived in a certain way, but are in reality different. Communicating the actual barriers and benefits can change the perception of the medical specialists and thus promote the successful use of the complication registration. The mandatory aspect of the complication registration, coupled with the perceptions of the medical specialists of the benefits and the barriers that coincide with using the complication registration, can lead to several outcomes:

- The specialists use the complication registration, but only because it is mandatory, and no real action follows the registration of complications.
- The specialists accept and use the complication registration and couple this with an analysis of complications so that it will improve the quality of healthcare
- The specialists accept and improve the complication registration to fit the specific demands of the medical specialists that operate in a certain profession group.

3.2 Categories of attributes

In order to use the Health Belief Model to represent the decision-making process with regard to the complication registration in more detail, the content, conditional attributes and social/organisational conditions have to be focussed on the specific situation of the complication registration. Literature has been studied to find attributes that influence the success of innovations in the healthcare industry. Articles from Cain (2002) and Grol (2007) discuss 27 attributes of innovations in healthcare that influence their diffusion and implementation. These attributes are used to fill in the Health Belief Model so that it can be used to describe the process that medical specialist go through when working with the complication registration. The 27 attributes described by Cain (2002) and Grol (2007) are categorised by the researcher in order to simplify the Health Belief Model. The attributes are listed into seven categories. These categories are then used to complement the Health Belief Model. The categories relate to content factors, to conditional attributes and to social/organisations conditions. The differentiation between categories relating to content factors and conditional attributes on one side and social/organisational categories on the other side is also found in comparable studies (Broerse 2007). The categories that are used in this research are presented in section 3.2.1 up to and including section 3.2.7.
3. Attributes that influence the success of the complication registration

3.2.1 Relative advantage

The first category relates to relative advantage:
If medical specialists expect that spending resources to use the complication registration will be more beneficial to the quality of care than not spending these resources, they are more likely to use the complication registration successfully.

This category relates to the difference between expected costs versus expected benefits of the complication registration (Grol 2007 & Cain 2002). Meaning: the expected improvement in quality and costs of using the complication registration versus not using the complication registration (or not allocating enough time to successfully use the complication registration). These expectations are influenced by the complexity of the complication registration (Grol 2007). A complex way of registering complications will increase the costs in terms of time and thus influence the likelihood of acceptance in a negative way. Most of the costs that are being considered, deal with time since there are few other costs connected to the complication registration. Time spent to use the complication registration can also be used to spend with patients. Medical specialists can perceive the complication registration to be ‘bureaucratic and time consuming’, time better spend with patients.

3.2.2 Risks

The second category is related to the risks that are involved when using the complication registration:
If medical specialists perceive the risks of using the complication registration to be minimal, the success of the complication registration will not be affected. If medical specialists perceive the risks of using the complication registration to be disproportionate to the expected improvement of quality of care, the success of the complication registration will be impaired.

It is often unknown (Wille 2005) what is done with the information that is stored in the complication registration. When information becomes public, it can give rise to misleading comparisons between hospitals, profession groups or even individual medical specialists. The absence of compensating for case-mix, or type of equipment used, results in incorrect comparisons, which can be very damaging to the hospital's or medical specialist's reputation.

3.2.3 Change in way of working

The third category regards attributes that depict the level of change in the current way of working:
If a complication registration can be used without having a significant effect on the way of working it is more likely to be accepted and used successfully.

If the complication registration is not embedded in the primary processes it will only minimally affect the way of working and acceptance will be easier (Grol 2007). If on the other hand the complication registration is part of the primary processes, it will have a bigger impact on the current way of working and medical specialist may feel it requires too much change. A flexible complication registration that can be tailored to the demands of the medical specialist will minimise the effect on the daily work and still makes it possible to integrate the complication registration in the daily routines (Cain 2002 & Grol 2007). Attributes in this category also concern the values and norms of the specialists in the profession group. When analysing and discussing complications, an open and transparent culture is necessary. A culture of blame and shame (Legemaate 2006) will hinder the successful use of the complication registration.
3.2 Categories of attributes

3.2.4 Speed of acceptance and implementation
The fourth category relates to attributes that govern the speed of acceptance and implementation:
If the complication registration is quickly implemented and accepted by the profession group, it is more likely to be used successfully. If, on the other hand the complication registration is not readily accepted and implemented slowly or in steps its benefits become obscure and its success less likely.

Attributes that fall into this category relate to the completeness and speed with which the complication registration is implemented (Grol 2007). The speed of acceptance and implementation regard only the complete complication registration. A profession group can have a registration system, but not use it to improve the quality of healthcare. The speed is then considered to be low. In theory, the complication registration can be tried out in parts (Cain 2002 & Grol 2007), but this is not feasible in reality, since using a complication registration is not something one can opt to do or not, it is mandatory.

3.2.5 Infrastructure
The fifth category relates to infrastructure:
The existence of an easy accessible and adaptable infrastructure will facilitate the success of a complication registration.

Infrastructure, which is the fifth category, relates to the system that is the complication registration: the connection to the current ICT infrastructure that are already in place. The attributes regard for example software that is used to register complications (Grol 2007) and the number of adaptations to the current equipment that is necessary to be able to use the complication registration (Cain 2002). Most complication registrations work on available software, like MS Excel or MS Access. There are also profession groups that have their own system of registration, sometimes provided by the national scientific organisation. The registration of complications itself has to be relatively easy; since this will reduce the time it takes to register complications. The retrieval of information to be used in the analysis of complications also needs to be easy and quick. This will both promote the successful use of the complication registration.

3.2.6 Social commitment
The sixth category relates to social commitment:
If the complication registration is supported by all the members of the profession group, resistance will be low and successful use of the complication registration more feasible.

Social commitment is the degree to which the norms of the profession group support the complication registration. If the complication registration is supported by all the involved medical specialists the likelihood of acceptance and successful use will be greater (Grol 2007). In contrary to for example the situation in which the complication registration is demanded by the board or hospital management. Involvement into the development of the complication registration by medical specialists will facilitate acceptance of the complication registration, because the benefits are more clearly visible. This is also true when the medical specialists can adapt the complication registration to their specific needs.
3.2.7 Authority and Seniority

The seventh category relates to authority and seniority attributes:
*The existence of a strong authority figure that promotes the complication registration greatly influences the success and speed of acceptance of the complication registration in a positive way.*

The success of the complication registration is greatly influenced by the existence of strong leaders in the medical profession groups (Cain 2002). Leaders in profession groups are those medical specialists that have a large amount of experience and knowledge and are respected and listened to by the other members of the profession group. Leaders or idea champions can present the complication registration to the other members of the profession group. Because of the authority and seniority they possess, they can influence the perception of the medical specialists of the complication registration. Leaders can also make the complication registration visible to medical specialists in other profession groups.

