Defining various pathway terms

Research School for Operations Management and Logistics

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Defining Various Pathway Terms

Literature Study

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Glossary

AGREE	Appraisal of Guidelines, REsearch and Evaluation. Collaboration that has developed an instrument to measure the quality of clinical guidelines
CBO	Centraal BegeleidingsOrgaan. Institute that provides framework on how to specify a guideline (www.cbo.nl)
DRG	Diagnosis-Related Group
GZA	GasthuisZusters Antwerpen
Healthcare	System to offer, provide, and deliver health care
Health care	Refers to actions by people who work in healthcare and by patients
ICP	Individual Care Pathway
ITP	Individual Treatment Plan
RCM	Reference Concept Map
UPCI PRC	University of Pittsburgh Cancer Institute Protocol Review Committee

1 Introduction

The healthcare is a domain where from an industrial engineering point of view a lot can be gained. The demand for better care is higher than ever, while the costs must be reduced due to the aging population and the economic crisis Europe is in right now. In the Netherlands there are plans to cut back the expenses in healthcare. Therefore a lot of organizations take a critical look at their health care processes. Compared to other industries, the healthcare is lagging behind with process improvements because until now there was no need to. This is because the healthcare was economically supported by the government. There are two opposing views on healthcare, firstly one where healthcare claims to be different from other industries because it has to deal with patients, doctors, unions, politicians, government, activists, and many more at the same time, while other industries don't have all these players involved or only at the beginning or at the end of their processes. Second view is where various industries can be compared to each other. Other industries might not have patients, but customers. Not doctors, but technicians, etc. So you could say that every industry is special, but not unique. The view that is supported in the literature study, is the one where knowledge can be exchanged between various industries, setting the various industries as equal. In other industries competition and market forces have already forced companies to be more efficient and more creative with scarce resources. The gained knowledge from these industries can be used in healthcare to solve organizational and logistical problems. The industries should be treated equally where possible, different where necessary.

A reference model is a process model that can be applied to several organizations by minor and simple changes. By providing a reference model, it is expected that the quality of the process models will be higher, an organization is able to model more complex business processes, and process models between different organizations can be easily compared because the models have the same structure. In this literature study it will become clear on which level these reference models will be implemented.

Before it is investigated whether reference models do have this expected added value, first a literature study is done. This literature study is about the processes in healthcare, also called pathways. In this literature study the goal is to identify the differences and similarities between the various definitions about guidelines, protocols, pathways, and individual treatment plans, and to create a taxonomy based on these differences and similarities.

To conduct a literature study which can be reproduced, a method for retrieving literature is described in chapter 2. In chapter 3 the taxonomy is presented and the differences between each layer are defined. Section 3.1 explains the definitions of a guideline and a protocol, and fits these concepts into the taxonomy. Then, section 3.2 describes the pathway definition, and fits this into the taxonomy. Section 3.3 explains what an individual treatment plan is, and explains the link between pathways and an individual treatment plan. Section 3.4 explains the link between the guidelines and protocols and pathways and between pathways and the individual treatment plans. Chapter 4 shows the complete taxonomy, and compares other taxonomies.

2 Methodology

The goal of this literature study is to gain insight in the differences and similarities between various terms about guidelines, pathways, and individual treatment plans. In order to do this in a way it can be reproduced, a methodology is described based on the paper by Vanwersch et al. (2011).

The first step of this explorative literature study is to find articles which describe the various terms about guidelines, protocols, and pathways. These articles are recovered by using a combination of the words '*definition*', '*define*', '*guideline*', '*clinical guideline*', '*protocol*', '*clinical protocol*', '*pathway*', '*care pathway*', '*clinical pathway*', '*critical pathway*'. In table 5 (Appendix A) the number of papers included to the library are shown for each combination of words. The next step is to specify the sources to find these articles in according to Vanwersch et al. (2011). Eindhoven University of Technology has access to a limited number of databases which all can be accessed through Google Scholar. Under the assumption that an article that is cited most can be seen as an important article, the most cited and most relevant articles are selected. Because Google Scholar is used as search engine, no specific databases have been selected. A paper is retrieved where possible if the paper was relevant enough. The relevancy is checked by reading the title and the abstract, and then the most cited article is chosen. The number of citations is checked by the program "Publish or Perish" developed by Harzing (www.harzing.com). Another tool used is "Qiqqa" (www.qiqqa.com). Qiqqa makes it possible to annotate text while reading, and to easily search within all retrieved papers. Another feature by Qiqqa is the inbound and outbound citations. The outbound function shows the papers in your own library where the paper refers to. The inbound function shows the papers in your own library that referred to your paper. Both functions were used to further expand the database of papers.

The inclusion and exclusion criteria for the relevance screening are formulated in table 1. In general the goal of these criteria is to include papers in the personal library that include relevant data. This literature study focusses on definition of various terms, and therefore the criterion focusses on definitions. If a criteria can be answered with either 'yes' or 'unknown', then the action corresponding to the criteria is performed.

After relevant papers have been identified, the next step is to extract data from these papers. For this step the tool Qiqqa is used. While reading the papers, relevant data is highlighted and/or annotated. The function 'annotation report' is used to extract all relevant data about a certain subject.

After retrieving relevant papers including a number of definitions about the concepts; (clinical) guidelines, (clinical) protocols, or any type of pathway, a reference concept map will be made based on the paper by Rodriguez-Priego, García-Izquierdo, & Rubio (2010). To make this reference concept map (RCM) the following steps have to be taken. First a table has to be made. This table consists of six columns. The first column contains the raw definitions. These definitions are retrieved from the papers found during the search for literature. The second column contains the rephrased definitions which are rephrased using the same words as much as possible. The third column shows what type of concepts is defined in the retrieved paper. The fourth column shows the retrieved papers. The fifth column shows the year in which the raw definition first occurred. The order of definitions is based on first occurrence to see the evaluation of the concepts over the years. The sixth and final column shows a reference number which refers to the paper where the raw definition was retrieved from. These reference numbers are used in the reference concept maps. After the table is made, the second step is to create the RCM. In this step each block of words is connected to the next block of words according to the rephrased definition. The final step is to order the words of block to create a few crossings as possible and improve readability, by making lines with a lot of references thicker. The width of the line corresponds with the number of references.

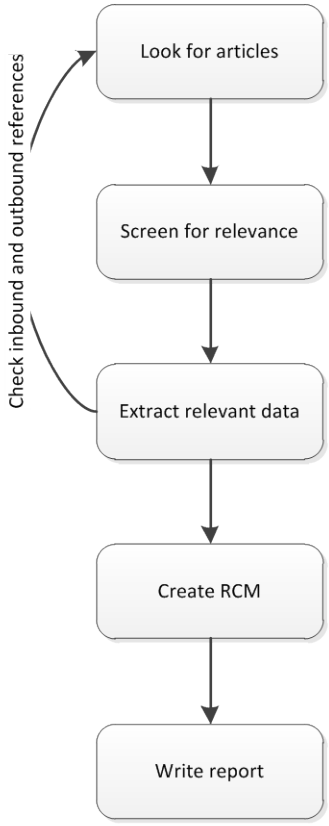
The definition gained by the RCM can be found be following the thickest line. This is the most common definition where most of the retrieved papers agree on. It might be possible a circle reference occurs by following the thickest line. In this case the re-occurring block of words can be ignored. To find a definition from one specific paper, the number representing that paper should be followed in the RCM. This definition can stop at any block of words.

After a definition is formed using a RCM, a description containing relevant information is made. The most important characteristics are summarized in a table, to gain a quick overview. Once each layer is described extensively, a taxonomy will be made. Each described concept is classified in a cell and a relation is shown between the layers where possible.

In figure 1 the methodology is graphically shown. In this way it is possible to see what steps are performed multiple times.

Criteria	Action
1. Does the paper provide a description about a guideline, protocol, pathway, and/or treatment plan?	Inclusion
2. Does the paper provide an overview of any other found terms? a. Does the paper describe the various terms as complete synonyms? b. Does the paper describe the differences between the various terms?	Inclusion
3. Is the paper a description of a pathway? a. Does the paper focus on a specific medical audience?	Exclusion
4. Does the paper refer to other relevant papers within personal libraries? (both inbound and outbound)	Inclusion

Table 1 – Inclusion and Exclusion Criteria Relevance Screening



- Use queries like: “definition of clinical guideline” (see table 5 (Appendix A))
- Use queries in Google Scholar and ‘Publish or Perish’ by Harzing
- Check number of references

- Read title and abstract
- Apply inclusion or exclusion criteria
- Annotate/highlight text in abstract using Qiqqa

- Read paper (or relevant parts of paper)
- Annotate/highlight text in paper using Qiqqa
- Extract data by using the Qiqqa ‘annotation report’ function

- Create RCM according to paper by Rodriguez-Priego et al. (2010)
- Link block of words
- Improve readability
- Make lines with most references thickest

- Extract definition of concept from corresponding RCM
- Describe relevant characteristics of each concept using retrieved papers
- Summarize data in table
- Make taxonomy

Figure 1 – Steps of Methodology

3 Definition of various terms

In the introduction of this literature study the taxonomy is briefly introduced. In this chapter a closer look is taken to the purpose of this taxonomy, and what each layer differs from the other layers. First a taxonomy is presented without the concepts to emphasize the differences between and within the layers, see figure 2. Then, firstly, a definition will be given for each concept, and some important characteristics will be shown. Secondly, to make the differences and similarities clear within each layer, this chapter will present a summarizing table for each layer.

The taxonomy will contain three layers where each layer will differentiate on the number of patients involved. The top layer of the taxonomy is the layer where more than one group of patients is involved. In the middle layer exactly one group of patients is involved. In the bottom layer the focus is on one specific patient. Within each layer a differentiation is made on organizational level; a concept can be valid for either two or more organizations, or within one organization. The purpose of the taxonomy is to gain more clarity about the various terms used to identify care processes and to set the scope. In figure 2 a blank taxonomy is shown. In the following sections the taxonomy will get shape.

The top layer contains the clinical guidelines and protocols, which are highlighted in section 3.1. The mid layer of the taxonomy is the one with the various definitions of pathways; more is explained in the section 3.2. In section 3.3 the third layer of the taxonomy is explained, which contains the individual treatment plan.

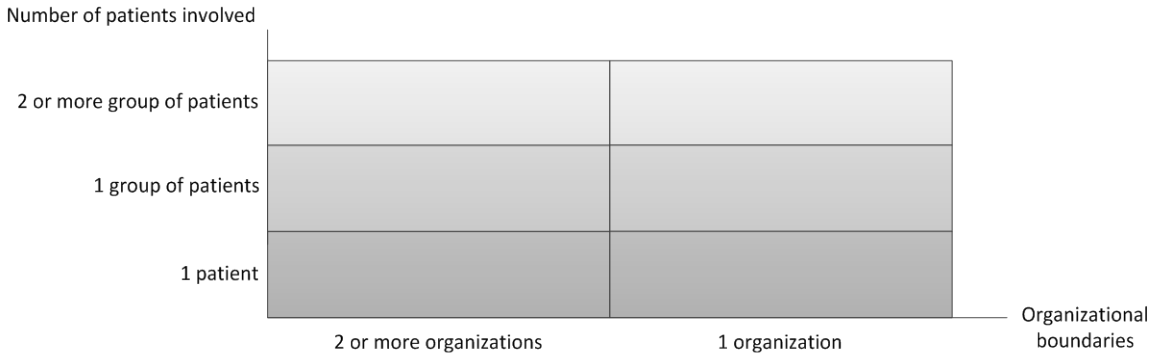


Figure 2 –Taxonomy without concepts

3.1 Clinical Guidelines and Protocols

This section will explain in what layer of the taxonomy the clinical guideline and the protocol belong, and will give an extensive definition for both concepts based on several papers and show the definition in a Reference Concept Map (RCM).

3.1.1 Clinical Guidelines

Although there is high consensus about the definition of a guideline, a number of studies elaborating on the definition about clinical guidelines are investigated. It is chosen to use the term clinical guideline based on the frequency the term clinical guideline occurs. In figure 4 the top layer is shown within the left cell a word cloud based on the frequency of the term clinical guideline and its varieties. The larger the word in the word cloud, the more it occurs in the retrieved papers about clinical guidelines. The number of occurrence can be checked in table 9 in Appendix E 1.

In Appendix A on page 21 a table is made about the definition of clinical guidelines, wherein eight different definitions are rephrased. These eight rephrased definitions are then made into a RCM to gain a new definition, shown in figure 3. The resulting definition is “A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations for specific clinical circumstances in order to support the decision making process.” A clinician can be any sort of medical professional; doctors, nurses, etc. The definition of a clinical guideline implicitly tells that if there is deviated from a guideline it has no consequences for the organization and/or the clinician. It provides the clinician with a possible treatment in certain circumstances, thereby supporting the decision making process, without specifying how to do the treatment.

A guideline is written by a high level authority, such as the health care department of a government, or by an (inter)national wide institute that wants to provide a possible treatment (e.g. CBO, AGREE). The CBO (www.CBO.nl) is an institute that aims at improving the quality of healthcare by providing clinical guidelines in Europe. These guidelines are made according a specific format to increase the transparency. The guidelines made by the CBO are as much possible based on evidence, to have scientific support. For international development and validation for the quality of clinical guidelines the Appraisal of Guidelines, REsearch and Evaluation (AGREE) Collaboration has developed an instrument to measure the quality of clinical guidelines (AGREE-Collaboration, 2003).

The audiences a guideline reaches are organizations and patients through clinicians. According to Woolf, Grol, Hutchinson, Eccles, & Grimshaw (1999) the greatest benefit that could be achieved by guidelines is to improve health outcomes for both patients and clinicians. Of course there are limitations and pitfalls for the clinical guidelines. A guideline is written for an average patient, so the most obvious limitation is that the recommendation by the guideline cannot be applied to a unique patient (Woolf et al., 1999). However, according to Grimshaw & Russell (1993) the introduction of guidelines has a significant positive effect on the quality of care.

