

# Characterizing multi-actor decision-making towards crisis situations in DementiaNet networks



**Radboud Universiteit Nijmegen**

Name: Student  
number: Manon Dielissen  
S1065652

E-mail: [manon.dielissen@ru.nl](mailto:manon.dielissen@ru.nl)

Supervisor: F. Bekius  
2<sup>nd</sup> supervisor: K. Van den Oever  
Date: 30 September 2022

## Table of contents

<b><u>1. INTRODUCTION</u></b>	<b><u>3</u></b>
<b><u>2. THEORETICAL FRAMEWORK</u></b>	<b><u>9</u></b>
2.1. MULTI-ACTOR DECISION-MAKING IN NETWORKS	9
2.2. GAME THEORETICAL MODELS	11
2.3. CRISIS SITUATIONS	20
2.4. CONCEPTUAL MODEL	22
<b><u>3. METHODOLOGY</u></b>	<b><u>23</u></b>
3.1. DATA COLLECTION	23
3.2. DATA ANALYSIS	26
3.3. LIMITATIONS	29
3.4. ETHICAL CONSIDERATIONS	29
<b><u>4. RESULTS</u></b>	<b><u>31</u></b>
4.1. CASE 1: DEMENTIANET NETWORK A	31
4.2. CASE 2: DEMENTIANET NETWORK B	36
4.3. CASE 3: DEMENTIANET NETWORK C	41
4.4. CONCLUDING REMARKS	44
<b><u>5. COMPARISON</u></b>	<b><u>46</u></b>
5.1. COMPARISON BETWEEN THE CASES STUDIES ON SIGNALS/EVENTS AND DECISION MOMENTS	46
5.2. COMPARISON GAME THEORETICAL MODELS	48
5.3. RELATIONSHIP DECISION-MAKING MOMENTS/ELEMENTS AND GAME THEORETICAL MODELS	50
<b><u>6. CONCLUSION AND DISCUSSION</u></b>	<b><u>51</u></b>

<b>6.1. CONCLUSION</b>	<b>51</b>
<b>6.2. DISCUSSION</b>	<b>51</b>
<b><u>7. REFERENCES</u></b>	<b><u>55</u></b>
<b><u>8. APPENDICES</u></b>	<b><u>59</u></b>
<b>8.1. APPENDIX I: CRISIS DEFINITIONS FROM SEVEN ARTICLES WITH CITATIONS</b>	<b>59</b>
<b>8.2. APPENDIX II: CODEBOOK</b>	<b>60</b>
<b>8.3. APPENDIX III: INTERVIEW GUIDE IN DUTCH</b>	<b>63</b>

## 1. Introduction

With the aging population and the increasing number of people with dementia, the pressure on healthcare and its professionals is rising (Litjens et al., 2021). It is hard to offer the right healthcare to patients with dementia, especially when they are still living at home. It requires care from relatives and healthcare professionals (Leggett et al., 2018). It is a challenge to offer good quality healthcare since there are several healthcare professionals involved. Those healthcare professionals are present to help the patient as best as possible, but they have different tasks and responsibilities. Therefore, DementiaNet was founded to “facilitate the development of interprofessional networks of primary care professionals from the medical, health and social care services” (Oostra et al., 2021).

DementiaNet is an organization with local network healthcare for elderly people with Dementia and is the overarching organization that provides a program for the DementiaNet networks. The networks who participate in the program are local networks with the involved healthcare professionals. DementiaNet provides a program aimed at building sustainable local network, that interconnect healthcare professionals, to optimize the quality of healthcare for people with Dementia, but also for their relatives (Van den Bergh et al., 2021). The aim of the DementiaNet as an organization is the following (Richters et al., 2017): *“Reduce the burden of dementia on healthcare services and society through implementation and facilitation of integrated network-based care with increased dementia expertise.”* Each DementiaNet networks contains a local interprofessional team which consists of healthcare professionals different domains like medical, care and social (Nieuwboer et al., 2017).

At this moment, DementiaNet is investigating the factors that are determining the successfulness of DementiaNet networks, because DementiaNet networks who follow the program of DementiaNet for a couple years, showed a decline in situations where health care professionals had to act and decide urgently on behalf of a patient (Van den Bergh et al., 2021). In this research, such a situation is mentioned as a crisis situation. However, there is limited evidence that crisis intervention teams for people with Dementia in crisis situations show effectiveness (Streater et al., 2017). Nevertheless, by building these DementiaNet networks, the aim is still to contribute to improving the quality of healthcare for people with Dementia. A crisis which is specifically related to dementia is defined as: “a process where there is a stressor(s) that causes an imbalance requiring an immediate decision which leads to a desired outcome and therefore crisis resolution. If the crisis is not resolved, the cycle continues” (Vroomen et al., 2013). Crisis situations with people with Dementia can cause hospitalization or institutionalization, which is a burden on the healthcare systems (Ledgerd et al., 2016).

Regarding to this thesis and DementiaNet, a crisis situation means in practice a situation where it is not achievable anymore to let a patient live at home, due to stressors from the patient or relatives, so an intake to a care home is required.