3.3 Complication registration decision model

Figure 9 depicts the adapted Health Belief model from figure 8, with the categories inserted into the model. This transforms it into a model that visualises the influences on the medical specialists with regard to the decisions to implement and use the complication registration.

![Complication registration decision model](image)

Three categories, "relative advantage", "risk" and "change in way of working", determine the content attributes of the model. The categories: "speed of acceptance" and "infrastructure", make up the conditional attributes. The categories: "social commitment" and "authority and seniority" provide the attributes that govern the influence from the social and organisational factors that influence the perception that the medical specialists have of the complication registration. This created model describes the influences on the decision of the medical specialists to use the complication registration.
3.4 Phase of implementation

In order to describe how ‘far’ a profession group is with regard to the implementation of a complication registration, I use the five phase model of Grol (2007). Each phase describes a level of implementation, phase 1 describing a profession group unfamiliar with the concept of complication registration, and phase 5 describing a profession group that has integrates complication registration in daily routines. Each phase is described in more detail.

Phase 1 Orientation
The orientation phase governs the extent to which profession groups are familiar with the complication registration. In this phase, examples of topics are:
Are the members of the profession group familiar with the complication registration? Do the members of the profession group read relevant literature? Do the members of the profession groups have contact with colleagues, both inside and outside the own hospital? Do they experience a sense of urgency? Do they regard the complication registration as being relevant to their profession?

Phase 2 Insight
The insight phase governs the understanding of complications and insight into own routines. In this phase, examples of topics are:
Do medical specialists have enough knowledge of complications to implement the complication registration? Is the information needed accessible and understandable? Do they have insight into their own routines? Do they have an accurate estimation of their own performance?

Phase 3 Acceptance
The acceptance phase governs the actual acceptance of the complication registration by the members of the profession group and their decision to change. In this phase, examples of topics are:
Do the medical specialists see disadvantages to using the complication registration? Is there doubt about the value of the complication registration? Are the medical specialists attracted to change? Do they doubt the feasibility of the complication registration or their capability to use it?

Phase 4 Change
The change phase governs the actual adoption of the complication registration and the confirmation of the value of this system. In this phase, examples of topics are:
Does the complication registration actually start? Is there enough time to use the complication registration? Are there sufficient skills to use the complication registration and does it fit into the fixed routines? Is the complication registration yielding success? Are others positive about the results of the complication registration?

Phase 5 Maintenance
The maintenance phase is that phase in which the complication registration is anchored in the organisation.
In this phase, examples of topics are:
Is the complication registration integrated into the routines and into the organisation? Is there a risk of relapsing into old techniques or forgetting to use the complication registration? Is there support and budget for the complication registration?

A profession group can have a complication registration and seem to have accepted and adopted it. The profession groups can then appear to be in phase 4. If the complication registration is not used however, the profession group is actually still in phase 2 or struggling with phase 3.
3.5 **Resistances of profession groups**

The position of the profession groups relative to each other and relating to the complication registration can be depicted in an analytic model. The model depicts the resistances profession groups encounter with regard to the implementation of the complication registration. This model is created by the researcher and is depicted in figure 10. The categories that are discussed in section 3.2 are set out in the axis of the model. This enables us to visualise the change of success of the complication registration. Categories 1 through 5 make up the horizontal axis and categories 6 and 7 make up the vertical axis. It will be used to provide an overview of how the medical profession groups are oriented with regard to the use of the complication registration.

![Figure 10 - Resistance encountered by profession groups](image-url)
On the horizontal axis, the general perception of the benefits and barriers in the profession group is set out. On the left end of this axis one finds those that perceive that benefits do not outweigh barriers and on the right end, those who perceive that benefits do outweigh barriers. The vertical axis depicts the measure of social resistance versus social acceptance. On the top-end one finds those who belong to a group where there is social resistance against the introduction of registration systems, while at the lower end one finds those groups that advocate the introduction of such systems. There are four quadrants in the model, which globally depict problems profession groups have with regard to the implementation of the complication registration. A position in the top left quadrant of the model coincides with a profession group experiencing social resistance to the complication registration and a negative perception of the advantages of the complication registration with regard to the costs. A position in the bottom left quadrant of the model coincides with an accepted and successfully implemented and used complication registration. These four quadrants are discussed briefly.

1 Uninterested
There is social resistance with regard to the complication registration. The social resistance is not particularly due to medical specialists not wanting to use the complication registration, but can be because they are unfamiliar with it, do not know about it or have no clear image of the benefits and costs of a complication registration.

2 Not willing
Profession groups that fall into the second category do regard the complication registration as a tool that can improve the quality of healthcare, but are not willing to use it. A reason for this could be for example because the risks of making information public are seen as too great a liability. Or there is no person willing to take the responsibility for implementing the complication registration.

3 Benefits unknown
Profession groups that fall into this category know about the complication registration, but perceive the attainable benefits of the complication registration to be lower than the barriers that come with the use of the complication registration. They can for example regard the investment in terms of time as being too large, compared to the improvement in quality that could be attained when using the complication registration. Would the cost or barriers be reduced, the complication registration will be carried out by the members of the profession group.

4 Accepted
Profession groups that are situated in the fourth quadrant have accepted the complication registration as being a useful tool to help improve the quality of healthcare. This does not mean that no barriers are perceived, just that the perceived benefits outweigh the perceived barriers.

The diagonal line depicts the phases of implementation (as discussed in section 3.4) in which a profession group finds itself. This line fits only roughly in the model and therefore it has been 'lifted and extended' to fall outside the model. A profession group that is in the maintenance phase of implementing the complication registration will be in the bottom right quadrant, since the resistances have been overcome.
4. Complication registrations in the Deventer Hospital

4.1 Complication registrations in profession groups

In order to find answers to the questions stated, data was needed. Data was collected by interviewing medical specialists from selected profession groups. The profession groups that were selected are:

- Gynaecology, Obstetrics and Reproductive medicine (invasive)
- Surgery (invasive)
- Ophthalmology (invasive)
- Paediatrics (Observing traditional)
- Internal Medicine (Observing traditional)
- Gastroenterology (Observing technical)
- Radiology (Supportive)

For a further discussion of the methods used, refer to Appendix B.