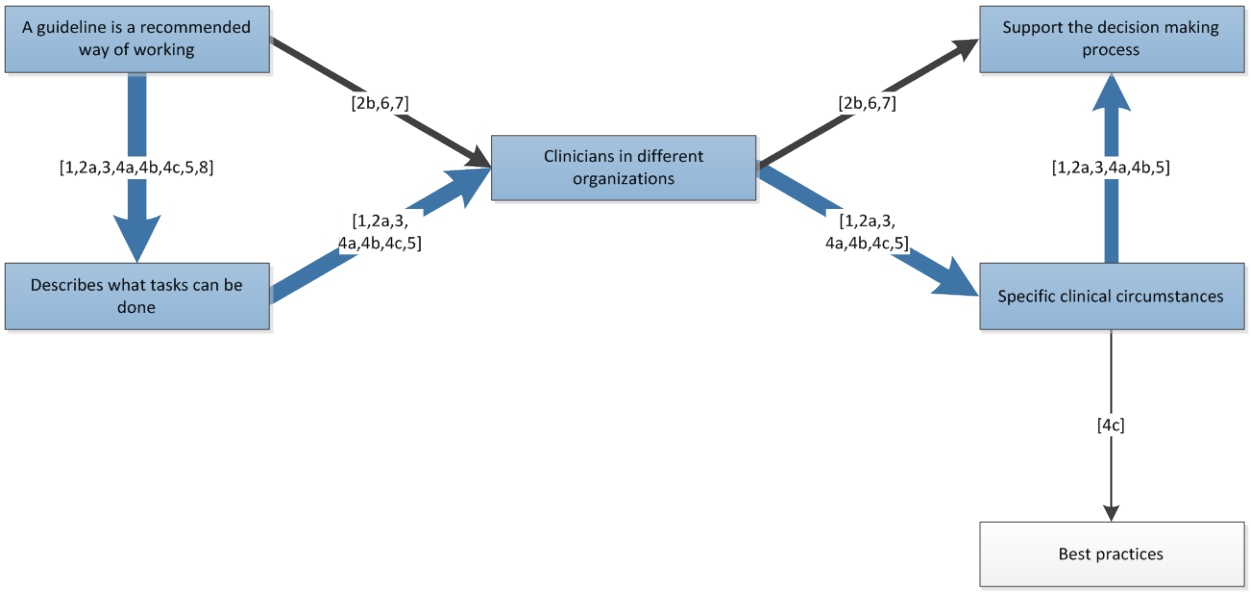


Figure 3 – Reference Concept Map for the guideline definitions

3.1.2 Protocols

Compared to the clinical guidelines, there is even more consensus about the definitions of a protocol. By rephrasing the definitions given by five different papers and constructing a new reference concept map a new definition is formed. This definition comprises the most relevant part of each paper. The way a term is chosen for clinical guidelines, the same way is used to find a term for the protocols. In Figure 4 the right cell of the top layer shows a word cloud for the various terms about protocols. The term protocol is the most occurring term and therefore the largest in the word cloud, see also table 10 in Appendix E 2. The resulting definition is "A protocol describes what and how should be done for a specific issue within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care."

The similarity between a guideline and a protocol is that both describe what to do for several group of patients on a national level. The difference is that a protocol also describes how to do it within an organization or local level in a more strict way. As defined, a protocol is based on the clinical guideline. Therefore both concepts exist on the same layer, but differentiate in the organizational boundaries level. In other words, the guideline operates at a national level, while the protocol operates at a local level.

A pitfall for the protocol is defined by Ilott, Rick, Patterson, Turgoose, & Lacey (2006) where the author warns for the '*cook book*' effect; "the '*must do*' implications might lead to protocols being followed mindlessly rather than mindfully".

For the protocols there isn't an institute specified in the literature that monitors the quality of all the protocols. However, in the paper by Fayers et al. (1997), a paper that provides a checklist for points that should be covered in protocols related to cancer treatments, there is a committee mentioned that focuses on the quality of protocols involving cancer. This committee is the University of Pittsburgh Cancer Institute Protocol Review Committee (UPCI PRC). "The UPCI PRC oversees all proposed clinical protocols involving subjects with cancer, prior to their submission to the University of Pittsburgh Institutional Review Board (IRB). The primary aim of the PRC is to ensure that the protocol utilizes scientifically sound and appropriate research methods and statistical analysis" (http://www.upci.upmc.edu/clinical_research/prc.cfm). Beside this committee, Fayers et al. (1997) provide a checklist which will ensure that new protocols will comprehensively cover an important aspect for cancer treatments, in this case '*quality of life*'.

All information that is written above is summarized and compared on certain characteristics in table 2.

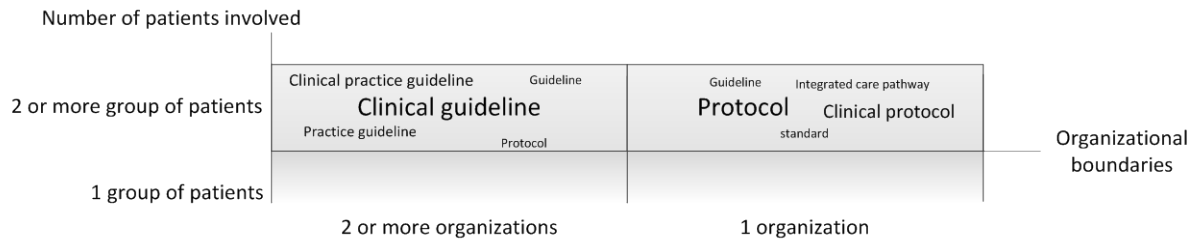


Figure 4 – Top layer of the taxonomy including two word clouds

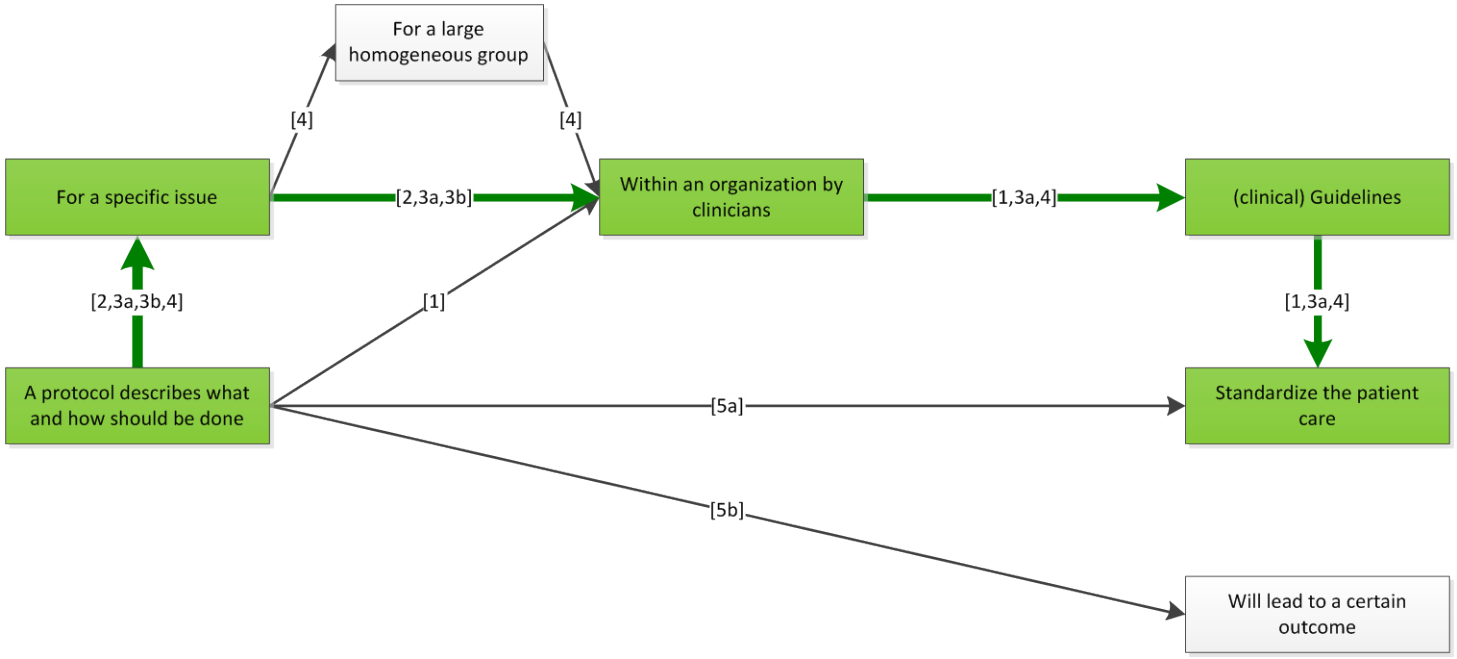


Figure 5 – Reference Concept Map for the protocol definitions

Characteristic	Clinical Guidelines	Protocols
Definition	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations for specific clinical circumstances in order to support the decision making process.	A protocol describes what and how should be done for a specific issue within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care.
Goal	Support decision making process	Standardize patient care
Origination	Government High-level association	Organization (based on guidelines)
Scope	International National	Regional Local
Target audience	Organizations Clinicians Patients	Clinicians Patients
Recommendation or obligation	Recommended way of working	Enforced way of working (warning for 'cook book effect')
Reviewing process	CBO's framework AGREE criteria	Checklists Independent Reviewing Committees

Table 2 – Comparative clinical guidelines and protocols

3.2 Care Pathways

This section describes the second layer of the taxonomy, the one of the various pathway terms.

The clinical pathway was first systematically used between 1985 and 1987 in Boston, USA as a response to the Diagnosis-Related Groups (DRGs), which was released in 1983. The DRGs restricted the health care spending which established set budgets for care and treatment for each group (Harvey, 2000). In the UK the pathways were introduced in the early 1990's. From the late 1990's the use of pathways was spread all over the world (Vanhaecht, Panella, Van Zelm, & Sermeus, 2010). The goal of the implementation of clinical pathways according to Vanhaecht et al. (2010) was to realize a more patient-centered care system by improving on quality and efficiency. According to (Harvey, 2000) the goal was to reduce the variation in clinical practice.

An extensive literature study about the definition of a pathway was done by De Bleser et al. (2006). In this literature study the authors tried to formulate a new definition, making other definitions obsolete. However, this literature study did not resulted in a new definition, but in a few recommendations where an organization like the European Pathway Association (E-P-A; www.E-P-A.org) can build a new and comprehensive definition with. The result of the literature study by De Bleser et al. (2006) was that a clinical pathway can be defined by a noun and a characteristic and results in an aim and outcome. There are two dimensions mentioned where a noun is varying in. The first dimension describes the content from a descriptive one to a prescriptive one (e.g. templates, care plans, procedures). The second dimension that varies represents the extent a clinical pathway is viewed as a tool for changing clinical practice and improving the quality of health care (e.g. document, approach, strategy). The characteristics of clinical pathways were classified into 16 subcategories. Each subcategory contains an amount of terms, where the subcategory '*homogeneous patient group*' contained the most terms. In the literature study by De Bleser et al. (2006) 12 subcategories of aims and outcomes where classified (e.g. reducing the variability of care).

The European Pathway Association (E-P-A; www.E-P-A.org) provides one definition to use globally based among others on the paper by De Bleser et al. (2006). By providing a clear definition the E-P-A tries to minimize the turmoil around all the definitions. According to the E-P-A all various definitions are synonyms and are defined as "*a complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period*". There are four characteristics that a care pathway should meet, formulated by the E-P-A as follows:

- An explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations;
- The facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives;
- The documentation, monitoring, and evaluation of variances and outcomes;
- And the identification of relevant resources.

However, this definition of the E-P-A is not the only definition of a pathway. During the evaluation of the pathway paradigm the definition of a pathway evaluated along with it. This evaluation is summarized in table 8 in Appendix D 1. This table shows various definitions which evaluated over the years and is the basis for the RCM. In the paper by Vanhaecht et al. (2012) a comparable table is presented, but does not compare the various terms. Table 8 in Appendix D 1 is slightly different from the structure described in the chapter about methodology. The first column two columns are slightly different. The first column contains the definition as specified by Vanhaecht et al. (2012). The second column contains the definition from the paper where Vanhaecht et al. (2012) refers to. The differences between these two columns are highlighted in bold. The last five columns are the same as described in chapter 2, Methodology.

Rephrasing the definitions is done on a systematic way, based on the paper by De Bleser et al. (2006), where a clinical pathway is defined as a noun plus a characteristic and results in an aim and outcome. The rephrased definitions therefore have the same building blocks and can be easily compared. These rephrased definitions are made in a Reference Concept Map (RCM) to make a graphically representation of various definitions about a certain concept (Rodriguez-Priego et al., 2010). With this RCM it is possible how many studies have the same/different definition and will result in a definition of the concept central to the RCM (Rodriguez-Priego et al., 2010). The RCM shown in figure 11 in Appendix D 2 results in the definition "A care pathway is a description of a care process from an organization point of view for a specific disease and for a specific (group of) patient(s), which is based on evidence and on (clinical) guidelines and it is designed to improve efficiency and improve patient outcomes." This definition might need some explanation to understand what is exactly meant by it.

The first block of words that might need some explanation is '*care pathway*', the umbrella definition of all types of pathways. According to many studies (e.g. (Vanhaecht et al., 2010), (Graeber et al., 2007), (De Bleser et al., 2006), (Every, Hochman, Becker, Kopecky, & Cannon, 2000), and (Campbell, Hotchkiss, Bradshaw, & Porteous, 1998)) the terms *critical pathways, integrated care pathway, care maps* and many other terms are seen as synonyms. In the literature study by De Bleser et al. (2006) the terms *critical pathways, integrated care pathway, care maps* beside the *clinical pathway* and *care pathway* are the most occurring terms. Chosen is the term *care pathway* to represent all other pathway terms because of two reasons. First reason is because the E-P-A mentions that the variation *clinical* pathway is the mostly used term of all terms used, however it may be confusing in some languages. For instance in Dutch, German, French, and Italian the term '*clinical*' refers to '*hospital*', which is wrong (Panella & Vanhaecht, 2010). Therefore the E-P-A advises to use the term *care pathway*. Second reason is the frequency the term *care pathway* is used in the papers used in the RCM. This is shown in Figure 6, the largest term (clinical pathway) is the most occurring, but the underlined term (care pathway) is the selected term. The term care pathway is the third largest term in the word cloud, see also table 11 in Appendix E 3.

The second block of words that might need some explanation is the '*organizational point of view*'. What the process describes are the steps that need to be taken by a clinician (or another employee from an organization) in order to come to a good treatment result. Thus the process does not describe the steps to be taken by a patient.

The third block of words is '*specific (group of) patient(s)*'. In some definitions it is explicitly mentioned that more than one group of patients is under focus, while in other definitions a specific patient is mentioned. In these later papers, a specific patient is not one patient, but a specific kind of patients, therefore all definitions are connected to the word block '*specific (group of) patient(s)*'.