DementiaNet offers support to the DementiaNet networks about their communication and collaboration, in order to optimize the quality of healthcare for people with Dementia, but also for the relatives of the patient, in order to the patient who can continue to live at home for as long as possible. Important factors that contributed to this quality of healthcare were stability of a network's composition, getting to know each other's expertise, participation of a general practitioner and having a capable network leader (Oostra et al., 2021). Another study that examined network leadership in complex interactions stated that decentralized and direct interaction may help improving the operation of decision making (Wang, 2016). Decisiveness is together with enthusiasm of healthcare professionals in a DementiaNet network considered by healthcare professionals who are participating in a DementiaNet network as the most important characteristic (Nieuwboer, 2019). Therefore, the healthcare professionals who are part of a DementiaNet network can select a training topic like shared decision making (Nieuwboer et al., 2017).

So, the interaction between healthcare professionals within the DementiaNet networks plays a large role in the multi-actor decision-making regarding the quality of the healthcare, since the DementiaNet networks consists of multiple actors which are mostly healthcare professionals. Healthcare professionals have to collaborate and communicate in crisis situations about the decisions that have to be made towards a crisis situation with the best intentions regarding the people with Dementia. The collective decision-making of the healthcare professionals is influenced by the fact that parties within a network have different interests, even though these parties pursue the same goal. These parties participate in consultation and negotiation in order to make a collective decision. In DementiaNet networks, the healthcare professionals represent these parties. The health care professionals in DementiaNet networks are, just as other networks, mutually dependent with conflicting interests. Even though the healthcare professionals have to cooperate within the decision-making (De Bruijn & Heuvelhof, 2002). This refers to the lens of multi-actor decision-making in networks which is used in this study and will be highlighted further in the next chapter. In this study, the decision-making in networks is just one of the theoretical lenses that form the framework of this study.

Since DementiaNet networks contain multiple interacting components of interdependent relations between issues and actors in a healthcare setting, the networks are complex. Therefore, game theoretical models are suitable for analyzing these interactions in the decision-making

between actors in the DementiaNet networks (Bekius, 2019; De Bruijn & Ten Heuvelhof, 2018; Richters et al., 2018). There are three elements on complex decision-making that should be considered in systems where multiple actors are participating in order to approach game concepts. The first element that should be considered is seeing a decision-making process as a game. There are multiple actors who show strategic behavior and follow particular rules of a game in order to reach a desired outcome or consensus. Second, a descriptive analysis takes into account context and dynamics of the decision-making process in terms of game elements. Lastly, the basis for an intervention in behavior of the actors is an analysis of the decision-making process. Game theoretical models is one tool to describe behavior within interactions during decision-making and are specifically relevant when characterizing decision-making processes which are complex, which means there are multiple actors with different interests. By identifying several game theoretical models in the decision-making process, a representation and explanation of the dynamics in the decision-making process can be made, because there is an interest in interactions in the several game theoretical models. Despite that the multiple actors have different interests, game theoretical models aim to find an optimal outcome or consensus, even if the responsibilities of the multiple actors are different and therefore perceive a different outcome. Since game theoretical models are not presenting the games in a formal way, the approach with game theoretical models is suitable for using in interventions with multiple actors in the decision-making process (Bekius et al., 2022). Game theoretical models can thus be applied and complex decision-making can be analyzed, since DementiaNet networks are independent networks which include multiple actors (health care professionals) with different incentives, which are criteria for applying game theoretical models (Bekius, 2019). The specific theoretical game concepts that are used in this study will also be elaborated in the next chapter, where the concepts form another perspective for this study.

The aim of this research is to characterize the multi-actor decision-making process towards crisis situations between healthcare professionals in DementiaNet networks by using game theoretical models. And especially because those healthcare professionals are multiple actors with different incentives, but with a common goal. Therefore, the social relevance is to provide knowledge about the appearance of the decision-making process towards crisis situations and characterizing which theoretical game model are present. Thereby, this research provides insight in decision-making patterns that exist between healthcare professionals, the patient and other stakeholders involved. These insights can help improving the collaboration within the DementiaNet networks and contribute to an improved quality of healthcare. The study is

explorative, but the expectation is that certain game theoretical models/patterns are present in the decision-making within the DementiaNet networks towards crisis situations.