Section 4.1 depicts the complication registration in the profession groups. The way the medical specialists in the profession groups use the complication registration is described first. After this, the ‘feeling and opinion’ of the medical specialists with regard to the complication registration is discussed. This describes the way in which the medical specialists view the complication registration. Information on the types of complication registrations that are used is summarized in table 1.

4.1.1 Obstetrics, Gynaecology and reproductive medicine

The chairman of the profession group OBGYN, as well as two other medical specialists have been interviewed. The profession group OBGYN registers complications in the ‘Gynaecologie en Verloskundig Registratie systeem (GVR)’. This system is developed by the national scientific organisation, the ‘Nederlandse Vereniging voor Obstetrie en Gynaecologie (NVOG)’. It contains information on complications and provides demands with regard to the types of data that have to be registered. About 210 complications are registered yearly (DZ 2007). Complications are identified by medical specialists or nurses. These inform a specialist who has taken up responsibility of the complication registration. They write a memo or an e-mail with information of the identified complication and this specialist then enters this information into the complication registration. This specialist also informs the other members of the profession group of the complication registration and keeps them alert to reporting complications. The complications are routinely discussed when patients are discussed (in the morning, four times each week). Every two months the complications are discussed in a separate complication discussion. Remarkable complications are selected for further analysis. This analysis resulted in several process adaptations that lead to a reduction of the number of complications. The policy regarding catheterisation concerning women after conception has been adapted, since the current protocol was found to be inadequate. This change was a direct result of the analysis of complications. On a yearly basis, the complications and changes in processes following the analysis of the complications are discussed with the entire department.

Previously, the complications were published in the yearly report of the profession group (DZ 2007). The juridical advisor from the national scientific organisation advises against this however, and this publishing has stopped. The reason for this was the uncertainty of what third parties would do with this information. The complication registration is used only as an internal quality tool now. All specialists that were interviewed were enthusiastic about the complication registration. They are aware that the system is not perfect and not all complications are registered (this concerns mostly ‘small’ complications). The specialists are however all convinced of the contribution of the complication registration on the quality of healthcare. The PDCA cycle of the profession group OBGYN is completed. All the steps are continually taken and repeated. Because this cycle is ‘closed’, the quality of healthcare can be systematically improved using the complication registration.
4.1.2 Surgery
The chairman of the profession group Surgery and one other specialist have been interviewed. The profession group Surgery discusses clinical patients after release from the hospital. Should a complication be noted during this discussion, it is relayed to a secretary. This secretary inputs the data regarding the complication in the registration system, the 'LHCR (Landelijk Heelkundige Complicatieregistratie)'. This complication registration is provided by the national scientific organisation, 'de Nederlandse Vereniging voor Heelkunde (NVH)'. Complications are discussed if the surgeons find this to be necessary. It is unknown how many complications occur each year. There is no fixed complication discussion or analysis based on the complication registration itself. The complication registration is thus not used to improve the quality of healthcare.

The medical specialists in the profession group are not convinced of the use of the complication registration. This is partially caused by the fact that ‘severe’ complications will be discussed anyway. This leads to an under registration of ‘smaller’ complications since this is not regarded to be any help to improve the quality of care and will only increase the workload. There also is certain reluctance in the registration of the complications, because medical specialists in the profession group do not want third parties to have access to this information. They feel that third parties do not have enough information to judge the quality of the profession group and fear that statements on the quality will reflect badly and inaccurately on the profession group. Because the PDCA cycle is not completed, it is not possible to improve the quality of healthcare with the complication registration. In terms of using the complication registration, the profession group Surgery ‘stops’ after the Plan and Do steps of the PDCA cycle. The Check and Act segments are not implemented. This does not mean that no quality improvement or control takes place; it means that the complication registration is not used to do this and quality improvement can only be done incidentally.

4.1.3 Ophthalmology
The chairman of the profession group Ophthalmology has been interviewed. Unfortunately it was not possible to interview other medical specialist in this profession group. The profession group Ophthalmology uses MS Access to register complications. The file in which this is done has been developed by two medical specialists in the profession group. It contains an extensive list of the complications that need to be registered. The complications are discussed, based on the complication registration, but not on a structured complication discussion. Two medical specialists are responsible for the complication registration and these two input the complication data into the system. Transparency is seen as an important part of quality control. The complication registration is seen as an integral part of the daily activities. The PDCA cycle is this completed and the complication registration is used successful to improve the quality of healthcare.

4.1.4 Paediatrics
The chairman of the profession group Paediatrics, as well as two other medical specialists were interviewed. The medical specialists of the profession group Paediatrics do not register complications in a complication registration. They are in the process of developing a complication discussion. The goal of this complication discussion is to increase the familiarity with discussing complications so that a complication registration can be implemented at a later time. It is unknown how many complications occur each year. The complication discussion will be based on available knowledge of complications and will not be based on a complication registration. This will not result in structural, but in incidental quality improvement. Complications can be missed, or a number of ‘small’ complications can be regarded as not being important, while a complication registration could have identified the trend and made its importance visible.
The medical specialists expressed the opinion that a complication registration should be implemented. This means that the uses of the complication registration are clear, but there is still a lack of knowledge as to how this should be implemented. It is unclear what needs to be registered to be able to implement a successful complication registration. The need for a transparent quality control system has been expressed in the interviews. The complication registration should be an integral part of this transparency. The fact that there is an education program for aspiring doctors is often referred to as being an important argument to have a complication registration. New doctors need to learn from possible complications, since they will be confronted with them when they themselves are practicing. The medical specialists in the profession groups Paediatrics are still in the ‘Plan’ phase step of the PDCA cycle. They have indicated that there is a strong wish to use the complication registration. It is expected that when the ‘Plan’ and ‘Do’ steps have been taken and there is an actual complication registration, that the ‘check’ and ‘act’ steps will also be taken.

### 4.1.5 Internal Medicine

One medical specialist from the profession group Internal Medicine has been interviewed. It was unfortunately not possible to interview other specialists in this profession group. The medical specialists of this profession group do not use a complication registration. They are however in the process of developing one. At the moment, it is necessary to define what needs to be registered and how this should be done. When a medical specialist identifies a complication, it is discussed, but this is not based on a complication registration, or done using a set systematic approach.