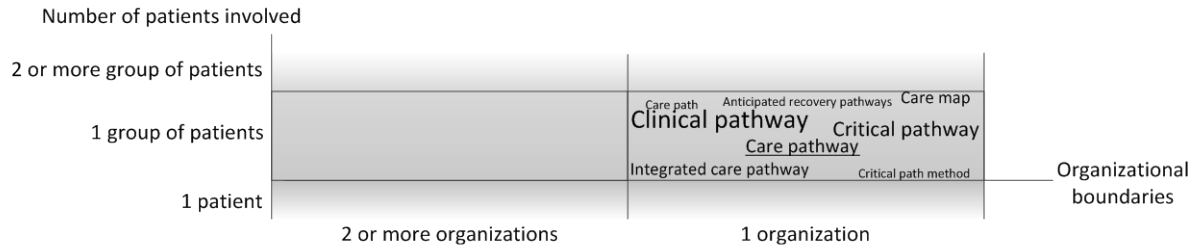


Figure 6 – Middle layer of the taxonomy including a word cloud

Characteristic	Care Pathway
Synonyms (most common)	Clinical pathway Critical pathway Integrated care pathway Care map
Definition	A care pathway is a description of a care process from an organization point of view for a specific disease and for a specific (group of) patient(s), which is based on evidence and on (clinical) guidelines and it is designed to improve efficiency and improve patient outcomes.
Goal	Improve efficiency; Improve patient outcomes
Scope	Regional; Local
	Specific disease Specific (group of) patient(s)
Recommendation or obligation	Obligated way of working

Table 3 – Comparitive table of pathway terms

3.3 Individual Treatment Plan

The third layer of the taxonomy is dedicated to one specific patient. The individual treatment plan (ITP) is placed in the bottom right cell of the taxonomy, because an individual is mostly treated within one organization for a specific disease. An ITP is based on a care pathway. ITP is an umbrella term for various pathways; each of them having their own purpose which will be explained in this section.

There are different views within this ITP class. There is an organizational point of view and a patient point of view. In the description from an organizational point of view it is specified what clinician treats which patient at what time and does what tasks. The description from a patient point of view provides the patient with all kind of information about meetings with clinicians, preparation, treatments, recovery time, aftercare, etc. These are called Individual Care Pathways (ICPs) for clinicians or patients, respectively. This ICP is a patient specific approach about a certain treatment, without any appointment dates specified. The ICP differs significantly from a care pathway. A care pathway is a description for a general patient, for a specific disease from an organizational point of view. An example of a care pathway is a hip replacement, regardless relevant demographic data of a patient. An ICP takes into account patient specific data, like age or other health issues.

When the appointments are specified within an ICP, another pathway within the ITP class is specified, namely the assigned pathway. This assigned pathway describes the treatments as in the ICP including when a patient meets a clinician. The assigned pathway can be updated as many times as needed, creating a number of versions, represented by V_x where x is an integer equal to or larger than 1. Each update can contain new appointments, treatments and/or clinicians that play a role in the treatment. The last version (V_n) describes what Vanhaecht calls the completed pathway (Vanhaecht et al., 2010). This is a pathway that is used to compare the first version of the assigned pathway to evaluate the completed path. In figure 7 the ITP class is graphically shown.

Not many references to ITPs or similar concepts could be found. Vanhaecht et al. (2010) describes five different types of pathways within four levels aggregation. The paper by Vanhaecht et al. (2010) is the only found paper that explicitly mentions the different views. Although not many references were found, this knowledge was verified by talking to policy advisors H. van der Mussele and J. de Sitter of the GasthuisZusters Antwerpen (GZA) hospital in Antwerp, Belgium.

Characteristics	Individual Care Pathway		Assigned pathway	
	Patient point of view	Clinician point of view	Patient point of view	Clinician point of view
Definition	Description of the care process for a specific disease for informative purposes.	Patient specific description of the care process for a specific disease specifying organizational aspects.	Informative description of the care process for a specific disease including appointments.	Patient specific description of the care process for a specific disease specifying organizational aspects including appointments.
Purpose	Not applicable	Not applicable		$V_1 \dots V_{(n-1)}$: Prospective V_n: Retrospective
Stakeholder	Patient	Clinician	Patient	$V_1 \dots V_{(n-1)}$: Clinician V_n: Management

Table 4 – Comparative table with characteristics of individual treatment plans

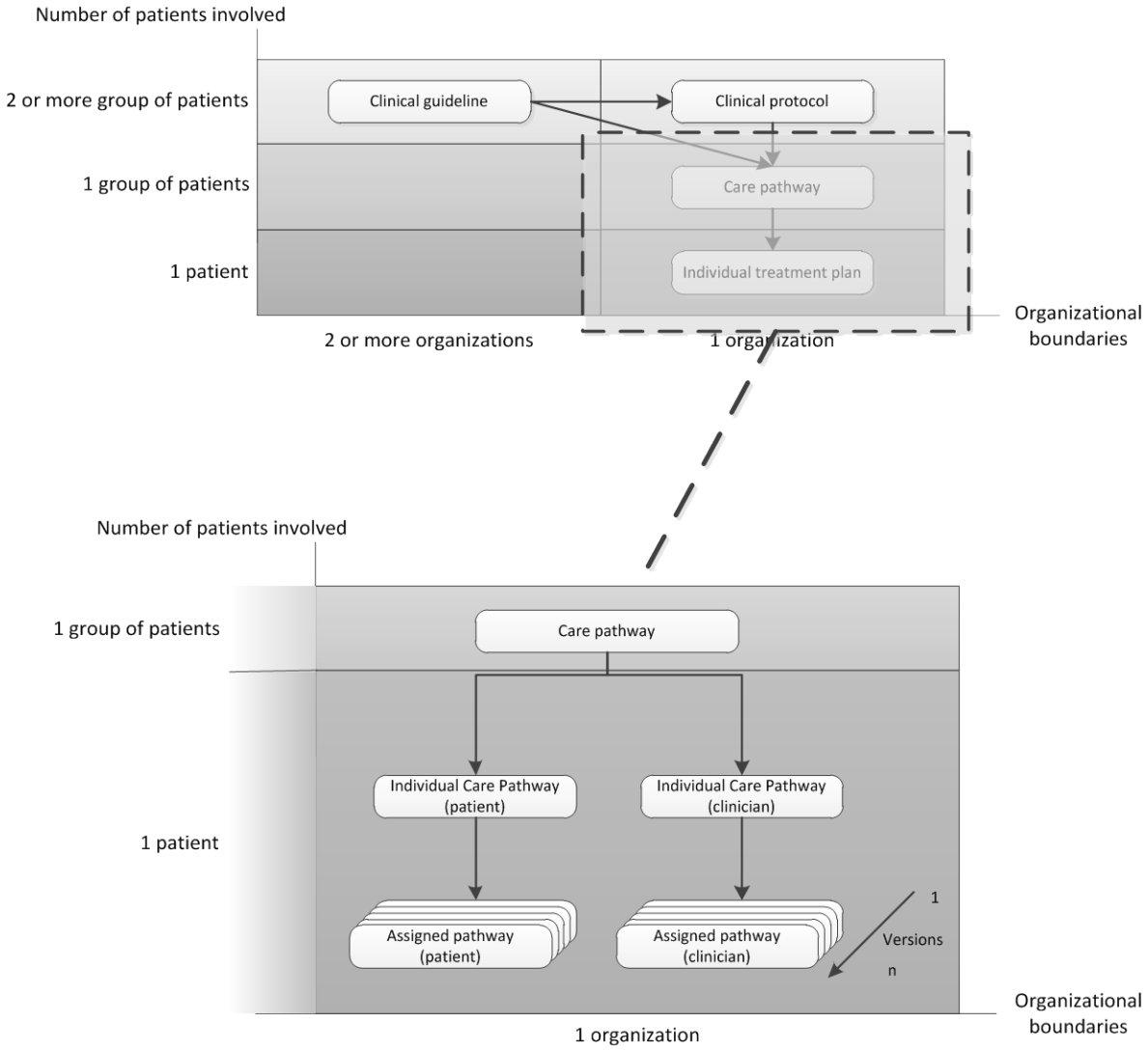


Figure 7 – Individual Treatment Plan class

3.4 Link Between various layers

3.4.1 Link Between Guidelines and Protocols and Pathways

The difference between the top layer and the middle layer in the taxonomy is the number of patients that are involved. According to Browne (2005) and Sermeus et al. (2006) a care pathway can contain more than one clinical guideline. The top layer forms the basis for this middle layer, because a care pathway is based on national wide guidelines and organization specific protocols. The care pathway provides more insight for the involved medical staff on what to do for a specific group of patients. A guideline describes on a high level what should be done, and a protocol describes how this guideline is implemented within an organization. The care pathway on the other hand specifies also the tasks that need to be taken by what person. The middle layer contains information about exactly one group of patients. The care pathway describes the care process for a group of average patients; thus is the care pathway correctly placed in this middle layer.

3.4.2 Link Between Care Pathways and Individual Treatment Plans

The concepts within the ITP class are implemented care pathways and thus are a detailed care description of a general care pathway. The link between these two concepts is the level of aggregation. The concepts within the ITP class are more aggregated in terms of specific organizational details, where a care pathway is a more description for a general patient within an organization. Therefore the ITP concepts are based on the care pathway.

4 Making the Taxonomy

In this literature review four concepts are discussed and can be fitted into a three layered taxonomy. These layers differ from each other in the number of patients involved. The top layer contains the concepts for more than one patient group, the middle layer contains the concept for exactly one patient group and the third and final layer contains the concepts for an individual patient. Within each layer a differentiation is possible, and this is based on the number of organizations involved. It can be either two or more organizations that are involved or a concept can describe the care processes within one organization.

The organizational wide clinical guidelines are composed by high-level authorities such as a government. The protocols are an organization specific implementation of these guidelines, specified by a high-level authority within an organization (e.g. board of care directors). These guidelines and protocols are used as a basis, beside the clinical evidence, to make the care pathways; a description of a care process for a specific disease for an average patient. To make these care pathways patient specific, but also concrete within an organization, the individual treatment plan is formed. Within this layer different type of individual treatment plans are presented, each having a different purpose.

In a number of papers that were found a similar idea was presented, however it was not done by fitting the various terms into a taxonomy. For example Ilott et al. (2006) discuss the idea of protocol-centered care and how this could be implemented. The protocol-centered care “relates to standardizing specific clinical care processes” (Ilott et al., 2006). The paper also describes that the concepts guidelines, protocols, and/or pathway can be used as a tool to implement protocol-centered care. Ilott et al. (2006) define the concepts, the purposes of each concept, and the relation between the concepts. Although there was no taxonomy presented in the paper, the idea of the paper by Ilott et al. (2006) can be compared to the taxonomy presented in this literature study. A similarity is the relation between high-level guidelines and mid-level pathways. Relations between mid-level and lower level are missing in the paper by Ilott et al. (2006).

In the paper by Vanhaecht et al. (2010) four levels of aggregation are presented; concept, model, process, and product. The care pathway as a concept is the highest level of aggregation and the care pathway as a product is the lowest level of aggregation. Within the product level, five types of pathways are presented. The first type of pathway is the model pathway, and shows high resemblance with a clinical guideline. Both concepts describe on high-level recommendations on what tasks can be done in case of a certain treatment. It is unclear however whether Vanhaecht et al. see the model pathway on the same level as the clinical guideline in this literature review’s taxonomy because Vanhaecht et al. do not specify the number of patients that are involved. The second type is the operational pathway, which can be compared to both a protocol and care pathway as known in the taxonomy. An operational pathway shows similarities with a protocol. They both take into account characteristics from a specific organization. An operational pathway can also be on the same level as a care pathway because again the number of involved patients is not specified. The third pathway is the assigned pathway, which could be identified as a type of individual treatment plan. The fourth pathway, the completed pathway, could also be identified as another type of individual treatment plan. This type of pathway has a retrospective focus, where the assigned pathway has a prospective focus, as described in section 3.3.

Figure 8 shows the complete taxonomy, including the relationships (shown by arrows) between the concepts.

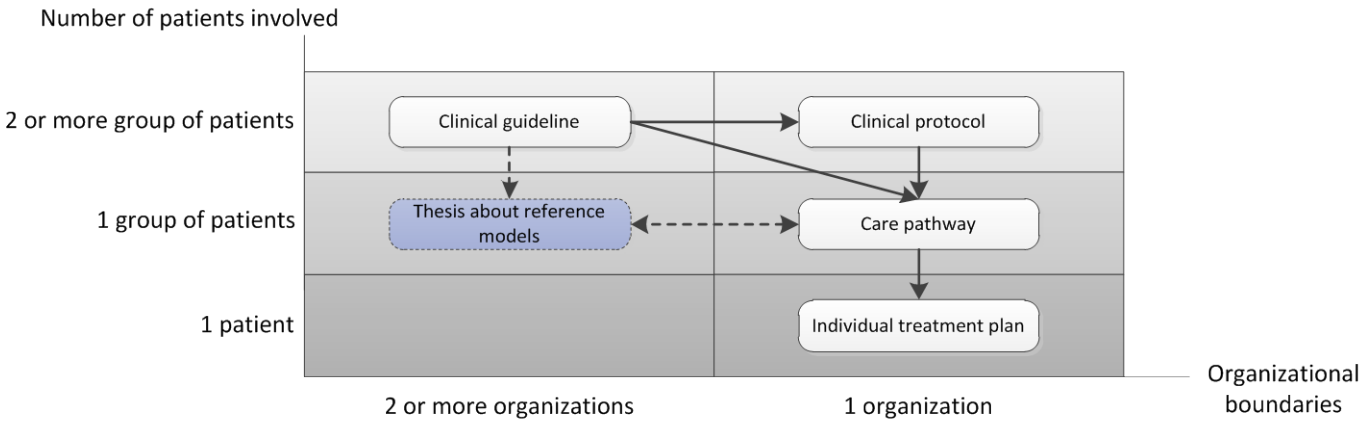


Figure 8 – Three-layered taxonomy of definitions

5 Reflection

In this literature study there can be identified some weaknesses and some strength. The first strength is the tables preliminary to the RCMs. These tables are easy to read and self-explaining, and give full support to the RCMs. The second strength is the RCMs itself. Each of them resulted in a good and understandable definition, using various references. Also the tables where the frequency of each concept is investigated showed a logical result. Another strength is the tables where all relevant characteristics of a concept are compared. These tables give a quick overview of the main differences and similarities between various concepts. All this resulted in a clear and easy to read three-layered taxonomy. The relation between each layer is explained and the main characteristics wherein the layers differ make sense. I have learned a lot by making this taxonomy. I have learned the subtle differences between the guidelines, protocols, pathways and various types of ITPs. However, a weakness is the methodology that was used in this literature review, because I have never done such a thing before. Therefore the method used in this literature review leaves some room for improvement.

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Browne, E. D. (2005). *Workflow Modelling of Coordinated Inter-Health-Provider Care Plans*.

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Degeling, P. J., Maxwell, S., Iedema, R. & Hunter, D. J. (2004). Making clinical governance work. *BMJ*, *329*(7467), 679-681. BMJ.

Every, N. R., Hochman, J., Becker, R., Kopecky, S. & Cannon, C. P. (2000). Critical pathways: a review. *Circulation*, *101*(4), 461-465. Am Heart Assoc.

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Fox, J., Alabassi, A., Patkar, V., Rose, T. & Black, E. (2006). An ontological approach to modelling tasks and goals. *Computers in biology and Medicine*, *36*(7), 837-856. Elsevier.

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Grimshaw, J. M. & Russell, I. T. (1993). Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluations. *The Lancet*, *342*(8883), 1317-1322. Elsevier.