The reason for not having a complication registration is the fact that is difficult to link procedures from this profession group to complications. The relation intervention - complication is not as clear as it is in the invasive profession groups for example. Complications will often occur after a patient has left the hospital. The medical specialists in the profession group Internal Medicine want to use the complication registration, but uncertainty in the ‘Plan’ step of the PDCA cycle hinders taking the ‘Do’ step. A clear definition of what needs to be registered will make taking these two steps possible, the positive attitude in the profession group should lead to a successful use of the complication registration once it is implemented.

### 4.1.6 Gastroenterology

One medical specialist of the profession group Gastroenterology has been interviewed. Unfortunately, it was not possible to interview other medical specialists. The medical specialists of the profession group Gastroenterology register complications since 2002. They use a MS Excel file to do this. This file is developed by the specialists of the profession group and has been created when the education program of the profession group was launched. Complications are discussed based on the complication registration on a monthly basis. The national scientific organisation, ‘(Nederlands Genootschap van MDL-Arten)’ is currently in the process of developing national guidelines for the complication registration of Gastroenterological profession groups.

The complication registration is seen as an instrument to get feedback on the own operations. Since the complication registration will be mandatory in the future, the medical specialists of the profession group regard starting it earlier than mandatory as a positive step. All the steps in the PDCA cycle are taken. Since the cycle is ‘closed’ the complication registration can be used to improve the quality of healthcare.
4.1.7 Radiology

The chairman of the profession group Radiology, as well as two other specialists were interviewed. The complication registration is used only by the intervention radiologists. This is because practically all complications that occur are related to intervention radiology. This type of radiology has an invasive element. The chance of a complication occurring in other radiological procedures is minimal.

The intervention radiologists use a MS Excel file to register complications. The complication registration is based on a complication registration card that has been distributed by the national scientific organisation, the ‘Nederlands Genootschap voor Interventie Radiologie (NGIR)’ (this card is depicted in figure 11). There is no structural complication discussion, since only two complications are registered on a yearly basis. If a complication is identified, this is discussed, but this is incidental and not based on the complication registration. Once a year, there is a gathering of intervention radiologists on a national level. Radiologists can go to this meeting only if they bring a selected complication that they themselves have encountered. These complications are then discussed with other radiologists. This provides a learning opportunity on a national level.

The intervention radiologists think that there is an underreporting of complications, but also agree that even if this is taken into account, that too few complications occur for the complication registration to be successfully used.

The ‘Plan’ and ‘Do’ steps of the PDCA cycle are taken, but this is where the cycle stops. The low number of complications each year prevents the medical specialists from seeing the added value of the complication registration.

Figure 11 – NGIR complication registration card
4.2 Results

Table 1 schematically provides a comparison of the profession groups that were studied. The profession groups are scored on the different categories by the researcher. This scoring is based on information collected during the interviews. To represent the scores in the different categories, a five point Likert scale is used. The phase of implementation in which the profession groups are with regard to the complication registration is also depicted in table 1. Table 1 is used to pinpoint the position of the medical profession groups in the analytic model. Categories 1 through 5 relate to the position on the horizontal axis of the model. Categories 6 and 7 relate to the vertical axis.

The top part of table one contains a short overview of the medical profession groups that are subject of this research. This part depicts information on the type of complication registration (if any) that is used. This is followed by the scoring of the profession groups on the different categories. These scores depict the way in which attributes in this category contribute to the success of the complication registration.
Table 1 - Comparison of the complication registrations of medical profession groups

<table>
<thead>
<tr>
<th>Profession group / Attributes</th>
<th>OBGYN</th>
<th>Surgery</th>
<th>Ophthalmology</th>
<th>Paediatrics</th>
<th>Internal Med</th>
<th>Gastroenterology</th>
<th>Radiology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of profession group</strong></td>
<td>Invasive</td>
<td>Invasive</td>
<td>Invasive</td>
<td>Observing trad.</td>
<td>Observing trad.</td>
<td>Observing tech.</td>
<td>Supporting</td>
</tr>
<tr>
<td><strong>Number of interviewed specialists (n)</strong></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Complication registration present?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Type of complication on registration system</strong></td>
<td>National</td>
<td>National</td>
<td>Local</td>
<td>None</td>
<td>None</td>
<td>National</td>
<td>National</td>
</tr>
<tr>
<td><strong>Analysis based on the complication registration?</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Categories relating to benefits and burdens (x axis):
- Category 1 - Relative advantage
- Category 2 - Risks
- Category 3 - Measure of change
- Category 4 - Speed of implementation
- Category 5 - Infrastructure

Categories relating to the social resistance and acceptance (y axis):
- Category 6 - Social commitment
- Category 7 - Authority and Seniority

Phase of implementation:
- 5
- 2-3
- 5
- 1-3
- 1-3
- 5
- 4

---

Table 1. A comparison of the complication registrations of selected medical profession groups

- A national registration system is a complication registration that has been provided by the national scientific organization.
- Analysis based on the complication registration regards the analysis of complications and if the PDCA cycle is completed, if the complications are discussed, analysed and processes improved, based on the complication registration.
- The Likert scale has used consists of five different scores: very applicable / contributes a lot, applicable / contributes, no influence, not applicable / irrelevant, absolutely not applicable / compromises. These scores are decided by: ++, +++, +, +, -.
- The phases of implementation are the following: 1 Orientation, 2 Insight, 3 Acceptance, 4 Change, and 5 Maintenance.
4.3 Position of profession groups model

Based on the collected data (represented in table 1) the medical profession groups are positioned in the analytical model. Figure 12 shows the positions of the medical profession groups OBGYN, Surgery, Ophthalmology, Paediatrics, Internal Medicine, Gastroenterology and Radiology.

Figure 12 – Resistance encountered by profession groups

Scales are set onto the horizontal and vertical axis. These scales are derived from table 1. Both axes represent a number of categories. The horizontal axis represents the first 5 categories (see table 1). The vertical axis represents categories 6 and 7, that represent the social and organisational influences on the perception of the complication registration (see table 1). The maximum 'score' on any axis is depicted by the amount of pluses and minuses in table 1. For example, the profession groups OBGYN scores 8 pluses on the first 5 categories on 3 pluses on the last two. Since these are also the maximum scores, the horizontal axis has a minimum of minus and maximum of plus 8, and the vertical axis a minimum of minus 3 and a maximum of plus 3.
Figure 12 depicts the resistances that profession groups encounter when dealing with the implementation of a complication registration. The position of the profession groups in the analytical model relative to each visualises the differences in encountered resistances between the profession groups with regard to the complication registration. A position in the bottom right quadrant of figure 12 relates to a successful complication registration, while a position in the upper left quadrant relates to a totally unsuccessful system and negative attitude towards ever using a complication registration.