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Kinsman, L., Rotter, T., James, E., Snow, P. & Willis, J. (2010). What is a clinical pathway? Development of a definition to inform the debate. *BMC medicine*, *8*(1), 31. BioMed Central Ltd.

Kwan, J. & Sandercock, P. (2003). In-hospital care pathways for stroke: a Cochrane systematic review. *Stroke*, *34*(2), 587-588. Am Heart Assoc.

De Luc, K. (2000). Are different models of care pathways being developed? *International journal of health care quality assurance*, *13*(2), 80-87. MCB UP Ltd.

Melbert, R. B., Kimmins, M. H., Isler, J. T., Billingham, R. P., Lawton, D., Salvadalena, G., Cortezzo, M., et al. (2002). Use of a critical pathway for colon resections. *Journal of gastrointestinal surgery*, *6*(5), 745-752. Springer.

Panella, M. & Vanhaecht, K. (2010). Is there still need for confusion about pathways? *Intl J Care Pathw*, *14*(1), 1-3. Royal Society of Medicine Press Ltd.

Rodriguez-Priego, E., García-Izquierdo, F. & Rubio, Á. (2010). Modeling issues: a survival guide for a non-expert modeler. *Model Driven Engineering Languages and Systems*, 361-375. Springer.

Sermeus, W., Aertgeerts, B., Demeulemeester, E., Ramaekers, D., De Bleser, L. & Vlayen, J. (2006). Eindrapport BOS-project Klinische paden 2003-2005. *Beleidsondersteunende studie Klinische Paden 2003-2005*.

Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? *Evaluation & the health professions*, *35*(1), 28-42. SAGE Publications.

Vanhaecht, K., Panella, M., Van Zelm, R. & Sermeus, W. (2010). An overview on the history and concept of care pathways as complex interventions. *Intl J Care Pathw*, *14*(3), 117-123. Royal Society of Medicine Press Ltd.

Vanwersch, R., Shahzad, K., Vanhaecht, K., Grefen, P., Pintelon, L., Mendling, J., Van Merode, G., et al. (2011). Methodological support for business process redesign in health care: a literature review protocol. *Intl J Care Pathw*, *15*(4), 119-126. Royal Society of Medicine Press Ltd.

Woolf, S. H., Grol, R., Hutchinson, A., Eccles, M. & Grimshaw, J. (1999). Potential benefits, limitations, and harms of clinical guidelines. *Bmj*, *318*(7182), 527-530. British Medical Journal Publishing Group.

Appendices

Appendix A. Literature study query search results

Paper	Queries	Going backward	Going forward	Received from
AGREE-Collaboration. (2003). Development and validation of an international appraisal instrument for assessing the quality of clinical practice guidelines: the AGREE project [AGREE]. Quality & safety in health care, 12, 18-23.		Vanhaecht, K., Panella, M., Van Zelm, R. & Sermeus, W. (2009). Is there a future for pathways? Five pieces of the puzzle. Intl J Care Pathw, 13(2), 82-86. Royal Society of Medicine Press Ltd.		
Van Aken, J. E., Berends, H. & Van der Bij, H. (2007). Problem-solving in organizations: a methodological handbook for business students. Cambridge Univ Pr.				
De Backere, F. (2009). Automatisering van klinische protocollen aan de hand van een regelgebaseerd systeem.		Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.		
De Bleser, L., Depreitere, R., Waele, K. D. E., Vanhaecht, K., Vlayen, J. & Sermeus, W. (2006). Defining pathways. Journal of Nursing Management, 14(7), 553-563. Wiley Online Library.		Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.		
Bragato, L. & Jacobs, K. (2003). Care pathways: the road to better health services? Journal of health organization and management, 17(3), 164-180. MCB UP Ltd.	care pathway			
Brereton, P., Kitchenham, B. A., Budgen, D., Turner, M. & Khalil, M. (2007). Lessons from applying the systematic literature review process within the software engineering domain. Journal of Systems and Software, 80(4), 571-583. Elsevier.	literature review			
Browne, E. D. (2005). Workflow Modelling of Coordinated Inter-Health-Provider Care Plans.			Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.	
Cabana, M. D., Rand, C. S., Powe, N. R., Wu, A. W., Wilson, M. H., Abboud, P. A. C. & Rubin, H. R. (1999). Why don't physicians follow clinical practice guidelines? JAMA: the journal of the American Medical Association, 282(15), 1458-1465. Am Med Assoc.	Clinical practice guideline			
Campbell, H., Hotchkiss, R., Bradshaw, N. & Porteous, M. (1998). Integrated care pathways. Bmj, 316(7125), 133-137. British Medical Journal Publishing Group.	Integrated care pathway			
Crocker, T., Johnson, O. & King, S. (2009). The suitability of care pathways for integrating processes and information systems in healthcare. Transforming Government: People, Process and Policy, 3(3), 289-301. Emerald Group Publishing Limited.	care pathway			

Davenport, T. H. & Short, J. E. (1990). The New Industrial Engineering: Information Technology and Business Process Redesign. Sloan Management Review, 31(4), 11-27. Center for Information Systems Research, Massachusetts Institute of Technology, Sloan School of Management.				
Deccache, A. & Van Ballekom, K. (2010). From patient compliance to empowerment and consumer's choice: Evolution or regression? An overview of patient education in French speaking European countries. Patient education and counseling, 78(3), 282-287. Elsevier.	care pathway	definition		
Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.				Pieter Van Gorp Irene Vanderfeesten
Degeling, P. J., Maxwell, S., Iedema, R. & Hunter, D. J. (2004). Making clinical governance work. BMJ, 329(7467), 679-681. BMJ.			Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.	
Van Dongen, B., Dijkman, R. & Mendling, J. (2008). Measuring similarity between business process models. Advanced Information Systems Engineering, 450-464.				
Doocey, A. & Reddy, W. (2010). Integrated care pathways-the touchstone of an integrated service delivery model for Ireland. Intl J Care Pathw, 14(1), 27-29. Royal Society of Medicine Press Ltd.	Integrated care pathway			
Every, N. R., Hochman, J., Becker, R., Kopecky, S. & Cannon, C. P. (2000). Critical pathways: a review. Circulation, 101(4), 461-465. Am Heart Assoc.			Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.	
Fayers, P., Hopwood, P., Harvey, A., Girling, D., Machin, D. & Stephens, R. (1997). Quality of life assessment in clinical trials—guidelines and a checklist for protocol writers: the UK medical research council experience. European Journal of Cancer, 33(1), 20-28. Elsevier.	Protocol	Design		
Feder, G., Eccles, M., Grol, R., Griffiths, C. & Grimshaw, J. (1999). Using clinical guidelines. Bmj, 318(7185), 728-730. British Medical Journal Publishing Group.	Clinical guidelines			deel 4/4
Fox, J., Alabassi, A., Patkar, V., Rose, T. & Black, E. (2006). An ontological approach to modelling tasks and goals. Computers in biology and Medicine, 36(7), 837-856. Elsevier.			Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.	
Graeber, S., Richter, S., Folz, J., Pham, P., Jacob, P. & Schilling, M. (2007). Development, Implementation, and Evaluation. Methods Inf Med, 46, 574-579.	Clinical pathway	development		

Grimshaw, J. & Russell, I. (1993). Achieving health gain through clinical guidelines. I: Developing scientifically valid guidelines. Quality in health care, 2(4), 243-248. BMJ Publishing Group Ltd.	Clinical guidelines				
Grimshaw, J. M. & Russell, I. T. (1993). Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluations. The Lancet, 342(8883), 1317-1322. Elsevier.			Woolf, S. H., Grol, R., Hutchinson, A., Eccles, M. & Grimshaw, J. (1999). Potential benefits, limitations, and harms of clinical guidelines. Bmj, 318(7182), 527-530. British Medical Journal Publishing Group.		
Grossman, J. H. & Field, M. J. (1990). Clinical Practice Guidelines: Directions for a New Program (Vol. 90). National Academies Press.			going backward enkele papers		
Harvey, V. L. C. G. (2000). The use of care pathways as tools to support the implementation of evidence-based practice. Journal of Interprofessional Care, 14(4), 311-324. Informa UK Ltd UK.	Clinical pathway	evidence based pathway			
Heise, D. L. (2005). Data warehousing and decision making in higher education in the united states.	Anthony's triangle				
Hindle, D. & Yazbeck, A. M. (2005). Clinical pathways in 17 European Union countries: a purposive survey. Australian Health Review, 29(1), 94-104. CSIRO.			Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.		
Hurwitz, B. (1999). Legal and political considerations of clinical practice guidelines. Bmj, 318(7184), 661-664. British Medical Journal Publishing Group.	Clinical guidelines				deel 3/4
Ilott, I., Rick, J., Patterson, M., Turgoose, C. & Lacey, A. (2006). What is protocol-based care? A concept analysis. Journal of nursing management, 14(7), 544-552. Wiley Online Library.	Protocol	Clinical guidelines			
Jones, A. (2001). Hospital care pathways for patients with schizophrenia. Journal of clinical nursing, 10(1), 58-69. Wiley Online Library.	care pathway	defined as			
Keuzenkamp, H. (2005). Marktwerking in de zorg. Economisch Statistische Berichten, 90(4464), 21-25.	Marktwerking	zorg			
Kinsman, L., Rotter, T., James, E., Snow, P. & Willis, J. (2010). What is a clinical pathway? Development of a definition to inform the debate. BMC medicine, 8(1), 31. BioMed Central Ltd.			Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.		
Kitchenham, B. & Charters, S. (2007). Guidelines for performing systematic literature reviews in software engineering. Engineering, 2(EBSE 2007-001). Citeseer.					Fellow students
Kitchiner, D., Bundred, P. & others. (1996). Integrated care pathways. Archives of disease in childhood, 75(2), 166-168. London: British Medical Association, 1926-.	Integrated care pathway				

Kwan, J. & Sandercock, P. (2003). In-hospital care pathways for stroke: a Cochrane systematic review. Stroke, 34(2), 587-588. Am Heart Assoc.				Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.	
De Luc, K. (2000). Are different models of care pathways being developed? International journal of health care quality assurance, 13(2), 80-87. MCB UP Ltd.				Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.	
Melbert, R. B., Kimmins, M. H., Isler, J. T., Billingham, R. P., Lawton, D., Salvadalena, G., Cortezzo, M., et al. (2002). Use of a critical pathway for colon resections. Journal of gastrointestinal surgery, 6(5), 745-752. Springer.	Clinical pathway	is defined			
Muscholl, M. (2005). The "Integrated Clinical Pathways"-Approach-Current Requirements to the Knowledge Management in Health Information Systems. Proceedings of the Workshop on Current Aspects of Knowledge Management in Medicine (KMM05), Kaiserslautern, Germany.	Clinical pathway				
Novak, J. D. & Cañas, A. J. (2008). The theory underlying concept maps and how to construct and use them. Florida Institute for Human and Machine Cognition Pensacola Fl, www. ihmc. us.				Rodriguez-Priego, E., García-Izquierdo, F. & Rubio, Á. (2010). Modeling issues: a survival guide for a non-expert modeler. Model Driven Engineering Languages and Systems, 361-375. Springer.	
Okoli, C. & Schabram, K. (2011). A Guide to Conducting a Systematic Literature Review of Information Systems Research.	literature review				
Panella, M. & Vanhaecht, K. (2010). Is there still need for confusion about pathways? Intl J Care Pathw, 14(1), 1-3. Royal Society of Medicine Press Ltd.	Clinical pathway				
Panella, M., Marchisio, S. & Di Stanislao, F. (2003). Reducing clinical variations with clinical pathways: do pathways work? International Journal for Quality in Health Care, 15(6), 509. ISQHC.				Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.	
Pearson, S. D., Goulart-Fisher, D. & Lee, T. H. (1995). Critical pathways as a strategy for improving care: problems and potential. Annals of internal medicine, 123(12), 941. Am Coll Physicians.	Critical pathway	problems	potential		
Reijers, H. & Liman Mansar, S. (2005). Best practices in business process redesign: an overview and qualitative evaluation of successful redesign heuristics. Omega, 33(4), 283-306. Elsevier.					college BPM

Rodriguez-Priego, E., García-Izquierdo, F. & Rubio, Á. (2010). Modeling issues: a survival guide for a non-expert modeler. Model Driven Engineering Languages and Systems, 361-375. Springer.					Pieter Van Gorp
Sermeus, W., Aertgeerts, B., Demeulemeester, E., Ramaekers, D., De Bleser, L. & Vlayen, J. (2006). Eindrapport BOS-project Klinische paden 2003-2005. Beleidsondersteunende studie Klinische Paden 2003-2005.			Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.		
Sermeus, W., Vleugels, A., Vanhaecht, K., Alewaters, M. H., Glorieux, M. A., Van Gerven, M. E., Heyrman, E. D. J., et al. (2009). Onderzoek naar de toekomst van transmurale zorgpaden binnen Vlaanderen. Leuven: Centrum Ziekenhuis-en Verplegingswetenschap KULeuven.			Deen, I. J., Mengerink, J. G. M., De Ruijter, J. & Van der Sanden, L. J. (2012). Zorgschema's.		
Shekelle, P., Eccles, M. P., Grimshaw, J. M. & Woolf, S. H. (2001). When should clinical guidelines be updated? Bmj, 323(7305), 155-157. British Medical Journal Publishing Group.				Woolf, S. H., Grol, R., Hutchinson, A., Eccles, M. & Grimshaw, J. (1999). Potential benefits, limitations, and harms of clinical guidelines. Bmj, 318(7182), 527-530. British Medical Journal Publishing Group.	
Shekelle, P. G., Woolf, S. H., Eccles, M. & Grimshaw, J. (1999). Developing guidelines. Bmj, 318(7183), 593-596. British Medical Journal Publishing Group.	Clinical guidelines				deel 2/4
Temple, J. (2006). Conducting Research Literature Reviews: from the Internet to Paper. Journal of Advanced Nursing, 55(6), 792-792. Wiley Online Library.	literature review				
Vanhaecht, K., Bollmann, M., Bower, K., Gallagher, C., Gardini, A., Guezo, J., Jansen, U., et al. (2006). Prevalence and use of clinical pathways in 23 countries-an international survey by the European Pathway Association. Intl J Care Pathw, 10(1), 28-34. Royal Society of Medicine Press Ltd.	Clinical pathway	definition			
Vanhaecht, K., Ovretveit, J., Elliott, M. J., Sermeus, W., Ellershaw, J. & Panella, M. (2012). Have We Drawn the Wrong Conclusions About the Value of Care Pathways? Is a Cochrane Review Appropriate? Evaluation & the health professions, 35(1), 28-42. SAGE Publications.	Schedules of medical and nursing procedures				
Vanhaecht, K., Panella, M., Van Zelm, R. & Sermeus, W. (2009). Is there a future for pathways? Five pieces of the puzzle. Intl J Care Pathw, 13(2), 82-86. Royal Society of Medicine Press Ltd.			Vanhaecht, K., Panella, M., Van Zelm, R. & Sermeus, W. (2010). An overview on the history and concept of care pathways as complex interventions. Intl J Care Pathw, 14(3), 117-123. Royal Society of Medicine Press Ltd.		
Vanhaecht, K., Panella, M., Van Zelm, R. & Sermeus, W. (2010). An overview on the history and concept of care pathways as complex interventions. Intl J Care Pathw, 14(3), 117-123. Royal Society of Medicine Press Ltd.	Clinical pathway	definition			