Roughly three ‘sets’ of profession groups can be identified in figure 12. The set that consists of profession groups that do not have a successful complication registration consists of the profession group Surgery. The second set consists of profession groups that are in the process of creating a complication registration, but have not implemented one yet; Paediatrics and Internal Medicine. The profession group Radiology also falls into this category. The third set consists of profession groups that have implemented a successful complication registration, Gastroenterology, OBGYN and Ophthalmology.

The profession group Surgery is positioned in the upper right quadrant of the model. The profession group Surgery is in between the third and fourth phase of implementation. They do not close the PDCA cycle. The complication registration therefore is not used to improve the quality of care. Improvement can only be achieved on an incidental basis.

The profession groups Internal Medicine and Paediatrics are positioned somewhat below the middle. This position is a result of the fact that both profession groups do not yet have a complication registration, which is represented by low scores on categories 3, 4 and 5. Since the ‘Plan’ and ‘Do’ steps of the PDCA cycle have not been taken completely, it is not possible to Improve the complication registration. The profession group Radiology is also positioned in the centre of the model. This indicates the fact that they do have a complication registration, but it does not contribute to the improvement of the quality of healthcare. The profession group Radiology is in the fourth stage of implementation, but the complication registration is lacking success, because of the low number of complications. This prevents the complication registration from being thoroughly imbedded into the organisation. The transition from the ‘Do’ step to the ‘Check’ step is not completed. This is not because the medical specialists of this profession group do not want to use the complication registration, but because they don’t see its use when there are this few complications.

The profession groups OBGYN, Ophthalmology and Gastroenterology are positioned in the bottom right quadrant of the model depicted in figure 12. They have, in relation to the other profession groups the most successful complication registration. All profession groups have taken all the steps in the PDCA cycle and the complication registration is actively being used to improve the quality of healthcare. The profession groups are in the fifth phase of implementation. They are in the process of integrating or having integrated the complication registration into the routines. The profession group Gastroenterology is positioned above the profession groups OBGYN and Ophthalmology, because no clear leaders or particularly influential specialists can be identified.
4.4 Patterns in complication registrations

The remarkable patterns that are derived from table 1 are described in this section. The patterns are described in the order in which they are found. The titles of the patterns roughly coincide with the categories that are used in table 1.

4.4.1 Similarities among same type profession groups

The differences between profession groups with regard to the success of the complication registration correspond with the types of specialisms that make up the profession groups. There are few differences among same type profession groups. OBGYN, Ophthalmology and Gastroenterology are positioned close to each other in figure 12. This fact supports the assumption that technical observing profession groups have more in common with invasive profession groups than with traditional observing profession groups.

The traditional observing profession groups are also positioned close to each other. The profession group Radiology is on its own and because the medical specialists in this profession group encounter only a small number of complications and do not use the complication registration successfully. There are, however, some similarities with the traditional observing profession groups which position Radiology close to this profession groups and places it in the same category.

The profession group Surgery is positioned separate from the other invasive profession groups. Since it would be expected that this profession group is located in the fourth quadrant of the analytical model, something different must be happening in this profession group. It has already been established that the profession group Surgery does not complete the PDCA cycle. This as opposed to the other invasive type profession groups and the technical observing profession group Gastroenterology. Since the difference cannot be explained by the profession group surgery consisting of different types of specialisms, other factors must be responsible for the position of this profession groups in the analytical model.

4.4.2 “Risks”

The explanation for the different score of the profession group Surgery in relation to the other profession group and especially the invasive profession groups, lies in the perception of the medical specialists. The categories on which the scores of the profession group Surgery differ significantly from the scores of the other invasive profession groups are; ‘relative advantage’ and ‘risks’. The profession group scores negatively on the category ‘relative advantage’ because the complication registration is seen as in instrument that takes time, but returns little in the form of quality improvement. The negative score on the category ‘risks’ is remarkable, since all other profession groups score positive on this category.

The medical specialists perceive the risks of using the complication registration to be very high. This is due to the fact that it is unknown what third parties can do with the information that is present in the complication registration. An example of third parties using this information is provided in box 4. The perceived risks and perceived costs in terms of time investment that coincides with using the complication registration set against the group dynamic factors lead to a negative attitude toward the complication registration. There is a complication registration, because it is mandatory, but the PDCA cycle is not completed.

That the perception of risks is very much relevant is also shown by analogy in another profession group. Namely, the fact that the profession group OBGYN stopped publishing information on the complication registration. This is done, following advice from the national scientific organisation who deemed it too dangerous to publicise this information, since they are also convinced others that do not have all required information will use it to correctly judge the quality of healthcare.
4.4.3. Registration system factors

All the profession groups that have a complication registration, whether successful or not, score positive on category 3, 4 and 5. The profession groups that do not have a complication registration, Paediatrics and Internal Medicine score negative on these categories. A positive score on these categories is requisite for a successful complication registration, but it is no guarantee. Without a positive score on there these categories, the ‘Plan’ and ‘Do’ steps of the PDCA cycle cannot be taken, which will prevent the ‘Check’ and ‘Act’ steps from being taken. There must be a system to register complications, before the complication registration can be used successfully.

4.4.4 Infrastructure

The profession groups that have a complication registration, with the exception of the profession group Radiology, score positive on the category infrastructure. The profession groups Paediatrics and Internal Medicine have a negative score on the category infrastructure, since they do not have a complication registration. The negative score of the profession group Radiology can be attributed to the obsolete computers used to run the complication registration. The interviewed specialists indicated that it takes unnecessary amounts of time, because the computers are very slow. The problems that can arise concerning the infrastructure of the complication registration seem relatively easy to solve.

The profession groups use different systems to register complications. The profession group OBGYN uses the GVR, Surgery the LHCR, Ophthalmology uses MS Access, Gastroenterology and Radiology both use MS Excel to register complications. Even though different systems are used to register complications, all the systems collect similar data concerning the complications (date, age, and type of complications for example).