Vanhaecht, K., Sermeus, W., Peers, J., Deneckere, S., Lodewijckx, C., Leigheb, F. & Panella, M. (2010). The European Quality of Care Pathway (EQCP) Study: history, project management and approach. Intl J Care Pathw, 14(2), 52-56. Royal Society of Medicine Press Ltd.	care pathway	development	
Vanhaecht, K., de Witte, K. & Sermeus, W. (2007). The care process organization triangle: a framework to better understand how clinical pathways work. Intl J Care Pathw, 11(2), 54-61. Royal Society of Medicine Press Ltd.	Clinical pathway	framework	
Vanhaecht, K., Witte, K. D. E., Depreitere, R. & Sermeus, W. (2006). Clinical pathway audit tools: a systematic review. Journal of Nursing Management, 14(7), 529-537. Wiley Online Library.	Clinical pathway	defining	
Vanwersch, R., Shahzad, K., Vanhaecht, K., Grefen, P., Pintelon, L., Mendling, J., Van Merode, G., et al. (2011). Methodological support for business process redesign in health care: a literature review protocol. Intl J Care Pathw, 15(4), 119-126. Royal Society of Medicine Press Ltd.			Pieter Van Gorp
Webster, J. & Watson, R. T. (2002). Analyzing the past to prepare for the future.	literature review		
Woolf, S. H., Grol, R., Hutchinson, A., Eccles, M. & Grimshaw, J. (1999). Potential benefits, limitations, and harms of clinical guidelines. Bmj, 318(7182), 527-530. British Medical Journal Publishing Group.	Clinical guidelines		deel 1/4
Zuberbier, T., Bindslev-Jensen, C., Canonica, W., Grattan, C., Greaves, M., Henz, B., Kapp, A., et al. (2006). EAACI/GA2LEN/EDF guideline: definition, classification and diagnosis of urticaria. Allergy, 61(3), 316-320. Wiley Online Library.	guideline	definition	

Table 5 – Specification how each paper is found

Appendix B. Comparing various clinical guideline terms

Appendix B 1. Comparison of guidelines definitions

Original definition	Rephrased definition	What type of pathway is defined	Source	Year	Reference Number
Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	Clinical guideline Clinical practice guideline Practice guideline	(Grossman & Field, 1990), (J. Grimshaw & Russell, 1993), (Woolf et al., 1999), (Browne, 2005)	1990 according to (Grossman & Field, 1990). 1993 according to (J. Grimshaw & Russell, 1993). 1999 according to (Woolf et al., 1999). 2005 according to (Browne, 2005).	[1], [2a], [3a], [4a]
Clinical guidelines, [...], are consensus statements that are systematically developed to assist practitioners in making patient management decisions related to specific clinical circumstances.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	Clinical guidelines	(Every et al., 2000)	2000 according to (Every et al., 2000).	[5]
A clinical guideline [...] assists in decision-making, permitting the clinician to follow the suggestions in a flexible and considered way	A guideline is a recommended way of working for clinicians in different organizations in order to support the decision making process.	Clinical guideline	(J. Grimshaw & Russell, 1993), (Jones, 2001)	1993 according to (J. Grimshaw & Russell, 1993). 2001 according to (Jones, 2001).	[2b], [6]
Guidelines are either evidence-based, or formulated by consensus from the opinions of "experts" in the field of the illness. A guideline is applicable to all patients suspected of suffering from the target illness. [...] The treatment for a specific patient traces a path through a subset of the guideline steps, depending upon that patient's specific symptoms and characteristics.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	Clinical Practice Guidelines Guidelines	(Browne, 2005)	2005 according to (Browne, 2005).	[4b]
A Clinical Guideline can be viewed simply as the representations of clinical best practice that can inform decisions about appropriate health care for specific clinical circumstances.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances based on best practices.	Clinical guidelines	(Browne, 2005)	2005 according to (Browne, 2005).	[4c]
Graded set of recommendations to assist clinical decision-making or service planning based on the best research. Should be developed according to international quality criteria, i.e. the AGREE Collaboration guidelines (AGREE Collaboration 2001). Some versions may contain a systematic review of the research on which the recommendations are based. The recommendations provide auditable standards.	A guideline is a recommended way of working for clinicians in different organizations in order to support the decision making process.	Clinical guidelines	(Ilott et al., 2006)	2006 according to (Ilott et al., 2006).	[7]
A guideline is a recommended way of working which implies <u>what</u> *can* be done, a clinical protocol is a roadmap which will lead to a certain outcome, saying <u>how</u> something *should* be done	A guideline is a recommended way of working that describes what tasks can be done.	Guideline Protocol	www.zorgprotocollen.nl	2012 according to www.zorgprotocollen.nl.	[8]

Table 6 – Comparative table for the guideline definitions

Appendix B 2. Reference Concept Map for guidelines

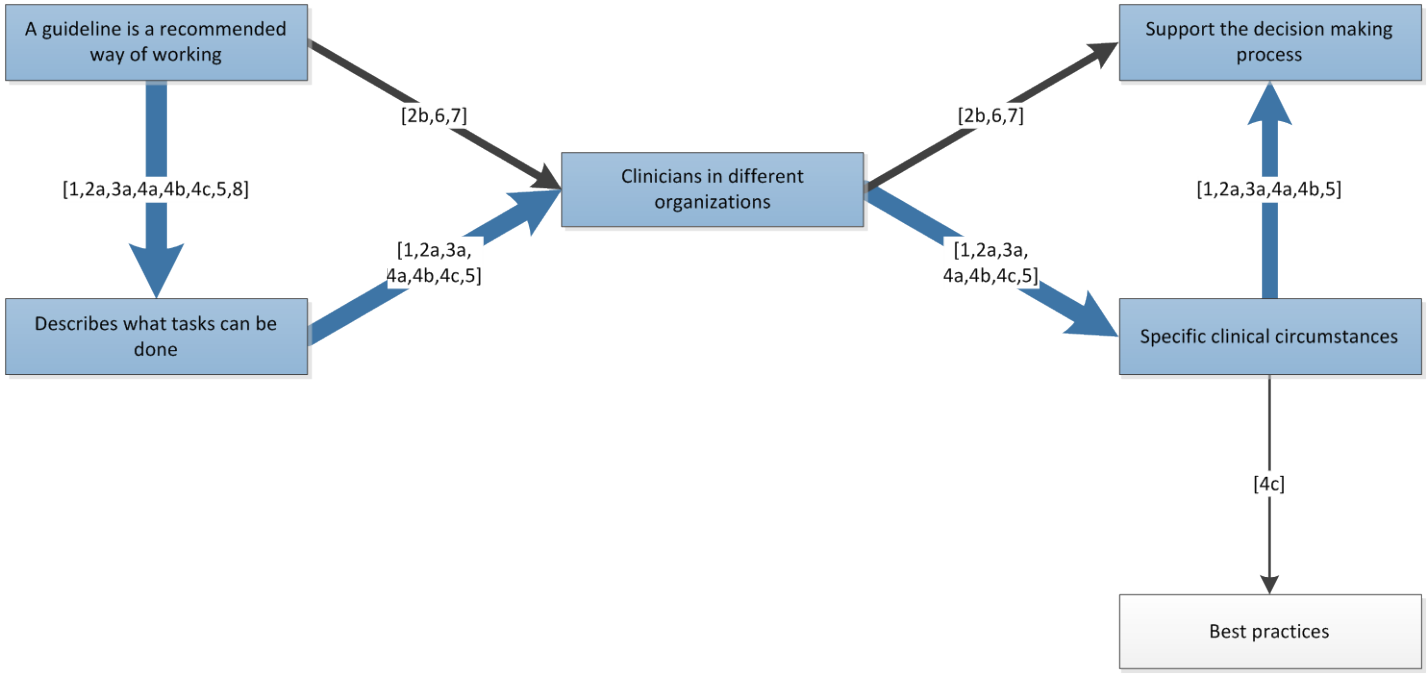

Figure 9 – Reference Concept Map for the guideline definitions

Appendix C. Comparing various protocol terms

Appendix C 1. Comparison of protocol definitions

Original definition	Rephrased definition	What type of pathway is defined	Source	Year	Reference Number
Protocols are treatment recommendations that are often based on guidelines. Like the critical pathway, the goal of the clinical protocol may be to decrease treatment variation. However, protocols are most often focused on guideline compliance rather than the identification of rate-limiting steps in the patient care process. In further contrast to critical pathways, protocols may or may not include a continuous monitoring and data-evaluation component.	A protocol describes what and how should be done within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care.	Protocols	(Every et al., 2000)	2000	[1]
A protocol or standard is a formal documented procedure for clinicians to follow, which addresses a specific clinical or managerial situation.	A protocol describes what and how should be done for a specific issue within an organization by clinicians.	Protocol Standard	(Jones, 2001)	2001	[2]
A protocol is defined [...] as "the detailed description of the steps taken to deliver care or treatment to a patient, and are sometimes called "the integrated care pathway". They are designed at a local level to implement the national standards and determine care provision by using the best available evidence if national standards are not available.... They include specific information on who carries out key parts of the care or treatment, and where that should be delivered"	A protocol describes what and how should be done for a specific issue within an organization by clinicians, based on **national** (clinical) guidelines designed to standardize the patient care. (national standards if available, otherwise best evidence).	Protocol Integrated care pathway	(Ilott et al., 2006)	2006	[3a]
Detailed written instructions about how to complete a specific task. Describes how, when, where and who should be involved in the task. Protocol may refer to a clinical care process or the working relationship between agencies.	A protocol describes what and how should be done for a specific issue within an organization by clinicians.	Protocol	(Ilott et al., 2006)	2006	[3b]
Clinical protocols are agreed statements about a specific issue, with explicit steps based on clinical guidelines and/or organizational consensus. A protocol is not specific to a named patient.	A protocol describes what and how should be done for a specific issue for a large homogeneous group within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care.	Clinical protocols	(Fox, Alabassi, Patkar, Rose, & Black, 2006)	2006	[4]
A protocol is defined as a specific standardized way of working.	A protocol describes what and how should be done to standardize the patient care.	Protocol	www.zorgprotocollen.nl	2012	[5a]
A guideline is a recommended way of working which implies what *can* be done, a clinical protocol is a roadmap which will lead to a certain outcome, saying how something *should* be done	A protocol describes what and how should be done, which will lead to a certain outcome.	Guideline Clinical protocol	www.zorgprotocollen.nl	2012	[5b]