4.4.5 Group dynamic factors

Those profession groups in which the complication registration is successful, score relatively well on the two group dynamic categories (category 6, social commitment and category 7, Authority and Seniority). Especially the existence of a strong respected person or persons seems to facilitate the success of the complication registration. The social commitment may be present (as it is in the observing traditional profession groups), but without a responsible ‘leader’ successful implementation of a complication registration seems to be difficult. In the profession groups that have a successful complication registration (OBGYN and Ophthalmology especially) a clear leader can be identified. These ‘leaders’ possess the amount of knowledge and experience needed to guide the other members of the profession group. This amount of knowledge and experience leads to the authority and seniority they need to change the perception of other medical specialist in the profession group with regard to the complication registration. These leaders make it possible for the profession group to go from the ‘Do’ step in the PDCA cycle to the ‘Check’ step. A clear ‘leader’ cannot be found in the profession group Surgery; this supports the assumption that leaders are vital for a successful complication registration system.
In section 2.2.1, six mechanisms to improve integration among medical profession groups were named (Glouberman & Mintzberg 2001-2). Standardising skills and knowledge and standardising values are depicted are vital elements for the successful implementation of the complication registration. Based on table 1, it seems to be so that leaders in these profession groups can influence the perception of other medical specialists. As a result, these leaders can shift the norms of the profession group. This translates to changing the perception in the complication registration decision model (shown in figure 9).

The fact that most profession groups have an education program is often referred to as being a reason to have a complication registration. It is both a qualifying criteria for having an education program and a way to pass knowledge on to a new generation of doctors.
5. Conclusion, discussion and recommendations

This study aims to discover the factors that influence the successful implementation of complication registrations in medical profession groups. The complication registration is described in the context of the hospital in which it functions. The factors that influence the success are described in a model based on the Health Belief model. Those factors most relevant to the successful implementation of the complication registration are identified. Different mechanisms exist that contribute to this success. If norms of medical specialists are standardized in such a way that the complication registration is viewed as a positive asset, mutual adjustment leads to the standardization of skills and knowledge. Relevant attributes of the complication registration will then be regarded as positive and the complication registration is more likely to be implemented with success.

5.1 Conclusion

This research is aimed to answer the following question:

*What lessons can be learned from a comparison of the complication registration system of the profession group OBGYN with those of the other profession groups in the Deventer Hospital?*

To answer this question, it was necessary to answer several sub questions. The answers to the sub questions are presented below:

1. *What is a complication? / What is a complication registration?*
   A complication is an undesired outcome during or after medical specialist acting, that is harmful to the patients' health in such a way that adjusting the (way of) treatment is necessary or there is irreversible damage. Reducing the number of complications will increase the quality of healthcare that is provided by the hospital. Successfully using a complication registration is a way to achieve this. A complication registration is a registration in which specific features of complications are registered. A complication registration can only lead to an improvement of the quality of healthcare if all the steps in the PDCA cycle are taken.

2. *In what context is a complication registration used?*
   The complication registration is used by medical specialists that are organised into profession groups. The profession groups encounter barriers in coordination with the community, the managers and the nurses. To further complicate communication, communication and coordination among profession groups is also subject to barriers. The professions groups encounter professional chimneys when dealing with other profession groups.

3. *Which factors influence the success of a complication registration?*
   The success of the complication registrations depends on the medical specialists. Specialists weigh their perceived benefits and costs of using the complication registration. The perception of the medical specialists depends on and in influenced by attributes that are placed into 7 categories; Relative advantage, Risks, Change in way of working, Speed of acceptance, Infrastructure, Social commitment and Authority and Seniority.
4. How do the complication registrations of the Deventer Hospital operate?
   a. How do the complication registrations operate in the different medical profession groups in the Deventer Hospital?

This research encompassed 7 profession groups. The profession groups OBGYN, Ophthalmology and Gastroenterology all have a successfully implemented complication registration. The profession groups Internal Medicine and Paediatrics do not have a complication registration, but are in the process of developing one. The profession group Surgery has an extensive complication registration, but does not use this to improve the quality of care. The profession group Radiology has a complication registration, but this is not used systematically to improve the quality of healthcare.

5. Which differences and which similarities exist between the complication registrations of the profession groups within the Deventer Hospital?

Profession groups consisting of the same type of specialism, usually have similar types of complication registrations. The profession groups use different software to register complications, but register similar data. All profession groups are aware of possible risks of publishing information with regard to the complications. Profession groups that have a successful complication registration have identifiable leaders.

6. Which factors govern the success of the complication registration?

The successful implementation of the complication registration is influenced most by the existence of a leader, someone who is responsible for the complication registration. It also needs to be clear what the complication registration contributes to the quality of healthcare that is delivered.

These answers show that for a complication registration to be implemented successfully the PDCA cycle needs to be closed. Only if this is the case can the complication registration contribute to structural quality improvement. If this is not done, complications may be registered because it is mandatory, but only incidental quality improvement can take place. The ‘closing’ of this cycle is influenced by the perception that medical specialists have of the benefits and costs that coincide with the use of a complication registration. The existence of a clear leader in a profession group is essential to the successful implementation of a complication registration. This will enable the medical specialists to perceive the advantage of using a complication registration. The hospital needs to ensure that information concerning complication is not published without proper reason and needs to facilitate the infrastructure that is necessary to register complications.

5.2 Discussion

Whilst interviews appear to be a suitable way to gather information from medical specialists, there is certainly some discussion possible regarding the implementation of this method. It was planned to interview three medical specialists in each profession group. However, this was not possible in all profession groups and the following number of medical specialists was interviewed:

- Three medical specialists were interviewed in the profession groups OBGYN, Radiology and Paediatrics.
- Two medical specialists were interviewed in the profession group Surgery.
- One medical specialist was interviewed in the profession groups Ophthalmology, Gastroenterology and internal Medicine.

It means that the target of interviewing three specialists was only reached in three profession groups. In the profession groups where only one specialist was interviewed, there is a significant risk of biased information. Next to the possible missing or being biased of information, the researcher himself is no expert interviewer. This can also have a distorting effect on the collected information. Should the research be done again, it is recommended that three specialists per profession group are interviewed to get valid and complete information with regard to the complication registration in the profession group.
An investigation of the safety culture within the profession groups provides a clearer image of the position and opinions of the nursing staff, which are not involved or taken into account in this research. An extensive investigation of the safety culture points out interaction of the complication registration and other safety and quality tools that are in place. Because this is not researched in this report, some explanations of differences and factors influencing the success of the complication registration can be missed.

Many of the differences between the profession groups can be explained by the existence of different types of profession groups (invasive, observing and supportive). Invasive profession groups will have a more clearly defined complication registration, because a complication can be more easily linked to medical specialist treatment. The relative advantage of the complication registration is then more apparent. However, it should be noted that the profession group Surgery does not use the complication registration as a quality improvement instrument.