Table 7 – Comparative table for the protocol definitions

Appendix C 2. Reference Concept Map for protocols

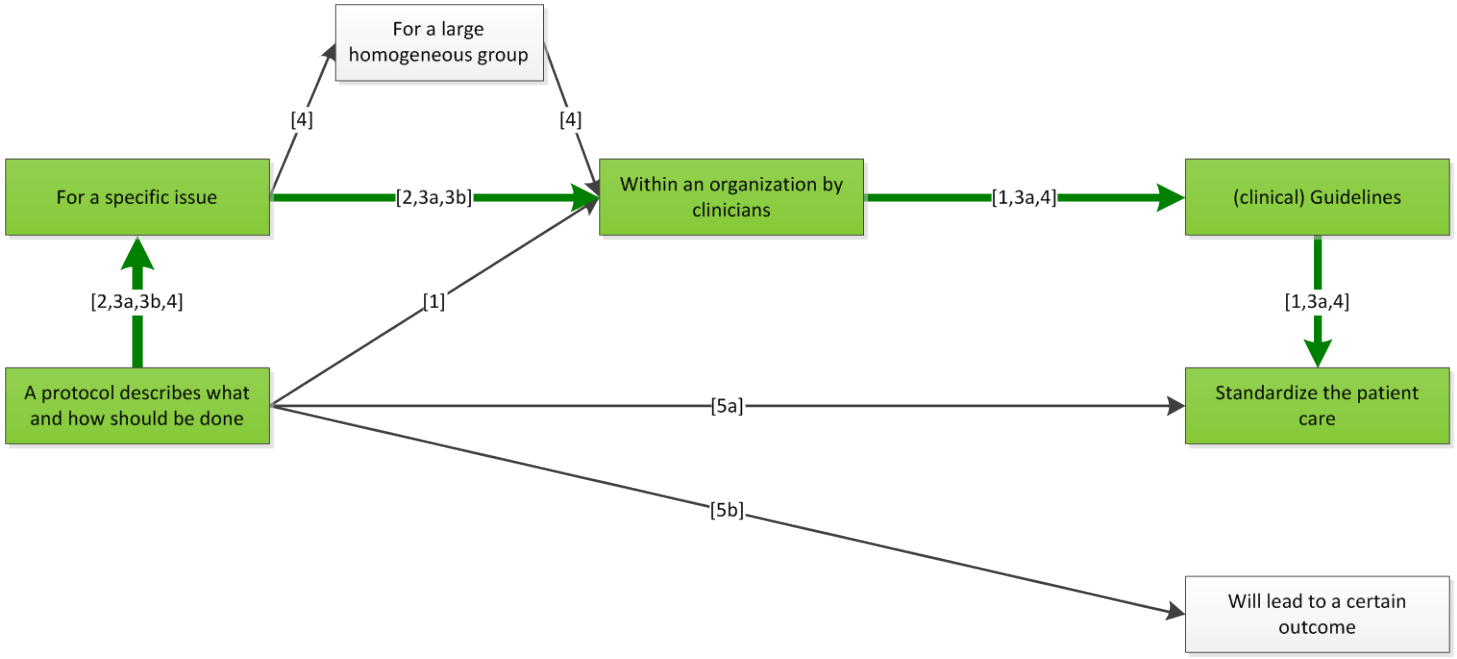

Figure 10 – Reference Concept Map for the protocol definitions

Appendix D. Comparing various pathway terms

Appendix D 1. Comparison of pathway definitions

Original definition from Vanhaecht et al. (2012)*	Original definition from paper itself **	Rephrased definition	What type of pathway is defined	Source	Year	Reference number
Schedules of medical and nursing procedures, including diagnostic tests, medications, and consultations designed to effect an efficient, coordinated program of treatment	*Paper could not be retrieved*	Description of care process from an organizational point of view designed to improve efficiency.	Critical pathway	(De Bleser et al., 2006)	1994 according to Vanhaecht et al. (2012) and 1996 according to De Bleser et al. (2006)	[2]
Management plans that display goals for patients and provide the corresponding ideal sequence and timing of staff actions to achieve those goals with optimal efficiency	*Paper could not be retrieved*	Description of the care process from a patient point of view where the organizational aspects are taken into account to improve efficiency.	Critical pathway Clinical pathway Care pathway Integrated care pathway	Vanhaecht et al. (2012)	1995 according to Vanhaecht et al. (2012)	[1a]
Describe, for a specific clinical condition, the tasks to be carried out together with the timing and sequence of these tasks and the discipline involved in completing the task. They consist of a single multidisciplinary record which is part of the patient's clinical record together with a patient summary sheet	*Paper could not be retrieved*	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), and this description is added to the patient's clinical record.	Integrated care pathway	(Vanhaecht et al., 2012)	1998 according to Vanhaecht et al. (2012)	[1b]
Not present in paper by Vanhaecht et al (2012)	Integrated care pathways—also known as coordinated care pathways, care maps, or anticipated recovery pathways—are task orientated care plans which detail essential steps in the care of patients with a specific clinical problem and describe the patient's expected clinical course. They offer a structured means of developing and implementing local protocols of care based on evidence based clinical guidelines. [...] They consist of a single multidisciplinary record which is part of the patient's clinical record together with a patient summary sheet.	Description of the care process from a patient point of view for a specific disease and for a specific (group of) patient(s), and this description is based on evidence and (clinical) guidelines and consists the organizational aspects.	Integrated care pathway Coordinated care pathways Care maps Anticipated recovery pathways	(Campbell et al., 1998)	1998 according to Campbell et al. (1998).	[3]
Determine locally agreed, multidisciplinary practices based on guidelines and evidence where available, for a specific patient/client group. It forms all or part of the clinical record, documents the care given, and facilitates the evaluation of out- comes for continuous quality improvement	An integrated care pathway determines locally agreed, multidisciplinary practice based on guidelines and evidence where available, for specific patient/client group. It forms all or part of the clinical record, documents the care given, and facilitates the evaluation of out- comes for continuous quality improvement	Description of the care process from an organizational point of view for a specific (group of) patient(s) based on evidence and (clinical) guidelines, designed to improve efficiency and to evaluate the completed process. This description is added to the patient's clinical record.	Integrated care pathway Critical pathway Anticipated recovery pathway Clinical pathway Care tracks Critical care pathway Critical care method Care map Clinical algorithm Care profile Care protocol Collaborative care plan Case management (micro-level) Patient pathways Collaborative care track Expected recovery pathway Multidisciplinary pathways of care (MPC)	(De Luc, 2000)	1998 according to De Luc (2000). 2000 according to Vanhaecht et al. (2012)	[4]
A distinct tool that details processes of care and highlights inefficiencies regardless of whether there is evidence to warrant changes in those processes	A distinct tool that details processes of care and highlights inefficiencies regardless of whether there is evidence to warrant changes in those processes.	Description of the care process based on evidence designed to improve efficiency.	Critical pathway Critical paths Clinical pathways Care paths	(Every et al., 2000)	2000 according to Vanhaecht et al. (2012)	[5]
Not present in paper by Vanhaecht et al (2012)	For the purposes of this paper, a care pathway is defined as a single care document which outlines the problems, interventions and outcomes for a diagnosis-related group.	Description of the care process for a specific disease and for a specific (group of) patient(s) designed to improve patient outcomes, interventions and visualize problems.	Care pathway	(Jones, 2001)	2000 according to (Jones, 2001).	[6]

Not present in paper by Vanhaecht et al (2012)	A critical (or clinical) pathway is defined as a sequence of events through which patients pass on their way from a state of illness (through surgery or some medical intervention) to the restoration of a desired outcome, usually wellness. The purpose of a critical pathway is to standardize the clinical practice of a group of specialists working to optimize care in a particular clinical scenario.	Description of the care process from a patient point of view for a specific period of time, designed to improve patient outcomes and standardize care.	Critical pathway Clinical pathway	(Melbert et al., 2002)	2002 according to Melbert et al. (2002).	[7]
In general, a care pathway can be defined as a plan of care that aims to promote organized and efficient multidisciplinary patient care that is based on the best available evidence and guidelines for a specific condition	A care pathway can be defined as a plan of care **that is developed and used by a multidisciplinary team, and is applicable to more than 1 aspect of care**.	Description of the care process from an organizational point of view for a specific disease and for a specific (group of) patient(s) based on evidence and (clinical) guidelines, designed to improve efficiency.	Care pathway Clinical pathway Critical pathway Critical path method Care paths CareMaps	(Kwan & Sandercock, 2003)	2003 according to Kwan & Sandercock (2003). 2004 according to Vanhaecht et al. (2012).	[8]
Describe the diagnostic and therapeutic events that will appreciably affect the quality, outcomes, and cost of care. Use of integrated care pathways for systematizing care extends the evidence base, strengthens service integration, and improves clinical effectiveness, quality, and technical efficiency, as well as patients' satisfaction and clinicians' work experience.	**These pathways** describe the diagnostic and therapeutic events that will appreciably affect the quality, outcomes, and cost of care. Use of integrated care pathways for systematizing care extends the evidence base, strengthens service integration, and improves clinical effectiveness, quality, and technical efficiency as well as patients' satisfaction and clinicians' work experience.	Description of the care process from an organizational point of view based on evidence, designed to improve efficiency, improve quality of care, improve patient outcomes and reduce the cost of care.	Integrated care pathway	(Degeling, Maxwell, Iedema, & Hunter, 2004)	2004 according to Vanhaecht et al. (2012).	[9]
Is a method for the patient-care management of a well-defined group of patients during a well-defined period of time. A clinical pathway explicitly states the goals and key elements of care based on evidence-based medicine (EBM) guidelines, best practice, and patient expectations by facilitating the communication, coordinating roles and sequencing the activities of the multidisciplinary care team, patients, and their relatives; by documenting, monitoring, and evaluating variances; and by providing the necessary resources and outcomes. The aim of a clinical pathway is to improve the quality of care, reduce risks, increase patient satisfaction, and increase the efficiency in the use of resources	**In general, we expected that this study would produce a new definition of clinical pathways, making other definitions obsolete [… however,] our initial expectations went unfulfilled.** **In general, the goals of a clinical pathway focus on achieving optimal efficiency and improving the quality of care.** Potential starting point of a definition*: A clinical pathway is a method for the patient-care management of a well-defined group of patients during a well-defined period of time.* The aim of a clinical pathway is to improve the quality of care, reduce risks, increase patient satisfaction and increase the efficiency in the use of resources.	*No description possible, because non given in paper, only a potential starting point.*	Clinical pathways Critical pathway Integrated care pathway Care pathway Care map.	(De Bleser et al., 2006)	2006 according to Vanhaecht et al. (2012) and De Bleser et al. (2006).	[2]
Not present in paper by Vanhaecht et al (2012)	A clinical pathway is a method that provides the care management of a specific group of patients during a well-defined period of time. Explicit objectives and key interventions are formulated. These are based on evidence, guidelines, best practices and (expected) patient outcomes. The communication and coordination between the different players, the (sequential) tasks, the multidisciplinary team, and the patient and their relatives are made possible because of the documentation, the evaluation of variances in the results of the completed pathway and the used resources. The goal of a clinical pathway is to improve the output of the care, reduce risks, increase the patient satisfaction, and to make efficient use of the available resources.	Description of the care process from an organizational point of view for a specific period of time, and for a specific (group of) patient(s), based on evidence, (clinical) guidelines and best practices, designed to improve efficiency and improve patient outcomes.	Clinical pathway	(Sermeus et al., 2006)	2006 according to Sermeus et al. (2006).	[10]
Not present in paper by Vanhaecht et al (2012)	Clinical pathways – also known as critical pathways, care pathways, or integrated clinical pathways – are patient care algorithms based on best evidence. They are intended to minimize variance in treatment and thus reduce cost, increase efficiency, and ultimately improve patient care outcomes. They are designed by multidisciplinary cooperation and implemented by organizational and technical measures, i.e. mainly specific IT-support.	Description of the care process from a patient point of view where the organizational aspects are taken into account and designed to improve efficiency, improve quality of care, improve patient outcomes and reduce the cost of care.	Clinical pathways Critical pathways Care pathways Integrated clinical pathways	(Graeber et al., 2007)	2007 according to Graeber et al. (2007)	[11]

	A clinical pathway has four major components: • Theory • Process • Control • Quality					
A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of care pathways include: (a) An explicit statement of the goals and key elements of care based on evidence, best practice, and patients' expectations **and their characteristics**; (b) the facilitation of communication among team members and with patients and families; (c) **the coordination of the care process by coordinating the roles and sequencing the activities of the multidisciplinary care team, patients, and their relatives**;(d)the documentation, monitoring, and evaluation of variances and outcomes; and (e) the identification of the appropriate resources. The aim of a care pathway is to enhance the quality of care across the continuum by improving risk-adjusted patient outcomes, promoting patient safety, increasing patient satisfaction, and optimizing the use of resources	'A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of pathways include: an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations; the facilitations of the communication **and coordination of roles, and sequencing the activities of the multidisciplinary care team**, patients and their relatives; the documentation, monitoring, and evaluation of variances and outcomes; and the identification of relevant resources'.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, designed to improve patient outcomes, improve efficiency and to evaluate the completed process.	Care pathway Clinical pathways Critical pathways Integrated care pathways	(Panella & Vanhaecht, 2010, Vanhaecht et al., 2010), (Deccache & Van Ballekom, 2010)	2008 according to Vanhaecht et al. (2012). 2010 according to Vanhaecht et al. (2010), Panella & Vanhaecht (2010), and Deccache & Van Ballekom (2010)	[12], [13], [14]
The intervention is a structured multidisciplinary plan of care; the intervention is used to channel the translation of guide- lines or evidence into local structures; the intervention details the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, protocol, or other ''inventory of actions''; the intervention has time frames or criteria-based progression (i.e., steps were taken if designated criteria were met); and the intervention aims to standardize care for a specific clinical problem, procedure, or episode of health care in a specific population	define a clinical pathway: (1) the intervention was a structured multidisciplinary plan of care; (2) the intervention was used to translate guidelines or evidence into local structures; (3) the intervention detailed the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, protocol or other 'inventory of actions'; (4) the intervention had timeframes or criteria-based progression; and (5) the intervention aimed to standardize care for a specific clinical problem, procedure or episode of healthcare in a specific population.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, and is designed to standardize care.	Clinical pathway Care map Care pathway Critical pathway Integrated care pathway Protocol Guideline	(Kinsman, Rotter, James, Snow, & Willis, 2010)	2010 according to Vanhaecht et al. (2012) and Kinsman et al. (2010).	[15]

Table 8 – Comparative table for the pathways definitions

* Vanhaecht et al. (2012) is reference number [1].

** Differences between two original definitions are in **bold**.

Appendix D 2. Reference Concept Map about the pathway definitions

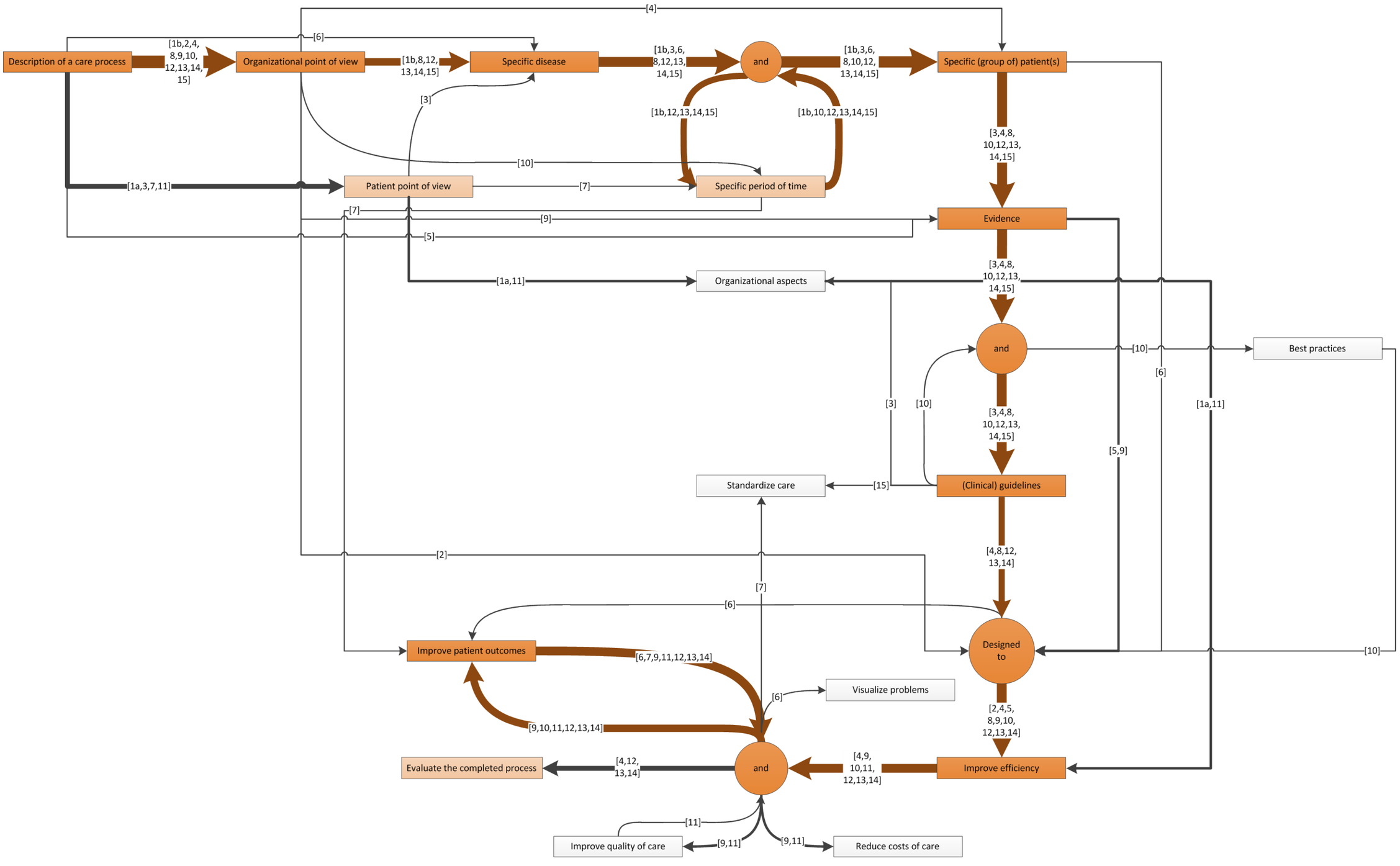

Figure 11 – Reference Concept Map for the pathway definitions

Appendix E. Frequency of used various pathway terms

Appendix E 1. Frequency of terms concerning clinical guidelines

Definition	(Grossman & Field, 1990) [1]	(J. Grimshaw & Russell, 1993) [2a]	(J. Grimshaw & Russell, 1993) [2b]	(Woolf et al., 1999) [3]	(Browne, 2005) [4a]	(Browne, 2005) [4b]	(Browne, 2005) [4c]	(Every et al., 2000) [5]	(Jones, 2001) [6]	(Ilott et al., 2006) [7]	zorgprotocollen.nl [8]	Frequency
Clinical guideline	x	x	x	x	x		x	x	x	x		**9**
Clinical practice guideline	x	x		x	x	x						**5**
Practice guideline	x	x		x	x							**4**
Guideline						x					x	**2**
Protocol											x	**1**
Number of synonyms in paper	**3**	**3**	**1**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**2**	
definition in paper #1	Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances	Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances	A clinical guideline […] assists in decision-making, permitting the clinician to follow the suggestions in a flexible and considered way	Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances	Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances	Guidelines are either evidence-based, or formulated by consensus from the opinions of "experts" in the field of the illness. A guideline is applicable to all patients suspected of suffering from the target illness. […] The treatment for a specific patient traces a path through a subset of the guideline steps, depending upon that patient's specific symptoms and characteristics	A Clinical Guideline can be viewed simply as the representations of clinical best practice that can inform decisions about appropriate health care for specific clinical circumstances	Clinical guidelines, […], are consensus statements that are systematically developed to assist practitioners in making patient management decisions related to specific clinical circumstances.	A clinical guideline […] assists in decision-making, permitting the clinician to follow the suggestions in a flexible and considered way	Graded set of recommendations to assist clinical decision-making or service planning based on the best research. Should be developed according to international quality criteria, i.e. the AGREE Collaboration guidelines (AGREE Collaboration 2001). Some versions may contain a systematic review of the research on which the recommendations are based. The recommendations provide auditable standards	A guideline is a recommended way of working which implies <u>what</u> *can* be done, a clinical protocol is a roadmap which will lead to a certain outcome, saying <u>how</u> something *should* be done	
rephrased definition #1	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	A guideline is a recommended way of working for clinicians in different organizations in order to support the decision making process	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances based on best practices.	A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations in case of specific clinical circumstances in order to support the decision making process.	A guideline is a recommended way of working for clinicians in different organizations in order to support the decision making process	A guideline is a recommended way of working for clinicians in different organizations in order to support the decision making process.	A guideline is a recommended way of working that describes what tasks can be done.	**A guideline is a recommended way of working that describes what tasks can be done by clinicians in different organizations for specific clinical circumstances in**

	order to support the decision making process.

Table 9 – Frequency of terms concerning clinical guidelines

Appendix E 2. Frequency of terms concerning Protocols

Definition	(Every et al., 2000) [1]	(Jones, 2001) [2]	(Ilott et al., 2006) [3a]	(Ilott et al., 2006) [3b]	(Fox et al., 2006) [4]	zorgprotocollen.nl [5a]	zorgprotocollen.nl [5b]	Frequency
Protocol	x	x	x	x		x		**5**
Standard		x						**1**
Integrated care pathway			x					**1**
Clinical protocol					x		x	**2**
Guideline							x	**1**
Number of synonyms in paper	**1**	**2**	**2**	**1**	**1**	**1**	**2**	
definition in paper #1	Protocols are treatment recommendations that are often based on guidelines. Like the critical pathway, the goal of the clinical protocol may be to decrease treatment variation. However, protocols are most often focused on guideline compliance rather than the identification of rate-limiting steps in the patient care process. In further contrast to critical pathways, protocols may or may not include a continuous monitoring and data-evaluation component.	A protocol or standard is a formal documented procedure for clinicians to follow, which addresses a specific clinical or managerial situation.	A protocol is defined […] as "the detailed description of the steps taken to deliver care or treatment to a patient, and are sometimes called "the integrated care pathway". They are designed at a local level to implement the national standards and determine care provision by using the best available evidence if national standards are not available…. They include specific information on who carries out key parts of the care or treatment, and where that should be delivered"	Detailed written instructions about how to complete a specific task. Describes how, when, where and who should be involved in the task. Protocol may refer to a clinical care process or the working relationship between agencies.	Clinical protocols are agreed statements about a specific issue, with explicit steps based on clinical guidelines and/or organizational consensus. A protocol is not specific to a named patient.	A protocol is defined as a specific standardized way of working	A guideline is a recommended way of working which implies what *can* be done, a clinical protocol is a roadmap which will lead to a certain outcome, saying how something *should* be done	
rephrased definition #1	A protocol describes what and how should be done within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care.	A protocol describes what and how should be done for a specific issue within an organization by clinicians.	A protocol describes what and how should be done for a specific issue within an organization by clinicians, based on **national** (clinical) guidelines designed to standardize the patient care. (national standards if available, otherwise best evidence).	A protocol describes what and how should be done for a specific issue within an organization by clinicians	A protocol describes what and how should be done for a specific issue for a large homogeneous group within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care	A protocol describes what and how should be done to standardize the patient care.	A protocol describes what and how should be done, which will lead to a certain outcome	A protocol describes what and how should be done for a specific issue within an organization by clinicians, based on (clinical) guidelines designed to standardize the patient care

Table 10 – Frequency of terms concerning protocols

Appendix E 3. Frequency of terms concerning Care Pathways

Definition	Vanhaecht et al. (2012) [1a]	(Vanhaecht et al., 2012) [1b]	(De Bleser et al., 2006) [2]	(Campbell et al., 1998) [3]	(De Luc, 2000) [4]	(Every et al., 2000) [5]	(Jones, 2001) [6]	(Melbert et al., 2002) [7]	(Kwan & Sandercock, 2003) [8]
Clinical pathway	x		x		x	x		x	x
Critical pathway	x		x		x	x		x	x
Care pathway	x		x		x		x		x
Integrated care pathway	x	x	x	x	x				
Care maps			x	x	x				x
Anticipated recovery pathways				x	x				
Care paths						x			x
Critical path method					x				x
Care profile					x				
Care protocol					x				
Care tracks					x				
Case management (micro-level)					x				
Clinical algorithm					x				
Clinical itinerary									
Collaborative care plan					x				
Collaborative care track					x				
Coordinated care pathways				x					
Critical care method					x				
Critical care pathway					x				
Critical paths						x			
Expected recovery pathway					x				
Integrated clinical pathway									
Multidisciplinary pathways of care (MPC)					x				
Patient pathways					x				
Number of synonyms in paper	**4**	**1**	**5**	**4**	**19**	**4**	**1**	**2**	**6**
definition in paper #1	Management plans that display goals for patients and provide the corresponding ideal sequence and timing of staff actions to achieve those goals with optimal efficiency	Describe, for a specific clinical condition, the tasks to be carried out together with the timing and sequence of these tasks and the discipline involved in completing the task. They consist of a single multidisciplinary record which is part of the patient's clinical record together with a patient summary sheet	Schedules of medical and nursing procedures, including diagnostic tests, medications, and consultations designed to effect an efficient, coordinated program of treatment	Integrated care pathways—also known as coordinated care pathways, care maps, or anticipated recovery pathways—are task orientated care plans which detail essential steps in the care of patients with a specific clinical problem and describe the patient's expected clinical course. They offer a structured means of developing and implementing local protocols of care based on evidence based clinical guidelines. […] They consist of a single multidisciplinary record	An integrated care pathway determines locally agreed, multidisciplinary practice based on guidelines and evidence where available, for specific patient/client group. It forms all or part of the clinical record, documents the care given, and facilitates the evaluation of out-comes for continuous quality improvement	A distinct tool that details processes of care and highlights inefficiencies regardless of whether there is evidence to warrant changes in those processes.	For the purposes of this paper, a care pathway is defined as a single care document which outlines the problems, interventions and outcomes for a diagnosis-related group.	A critical (or clinical) pathway is defined as a sequence of events through which patients pass on their way from a state of illness (through surgery or some medical intervention) to the restoration of a desired outcome, usually wellness. The purpose of a critical pathway is to standardize the clinical practice of a group of specialists working to optimize care in a particular clinical scenario.	A care pathway can be defined as a plan of care **that is developed and used by a multidisciplinary team, and is applicable to more than 1 aspect of care**.

				which is part of the patient's clinical record together with a patient summary sheet.					
rephrased definition #1	Description of the care process from a patient point of view where the organizational aspects are taken into account to improve efficiency.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), and this description is added to the patient's clinical record.	Description of care process from an organizational point of view designed to improve efficiency.	Description of the care process from a patient point of view for a specific disease and for a specific (group of) patient(s), and this description is based on evidence and (clinical) guidelines and consists the organizational aspects.	Description of the care process from an organizational point of view for a specific (group of) patient(s) based on evidence and (clinical) guidelines, designed to improve efficiency and to evaluate the completed process. This description is added to the patient's clinical record.	Description of the care process based on evidence designed to improve efficiency.	Description of the care process for a specific disease and for a specific (group of) patient(s) designed to improve patient outcomes, interventions and visualize problems.	Description of the care process from a patient point of view for a specific period of time, designed to improve patient outcomes and standardize care.	Description of the care process from an organizational point of view for a specific disease and for a specific (group of) patient(s) based on evidence and (clinical) guidelines, designed to improve efficiency.

Table 11 – Frequency of terms concerning Care Pathways

Note: table is continued in table 12.

Definition	(Degeling et al., 2004) [9]	(Sermeus et al., 2006) [10]	(Graeber et al., 2007) [11]	(Panella & Vanhaecht, 2010) [12]	(Vanhaecht et al., 2010) [13]	(Deccache & Van Ballekom, 2010) [14]	(Kinsman et al., 2010) [15]	Frequency
Clinical pathway		x	x	x			x	**10**
Critical pathway			x	x				**8**
Care pathway			x	x	x			**8**
Integrated care pathway	x			x				**7**
Care maps								**4**
Anticipated recovery pathways								**2**
Care paths								**2**
Critical path method								**2**
Care profile								**1**
Care protocol								**1**
Care tracks								**1**
Case management (micro-level)								**1**
Clinical algorithm								**1**
Clinical itinerary						x		**1**
Collaborative care plan								**1**
Collaborative care track								**1**
Coordinated care pathways								**1**
Critical care method								**1**
Critical care pathway								**1**
Critical paths								**1**
Expected recovery pathway								**1**
Integrated clinical pathway			x					**1**
Multidisciplinary pathways of care (MPC)								**1**
Patient pathways								**1**
Number of synonyms in paper	**1**	**1**	**4**	**4**	**1**	**1**	**1**	
definition in paper #1	**These pathways** describe the diagnostic and therapeutic events that will appreciably affect the quality, outcomes, and cost of care. Use of integrated care pathways for systematizing care extends the evidence base, strengthens service integration, and improves clinical effectiveness, quality, and technical efficiency as well as patients' satisfaction and clinicians' work experience.	A clinical pathway is a method that provides the care management of a specific group of patients during a well-defined period of time. Explicit objectives and key interventions are formulated. These are based on evidence, guidelines, best practices and (expected) patient outcomes. The communication and coordination between the different players, the (sequential) tasks, the multidisciplinary team, and the patient and their relatives are made possible because of the documentation, the evaluation of variances in	Clinical pathways – also known as critical pathways, care pathways, or integrated clinical pathways – are patient care algorithms based on best evidence. They are intended to minimize variance in treatment and thus reduce cost, increase efficiency, and ultimately improve patient care outcomes. They are designed by multidisciplinary cooperation and implemented by organizational and technical measures, i.e. mainly specific IT-support	A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of pathways include: an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations; the facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives; the documentation, monitoring, and evaluation of variances and outcomes;	A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of pathways include: an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations; the facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives; the documentation, monitoring, and evaluation of variances and outcomes;	A complex intervention for the mutualdecision making and organization ofcareprocesses for a well-defined group of patients during a well-defined period.	define a clinical pathway: (1) the intervention was a structured multidisciplinary plan of care; (2) the intervention was used to translate guidelines or evidence into local structures; (3) the intervention detailed the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, protocol or other 'inventory of actions'; (4) the intervention had timeframes or criteria-based progression; and (5) the intervention aimed to standardize care for a specific clinical problem, procedure or episode of healthcare in a specific population.	

		the results of the completed pathway and the used resources. The goal of a clinical pathway is to improve the output of the care, reduce risks, increase the patient satisfaction, and to make efficient use of the available resources.		and the identification of relevant resources	and the identification of relevant resources			
rephrased definition #1	Description of the care process from an organizational point of view based on evidence, designed to improve efficiency, improve quality of care, improve patient outcomes and reduce the cost of care.	Description of the care process from an organizational point of view for a specific period of time, and for a specific (group of) patient(s), based on evidence, (clinical) guidelines and best practices, designed to improve efficiency and improve patient outcomes.	Description of the care process from a patient point of view where the organizational aspects are taken into account and designed to improve efficiency, improve quality of care, improve patient outcomes and reduce the cost of care.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, designed to improve patient outcomes, improve efficiency and to evaluate the completed process.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, designed to improve patient outcomes, improve efficiency and to evaluate the completed process.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, and is designed to standardize care.	Description of the care process from an organizational point of view for a specific disease, for a specific period of time, and for a specific (group of) patient(s), based on evidence and (clinical) guidelines, and is designed to standardize care.	Description of a care process from an organization point of view for a specific disease and for a specific (group of) patient(s), which is based on evidence and on (clinical) guidelines and it is designed to improve efficiency and improve patient outcomes.