In spite of the elements just mentioned, the research itself is useful. It provides an overview of the complication registration in the profession groups that were investigated. It concluded what factors are relevant for the successful implementation of the complication registration. Most of these factors were suspected to be in place, but this study proves this. The recommendations can be used to help implement the complication registration in profession groups or help improve it were necessary. It can also be used to help form a strategy when dealing with the complication registration. It shows where strong and weaker points of the complication registration are. By influencing the factors that are most relevant to the success of the complication registration, the board of medical specialists influences the successful implementation of the complication registration.
5.3. Recommendations relating to the complication registration

This section provides recommendations for the board of medical specialists with regard to the implementation of the complication registration. Recommendations that are applicable to all profession groups are described first. After this, recommendations are given that apply to a cluster of profession groups. Three clusters have been identified;

1. The profession groups that have successfully implemented a complication registration, (OBGYN, Ophthalmology and Gastroenterology). These profession groups are all positioned in the bottom right part of the resistance model (see figure 12).

2. The profession groups that are in the process of developing a complication registration or do not know yet how to use it successfully, (Radiology, Internal Medicine and Paediatrics). These profession groups are all positioned in the centre of the resistance model (see figure 12).

3. The profession group Surgery, which has an extensive complication registration, but does not use it to improve the quality of delivered healthcare. This profession group is positioned at the top of the resistance model.

5.3.1 General recommendations

- **Appoint a person responsible for the complication registration in each profession group.**
  If no clear leader is present that takes charge of the complication registration, it will be much less likely to function successfully. The board of medical specialists must then create such a leader role by asking the profession group to appoint a person responsible for the complication registration. This person should be appointed by the other members of the profession group and preferably be a member of the profession group. This person can inform colleagues about the complication registration, organise and facilitate the complication registration meetings. He can organise discussions and analysis meeting of complications and prepare or have these meetings prepared.

- **Have a supporting staff member input the complications into the complication registration database.**
  Inputting the data with regard to a complication into the complication registration is a task that can be performed by a supporting staff member. This staff member can also review patient charts to collect information and assist the complication registration responsible person to prepare complication registration meeting.

- **Organise information sharing opportunities.**
  It would be ideal to have all the complication responsible persons organise a complication meeting. Such a meeting can be used to show other profession groups what improvements can be achieved with a complication registration. Such a meeting breaches the 'vertical barriers' or chimneys and will facilitate horizontal learning among profession groups.

- **Keep complication data internal if possible.**
  Information on complication should only be made public if this is supported by the profession group. If a third party requests information, the profession group should decide if they are willing to share this information. It is absolutely critical that this information is not published by other parties in the hospital, such as the hospital board. If this is done, underreporting can increase and the overall effectiveness of the complication registration will be reduced. The complication registration should be used only as an internal quality control tool.
5.3.2 Recommendation for profession groups that have successfully implemented a complication registration

**OBGYN**
The profession group OBGYN has a successful complication registration. It is used to register and analyse complications. This analysis has led and leads to the improvement of the quality of healthcare that is provided by the profession group. There are however some point of interest that need to be discussed.

**Ophthalmology**
The profession group Ophthalmology has an extensive complication registration, which has been developed by two medical specialists from the profession group. There is an analysis of complications based on the complication registration. And as with the profession group OBGYN the system functions successfully.

**Gastroenterology**
The profession group Gastroenterology has had a complication registration for some time now. It functions adequately.

- **Ensure continuity of the registration of complications.**
The complications are often inputted into the complication registration by one or two medical specialist(s). This task should be performed by all medical specialists. This will increase awareness of the complication registration since medical specialists are more involved and reduce the time that specific specialist needs to spend inputting complications. If there is a supporting staff member available to input the complications into the complication registration, he should receive complication data from all medical specialists.
5.3.3 Recommendations for profession groups that are in the process of developing a complication registration

**Paediatrics**
The medical specialists in the profession group Paediatrics are in the process of starting a complication registration, but do not have one at the time this research is carried out. The members of the profession group are convinced that the complication registration has the possibility to improve the quality of healthcare, but it is not clear what exactly needs to be registered and how the complication registration needs to function.

**Internal Medicine**
As with the profession group Paediatrics, the profession group internal medicine is in the process of developing a complication registration, but does not have one at the time of this research. The medical specialists have expressed the wish for clear guidelines from the national scientific organisations.

**Radiology**
The intervention radiologists use a complication registration, but because there are few complications each year, the complication registration is not used as a vantage point from which complications are analysed.

- **Make sure the complication registration is started as soon as possible.**
  There is a lot of interest in the profession groups with regard to transparency in the way of working and the complication registration. There is a risk of losing this interest if a complication registration is not started soon. The profession group will probably create a complication registration itself, but this process can be facilitated by appointing a profession group member (ask the profession group to appoint one) who guides this process.

- **Make sure up to date ICT infrastructure is available.**
  In the profession group Radiology, the computer on which complications are registered is very slow. This leads to annoyances when entering complication data into the system and results in some ‘smaller’ complications not being registered.

5.3.4 Recommendation for profession groups that have social resistance to using the complication registration

**Surgery**
The profession group surgery has an extensive complication registration, but does not implement a analysis of complications based on the complication registration. Complications are registered, because it is set a being mandatory by the national scientific organisation. The complication registration is not seen as an effective way to improve the quality of healthcare. Because the complication registration itself is quite extensive, the system itself has the potential to be successful if the perception of the merits and costs that the medical specialists have of the complication registration can be adjusted.

- **Increase positive perception of the complication registration by coupling its use with the education in the profession group.**
  A main barrier to using the complication registration in the profession group Surgery is that the medical specialists regard it as a time consuming bureaucratic tool. Coupling the complication registration with the education program increases awareness of the positive elements of the complication registration. This coupling can be done by a person whom is responsible for the complication registration.
5.4 Recommendations relating to further research

- Include all profession groups from the hospital.
  This will provide a complete view of the complication registrations in the hospital. While this research only provides information on the profession groups in which medical specialists were interviewed. A similar research design can be used to do this.

- Study a single profession group on a national level.
  Study of a single profession group on a national level (in several or all hospitals) will provide a better understanding of the profession group specific problems that exist. Then some solutions to these problems can be presented by the national scientific organisations since they relate to problems that are not local.

5.5 Reflection

In this paragraph, the researcher reflects on how he experienced this research, what he learned and what he would do different with the knowledge he now has.