Table 12 – Frequency of terms concerning Care Pathways (continued)

Working Papers Beta 2009 - 2012

nr.	Year	Title	Author(s)
384	2012	Defining Various Pathway Terms	W.R. Dalinghaus, P.M.E. Van Gorp
383	2012	The Service Dominant Strategy Canvas: Defining and Visualizing a Service Dominant Strategy through the Traditional Strategic Lens	Egon Lüftenegger, Paul Grefen, Caren Weisleder
382	2012	A Stochastic Variable Size Bin Packing Problem With Time Constraints	Stefano Fazi, Tom van Woensel, Jan C. Fransoo
381	2012	Coordination and Analysis of Barge Container Hinterland Networks	K. Sharypova, T. van Woensel, J.C. Fransoo
380	2012	Proximity matters: Synergies through co-location of logistics establishments	Frank P. van den Heuvel, Peter W. de Langen, Karel H. van Donselaar, Jan C. Fransoo
379	2012	A literature review in process harmonization: a conceptual framework	Heidi Romero, Remco Dijkman, Paul Grefen, Arjan van Weele
378	2012	A Generic Material Flow Control Model for Two Different Industries	S.W.A. Haneya, J.M.J. Schutten, P.C. Schuur, W.H.M. Zijm
377	2012	Dynamic demand fulfillment in spare parts networks with multiple customer classes	H.G.H. Tiemessen, M. Fleischmann, G.J. van Houtum, J.A.E.E. van Nunen, E. Pratsini
376	2012	Improving the performance of sorter systems by scheduling inbound containers	K. Fikse, S.W.A. Haneyah, J.M.J. Schutten
375	2012	Strategies for dynamic appointment making by container terminals	Albert Douma, Martijn Mes
374	2012	MyPHRMachines: Lifelong Personal Health Records in the Cloud	Pieter van Gorp, Marco Comuzzi
373	2012	Service differentiation in spare parts supply through dedicated stocks	E.M. Alvarez, M.C. van der Heijden, W.H.M. Zijm
372	2012	Spare parts inventory pooling: how to share the benefits	Frank Karsten, Rob Basten

371	2012	Condition based spare parts supply	X.Lin, R.J.I. Basten, A.A. Kranenburg, G.J. van Houtum
370	2012	Using Simulation to Assess the Opportunities of Dynamic Waste Collection	Martijn Mes
369	2012	Aggregate overhaul and supply chain planning for rotables	J. Arts, S.D. Flapper, K. Vernooij
368	2012	Operating Room Rescheduling	J.T. van Essen, J.L. Hurink, W. Hartholt, B.J. van den Akker
367	2011	Switching Transport Modes to Meet Voluntary Carbon Emission Targets	Kristel M.R. Hoen, Tarkan Tan, Jan C. Fransoo, Geert-Jan van Houtum
366	2011	On two-echelon inventory systems with Poisson demand and lost sales	Elisa Alvarez, Matthieu van der Heijden
365	2011	Minimizing the Waiting Time for Emergency Surgery	J.T. van Essen, E.W. Hans, J.L. Hurink, A. Oversberg
364	2011	Vehicle Routing Problem with Stochastic Travel Times Including Soft Time Windows and Service Costs	Duygu Tas, Nico Dellaert, Tom van Woensel, Ton de Kok
363	2011	A New Approximate Evaluation Method for Two-Echelon Inventory Systems with Emergency Shipments	Erhun Özkan, Geert-Jan van Houtum, Yasemin Serin
362	2011	Approximating Multi-Objective Time-Dependent Optimization Problems	Said Dabia, El-Ghazali Talbi, Tom Van Woensel, Ton de Kok
361	2011	Branch and Cut and Price for the Time Dependent Vehicle Routing Problem with Time Window	Said Dabia, Stefan Röpke, Tom Van Woensel, Ton de Kok
360	2011	Analysis of an Assemble-to-Order System with Different Review Periods	A.G. Karaarslan, G.P. Kiesmüller, A.G. de Kok
359	2011	Interval Availability Analysis of a Two-Echelon, Multi-Item System	Ahmad Al Hanbali, Matthieu van der Heijden
358	2011	Carbon-Optimal and Carbon-Neutral Supply Chains	Felipe Caro, Charles J. Corbett, Tarkan Tan, Rob Zuidwijk

357	2011	Generic Planning and Control of Automated Material Handling Systems: Practical Requirements Versus Existing Theory	Sameh Haneyah, Henk Zijm, Marco Schutten, Peter Schuur
356	2011	Last time buy decisions for products sold under warranty	M. van der Heijden, B. Iskandar
355	2011	Spatial concentration and location dynamics in logistics: the case of a Dutch provence	Frank P. van den Heuvel, Peter W. de Langen, Karel H. van Donselaar, Jan C. Fransoo
354	2011	Identification of Employment Concentration Areas	Frank P. van den Heuvel, Peter W. de Langen, Karel H. van Donselaar, Jan C. Fransoo
353	2011	BOMN 2.0 Execution Semantics Formalized as Graph Rewrite Rules: extended version	Pieter van Gorp, Remco Dijkman
352	2011	Resource pooling and cost allocation among independent service providers	Frank Karsten, Marco Slikker, Geert-Jan van Houtum
351	2011	A Framework for Business Innovation Directions	E. Lüftenegger, S. Angelov, P. Grefen
350	2011	The Road to a Business Process Architecture: An Overview of Approaches and their Use	Remco Dijkman, Irene Vanderfeesten, Hajo A. Reijers
349	2011	Effect of carbon emission regulations on transport mode selection under stochastic demand	K.M.R. Hoen, T. Tan, J.C. Fransoo G.J. van Houtum
348	2011	An improved MIP-based combinatorial approach for a multi-skill workforce scheduling problem	Murat Firat, Cor Hurkens
347	2011	An approximate approach for the joint problem of level of repair analysis and spare parts stocking	R.J.I. Basten, M.C. van der Heijden, J.M.J. Schutten
346	2011	Joint optimization of level of repair analysis and spare parts stocks	R.J.I. Basten, M.C. van der Heijden, J.M.J. Schutten
345	2011	Inventory control with manufacturing lead time flexibility	Ton G. de Kok
344	2011	Analysis of resource pooling games via a new extenstion of the Erlang loss function	Frank Karsten, Marco Slikker, Geert-Jan van Houtum
343	2011	Vehicle refueling with limited resources	Murat Firat, C.A.J. Hurkens, Gerhard J. Woeginger
342	2011	Optimal Inventory Policies with Non-stationary Supply Disruptions and Advance Supply Information	Bilge Atasoy, Refik Güllü, TarkanTan

341	2011	Redundancy Optimization for Critical Components in High-Availability Capital Goods	Kurtulus Baris Öner, Alan Scheller-Wolf Geert-Jan van Houtum
339	2010	Analysis of a two-echelon inventory system with two supply modes	Joachim Arts, Gudrun Kiesmüller
338	2010	Analysis of the dial-a-ride problem of Hunsaker and Savelsbergh	Murat Firat, Gerhard J. Woeginger
335	2010	Attaining stability in multi-skill workforce scheduling	Murat Firat, Cor Hurkens
334	2010	Flexible Heuristics Miner (FHM)	A.J.M.M. Weijters, J.T.S. Ribeiro
333	2010	An exact approach for relating recovering surgical patient workload to the master surgical schedule	P.T. Vanberkel, R.J. Boucherie, E.W. Hans, J.L. Hurink, W.A.M. van Lent, W.H. van Harten
332	2010	Efficiency evaluation for pooling resources in health care	Peter T. Vanberkel, Richard J. Boucherie, Erwin W. Hans, Johann L. Hurink, Nelly Litvak
331	2010	The Effect of Workload Constraints in Mathematical Programming Models for Production Planning	M.M. Jansen, A.G. de Kok, I.J.B.F. Adan
330	2010	Using pipeline information in a multi-echelon spare parts inventory system	Christian Howard, Ingrid Reijnen, Johan Marklund, Tarkan Tan
329	2010	Reducing costs of repairable spare parts supply systems via dynamic scheduling	H.G.H. Tiemessen, G.J. van Houtum
328	2010	Identification of Employment Concentration and Specialization Areas: Theory and Application	F.P. van den Heuvel, P.W. de Langen, K.H. van Donselaar, J.C. Fransoo
327	2010	A combinatorial approach to multi-skill workforce scheduling	Murat Firat, Cor Hurkens
326	2010	Stability in multi-skill workforce scheduling	Murat Firat, Cor Hurkens, Alexandre Laugier
325	2010	Maintenance spare parts planning and control: A framework for control and agenda for future research	M.A. Driessen, J.J. Arts, G.J. v. Houtum, W.D. Rustenburg, B. Huisman

324	2010	Near-optimal heuristics to set base stock levels in a two-echelon distribution network	R.J.I. Basten, G.J. van Houtum
323	2010	Inventory reduction in spare part networks by selective throughput time reduction	M.C. van der Heijden, E.M. Alvarez, J.M.J. Schutten
322	2010	The selective use of emergency shipments for service-contract differentiation	E.M. Alvarez, M.C. van der Heijden, W.H. Zijm
321	2010	Heuristics for Multi-Item Two-Echelon Spare Parts Inventory Control Problem with Batch Ordering in the Central Warehouse	B. Walrave, K. v. Oorschot, A.G.L. Romme
320	2010	Preventing or escaping the suppression mechanism: intervention conditions	Nico Dellaert, Jully Jeunet.
319	2010	Hospital admission planning to optimize major resources utilization under uncertainty	R. Seguel, R. Eshuis, P. Grefen.
318	2010	Minimal Protocol Adaptors for Interacting Services	Tom Van Woensel, Marshall L. Fisher, Jan C. Fransoo.
317	2010	Teaching Retail Operations in Business and Engineering Schools	Lydie P.M. Smets, Geert-Jan van Houtum, Fred Langerak.
316	2010	Design for Availability: Creating Value for Manufacturers and Customers	Pieter van Gorp, Rik Eshuis.
315	2010	Transforming Process Models: executable rewrite rules versus a formalized Java program	Bob Walrave, Kim E. van Oorschot, A. Georges L. Romme
314	2010	Getting trapped in the suppression of exploration: A simulation model	S. Dabia, T. van Woensel, A.G. de Kok
313	2010	A Dynamic Programming Approach to Multi-Objective Time-Dependent Capacitated Single Vehicle Routing Problems with Time Windows	
	2010		
312	2010	Tales of a So(u)rcerer: Optimal Sourcing Decisions Under Alternative Capacitated Suppliers and General Cost Structures	Osman Alp, Tarkan Tan
311	2010	In-store replenishment procedures for perishable inventory in a retail environment with handling costs and storage constraints	R.A.C.M. Broekmeulen, C.H.M. Bakx

310	2010	The state of the art of innovation-driven business models in the financial services industry	E. Lüftenegger, S. Angelov, E. van der Linden, P. Grefen
309	2010	Design of Complex Architectures Using a Three Dimension Approach: the CrossWork Case	R. Seguel, P. Grefen, R. Eshuis
308	2010	Effect of carbon emission regulations on transport mode selection in supply chains	K.M.R. Hoen, T. Tan, J.C. Fransoo, G.J. van Houtum
307	2010	Interaction between intelligent agent strategies for real-time transportation planning	Martijn Mes, Matthieu van der Heijden, Peter Schuur
306	2010	Internal Slackening Scoring Methods	Marco Slikker, Peter Borm, René van den Brink
305	2010	Vehicle Routing with Traffic Congestion and Drivers' Driving and Working Rules	A.L. Kok, E.W. Hans, J.M.J. Schutten, W.H.M. Zijm
304	2010	Practical extensions to the level of repair analysis	R.J.I. Basten, M.C. van der Heijden, J.M.J. Schutten
303	2010	Ocean Container Transport: An Underestimated and Critical Link in Global Supply Chain Performance	Jan C. Fransoo, Chung-Yee Lee
302	2010	Capacity reservation and utilization for a manufacturer with uncertain capacity and demand	Y. Boulaksil; J.C. Fransoo; T. Tan
300	2009	Spare parts inventory pooling games	F.J.P. Karsten; M. Slikker; G.J. van Houtum
299	2009	Capacity flexibility allocation in an outsourced supply chain with reservation	Y. Boulaksil, M. Grunow, J.C. Fransoo
298	2010	An optimal approach for the joint problem of level of repair analysis and spare parts stocking	R.J.I. Basten, M.C. van der Heijden, J.M.J. Schutten
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296	2009	An exact approach for relating recovering surgical patient workload to the master surgical schedule	Peter T. Vanberkel, Richard J. Boucherie, Erwin W. Hans, Johann L. Hurink, Wineke A.M. van Lent, Wim H. van Harten
295	2009	An iterative method for the simultaneous optimization of repair decisions and spare parts stocks	R.J.I. Basten, M.C. van der Heijden, J.M.J. Schutten
294	2009	Fujaba hits the Wall(-e)	Pieter van Gorp, Ruben Jubeh, Bernhard Grusie, Anne Keller
293	2009	Implementation of a Healthcare Process in Four Different Workflow Systems	R.S. Mans, W.M.P. van der Aalst, N.C. Russell, P.J.M. Bakker
292	2009	Business Process Model Repositories - Framework and Survey	Zhiqiang Yan, Remco Dijkman, Paul Grefen
291	2009	Efficient Optimization of the Dual-Index Policy Using Markov Chains	Joachim Arts, Marcel van Vuuren, Gudrun Kiesmuller
290	2009	Hierarchical Knowledge-Gradient for Sequential Sampling	Martijn R.K. Mes; Warren B. Powell; Peter I. Frazier

289	2009	Analyzing combined vehicle routing and break scheduling from a distributed decision making perspective	C.M. Meyer; A.L. Kok; H. Kopfer; J.M.J. Schutten
288	2009	Anticipation of lead time performance in Supply Chain Operations Planning	Michiel Jansen; Ton G. de Kok; Jan C. Fransoo
287	2009	Inventory Models with Lateral Transshipments: A Review	Colin Paterson; Gudrun Kiesmuller; Ruud Teunter; Kevin Glazebrook
286	2009	Efficiency evaluation for pooling resources in health care	P.T. Vanberkel; R.J. Boucherie; E.W. Hans; J.L. Hurink; N. Litvak
285	2009	A Survey of Health Care Models that Encompass Multiple Departments	P.T. Vanberkel; R.J. Boucherie; E.W. Hans; J.L. Hurink; N. Litvak
284	2009	Supporting Process Control in Business Collaborations	S. Angelov; K. Vidyasankar; J. Vonk; P. Grefen
283	2009	Inventory Control with Partial Batch Ordering	O. Alp; W.T. Huh; T. Tan
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281	2009	The link between product data model and process model	J.J.C.L. Vogelaar; H.A. Reijers
280	2009	Inventory planning for spare parts networks with delivery time requirements	I.C. Reijnen; T. Tan; G.J. van Houtum
279	2009	Co-Evolution of Demand and Supply under Competition	B. Vermeulen; A.G. de Kok
278	2010	Toward Meso-level Product-Market Network Indices for Strategic Product Selection and (Re)Design Guidelines over the Product Life-Cycle	B. Vermeulen, A.G. de Kok
277	2009	An Efficient Method to Construct Minimal Protocol Adaptors	R. Seguel, R. Eshuis, P. Grefen
276	2009	Coordinating Supply Chains: a Bilevel Programming Approach	Ton G. de Kok, Gabriella Muratore
275	2009	Inventory redistribution for fashion products under demand parameter update	G.P. Kiesmuller, S. Minner
274	2009	Comparing Markov chains: Combining aggregation and precedence relations applied to sets of states	A. Busic, I.M.H. Vliegen, A. Scheller-Wolf
273	2009	Separate tools or tool kits: an exploratory study of engineers' preferences	I.M.H. Vliegen, P.A.M. Kleingeld, G.J. van Houtum
272	2009	An Exact Solution Procedure for Multi-Item Two-Echelon Spare Parts Inventory Control Problem with Batch Ordering	Engin Topan, Z. Pelin Bayindir, Tarkan Tan
271	2009	Distributed Decision Making in Combined Vehicle Routing and Break Scheduling	C.M. Meyer, H. Kopfer, A.L. Kok, M. Schutten
270	2009	Dynamic Programming Algorithm for the Vehicle Routing Problem with Time Windows and EC Social Legislation	A.L. Kok, C.M. Meyer, H. Kopfer, J.M.J. Schutten

269	2009	Similarity of Business Process Models: Metics and Evaluation	Remco Dijkman, Marlon Dumas, Boudewijn van Dongen, Reina Kaarik, Jan Mendling
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