I consider the main learning point for me to be the establishing a solid research proposal. I started too quickly with the research itself, taking interviews and reading literature. This has cost me a lot of extra and unnecessary effort eventually. Because this report had to be rewritten many times, it is completed a lot later than I would have liked it to be. Also, this delay compromised the quality of this research.

The data collection was finished, although the research questions were adapted at a later time. The information gathered does not answer the research questions as well as it could have done. A second point of learning is the acceptance and finding of help. I did this far too late, which further contributed to the delay in writing. After I got this help, the writing of the report went far quicker and most importantly far better than it did before.

The research itself was a very interesting experience for me. Interviewing medical specialists on this subject is very interesting and visualises the knowledge I attained during my study. Writing this report was a task I thought to be easier, I particularly overestimated my own abilities in writing, both Dutch and English. Fortunately, the subject always kept my interest. I am convinced that there are a lot of relative simple changes possible in healthcare that will improve the quality of care and reduce harm to patients. It is certainly a subject in which I want to grow further.

I again want to thank everyone who helped and supported me during the research and the writing of this report.
6. References


6. References


Appendix A the Deventer Hospital

The Deventer Hospital was founded in 1985 from a fusion of the St. Josef hospital and the St. Geertruiden hospital. The history of these hospitals dates back much further however. A reference was made to the Geertruiden guesthouse in 1492 when it was a house for plague victims. Some of this history can still be seen today. The Deventer Hospital operates from two locations, Geertruiden and Josef. September 2008, the Deventer Hospital will relocate to a new Hospital, the ‘Rierlenk’.

The Deventer Hospital is a top clinical education hospital. This means that the level of facilities and the level of education provided make the Deventer Hospital to be among the top hospitals in The Netherlands. Table 2 provides an overview of the size of the Deventer Hospital.

<table>
<thead>
<tr>
<th>Table 2 – The Deventer Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Employees (Excluding medical specialists)</td>
</tr>
<tr>
<td>Medical Specialists</td>
</tr>
<tr>
<td>Available beds</td>
</tr>
<tr>
<td>Patients admitted (excluding transfers and day treatment)</td>
</tr>
<tr>
<td>Number of patients released</td>
</tr>
<tr>
<td>Number of first polyclinic visits</td>
</tr>
<tr>
<td>Number of other polyclinic visits</td>
</tr>
</tbody>
</table>

The service area of the Deventer Hospital consists of 170,000 inhabitants. The service is depicted in figure 12 (DZ 2006).

Figure 13 – Deventer Hospital service area
Appendix B Methods of data collection

Data is collected to provide information about the medical profession groups on how these use the complication registration. They are scored on the different categories that are depicted in section 3.2. Based on these scores the position of the medical profession groups is made visible in an analytic model (figure 12). Using this model and the scores on the categories, patterns are revealed and analysed.

Data regarding the current situation with regard to the complication registration in the medical profession groups in the Deventer Hospital is gathered by interviewing medical specialists from selected profession groups. A list of themes based on the research questions is used to structure these interviews. This list of themes is created by the researcher himself and is provided in appendix C. To have a wide and encompassing view of the profession groups in the Deventer Hospital, profession groups containing different types of medical specialists are selected. The reason that specific profession groups are selected, and no ‘hospital wide’ research is done, is because of time constraints. A second reason is the highly defined vertical structures in the medical profession groups. The profession groups can be seen as separate organisational units within the hospital that have organised the complication registration in their own specific way. Because of this, a hospital wide complication registration does not exist. The profession groups that have been selected are:

- Gynaecology, Obstetrics and Reproductive medicine (Invasive)
- Surgery (Invasive)
- Ophthalmology (Invasive)
- Paediatrics (Observing traditional)
- Internal Medicine (Observing traditional)
- Gastroenterology (Observing technical)
- Radiology (Supportive)

The procedure was that the chairman of the profession group was approached first, to get a general idea of the complication registration within that profession group. He or she was then asked if two other medical specialists were available to be interviewed. It was clearly stated by the researcher that specialist with a different opinion regarding the complication registration were welcome, because this would lead to a better understanding of the profession group with regard to the complication registration. The interviews were analysed using the qualitative data analysis tool called WEFTQDA.

The data was analysed and inserted into table 1. The analysis is based on this table and on the position of the profession groups in the analytic model that is outlined in figure 12. It is expected that, generally spoken, profession groups of invasive specialists have a more clearly defined and more successful complication registration than profession groups of observing or supporting specialists. This would be consistent with the National trend, where the complication registrations of invasive profession groups are more clearly defined than the complication registrations of observing or supporting profession groups (figure 7).
**Appendix C Interviews / theme list (Dutch)**

**Theme list used to conduct the Interviews**

*Theme 1: de huidige stand van zaken.*
Wat bestaat er aan complicatieregistratie bij de vakgroep?
Hoe wordt CR uitgevoerd? (in dossier en apart)
Aansluiting bij de wetenschappelijke vereniging? (is er bekendheid met wat de nationale
wetenschappelijke vereniging ontwikkelt)
Analyse van registratiegegevens?
Ontstaan van huidige stand van zaken?

*Theme 2: mening van medisch specialisten.*
Mening over meerwaarde van complicatieregistratie?
Gedeelde mening binnen de vakgroep? (generalisatie)
Verwachtingen over toekomst registratie?

*Theme 3: belemmeringen van complicatieregistratie.*
Worden complicaties ook wel eens niet geregistreerd omdat men niet weet wat de consequenties zijn?
(Juridische factoren)
Kost het bijhouden van een CR veel tijd/moeite?
Is het moeilijk in te bedden in de huidige manier van werken?
Andere belemmeringen?

*Theme 4: aanmoedigingen voor gebruik van het systeem.*
Is er iemand verantwoordelijk voor CR? Vanuit het ziekenhuis?
Is er aandacht voor in de vakgroep? Expliciet? En vanuit het ziekenhuis?
Voorbeelden uit hetzelfde vakgebied bij andere ziekenhuizen?
Andere aanmoedigingen?

*Theme 5: communicatie in het ziekenhuis tussen vakgroepen.*
Communicatie met andere vakgroepen?
Bekendheid met complicatieregistratie bij andere vakgroepen?
Bestaat er een leer effect?
Verantwoordelijkheid voor effectieve complicatie registratie? (zie ook thema 4)

*Theme 6: missende of aanwezige factoren die complicatie registratie beïnvloeden.*
Vakgroep specifieke behoeften?
Specialist specifieke behoeften?

Tot slot: nog niet genoemde andere factoren die relevant (kunnen) zijn?