However, the reason/need for conducting this research is that DementiaNet themselves conducted a study about the collaboration within DementiaNet networks towards a crisis situation, but this is done through a general perspective of DementiaNet and never from a perspective that takes into account the complexity of the decision-making within the DementiaNet networks over time, even though the awareness of the presence of multiple actors (health care professionals) with different incentives. The former researches that have been conducted regarding crisis in Dementia and DementiaNet are about certain characteristics of DementiaNet networks have been investigated and there is research that has been done about how care integration matures in interprofessional dementia care networks (Nieuwboer, 2019). This study identified factors associated with network maturation. Thereby, earlier research is done about crisis situations in Dementia cases (Vroomen et al., 2013). So, these are studies that investigated the collaboration from a medical and substantive perspective, but there was not analyzed on the behavior of the DementiaNet networks during decision-making processes over time. By doing so in this thesis, the collaboration can be analyzed through a new point of view. Thereby, game theoretical models help characterizing decision-making over time, which contributes to the dynamics and complexity of the decision-making (Bekius, 2018). The game theoretical models are never been applied on these kinds of networks before. By these kinds of networks are meant the DementiaNet networks towards crisis situations, so networks in Dementia healthcare. However, game theoretical models are applied in other studies where network decision-making is analyzed. For example, applying game theoretical concepts to understand and support complex decision-making in networks has been conducted for the Dutch Railway sector (Bekius et al., 2018). Another study is a study on the development and application of game theoretical models in the decision-making in engineering is also conducted (Hipel et al., 1993) (III). So, there is literature available about the characteristics of the DementiaNet networks and applying game theoretical models in networks. Other research which is relevant to this study, is about decision-making in healthcare. There is literature available about healthcare professionals who make decisions on behalf of the patient under uncertain conditions (Kaplan & Frosch, 2005). Other literature that applies to this study is the study of Charles & DeMaio (1993), which is about the decision-making context, the level of participation of the healthcare professionals and role perspectives in decision-making in healthcare (IV). So, by combining all these topics and perspectives, this thesis will fill the gap in the literature between the appliance of game theoretical models in decision-making in

networks, the characteristics of a DementiaNet network, and decision-making in crisis situations in Dementia cases over time. Therefore, the gap in the literature will be filled by characterizing the decision-making process towards a crisis situation in terms of interactions between healthcare professionals by applying game theoretical models to characterize the decision-making. This is, according to our knowledge, never been studied before. So, this study contributes theoretically by putting another theoretical framework, namely game theoretical models, to decision-making. Game theoretical models were used for decades in different domains as is mentioned in the previous Alinea, but never in a complex decision-making setting of patients with Dementia where multiple actors (health care professionals) participate. Thereby, this thesis is going further than letting game theoretical models describe decision-making situations, because that is not new.

The game theoretical models will add knowledge on how to look at the decision-making process of DementiaNet networks towards a crisis situation, from a complex decision-making view. The game theoretical models might show new insight on the collaboration during the decision-making process towards crisis situations in DementiaNet networks, because it is a new perspective of looking at these networks, because the game theoretical models will help recognize patterns in the decision-making process of DementiaNet networks that the actors of the networks and DementiaNet self were not aware of. When the game theoretical models show these patterns, this understanding and awareness might help improving the collaboration and decision-making. Thereby, new information about game theoretical models and complex decision-making in networks will be added to the literature after this thesis, since more knowledge is gained. Hence, this study will contribute to the existing literature which is relevant to this study by (I) adding more characteristics by regarding the decision-making process of the interactions between healthcare professionals; (III) applying game theoretical models in a network field which is never used before, namely a network in Dementia healthcare; (IV) specify decision-making in healthcare on Dementia in particular. It is not the main focus of this study, but different relationships between those above-mentioned topics. For example, if there occur relationships between the moment a decision is made often which is associated with a particular game theoretical model, then this will be mentioned in this thesis too.

To reach the goal of this study and fill the gap in the literature, the following question will be answered: “How can game theoretical concepts characterize the process of decision-making towards crisis situations in DementiaNet networks?”

To answer this question, the following question will be investigated:



1. What does the decision-making process towards crisis situations in terms of interaction between actors look like over time in the DementiaNet networks?
2. Which theoretical game concepts are present at which moment in time in the interaction between actors in decision-making processes towards crisis situations?
3. Comparing multiple case studies of decision-making processes towards crisis situations in DementiaNet networks, which patterns can be observed?

So, the next chapter will show a representation of the topics in the theoretical framework that are mentioned before (crisis situations in Dementia, decision-making in networks and game theoretical models) and these will be used to investigate the above-mentioned steps. Thereafter, the methodology on how this study is conducted is elaborated. After that, the results will show a created timeline to determine what happens at which point in time and in which DementiaNet network, together with the characterization of each step in the timeline with game theoretical models. In general, this will be an explorative study. If the game theoretical models have been characterized the collaboration moments of each DementiaNet network in the analysis, the networks will be compared to each other in the fifth chapter. This will be done in order to find generic patterns in the decision-making process towards a crisis situation in DementiaNet networks. The comparison will be followed by a conclusion, discussion and a recommendation about further research. The appendices can be found at of this thesis.

## **2. Theoretical framework**

This research solely started with a literature review in order to help defining the following subjects: multi-actor decision-making in networks, game theoretical models and crisis situations in Dementia. However, this research does not aim to contribute to the theory through merely the use of a literature review. Therefore, this chapter will introduce the theoretical framework which is derived from the literature, but will be used during this study of describing decision-making processes of DementiaNet networks towards crisis situations by using the game theoretical models. The first two topics in the theoretical framework are about decision-making in networks and game theoretical models. These topics will be used as theoretical framework for this study, but will also build further on the theory in this study. The last topic is about crisis situations in Dementia is used as a theoretical base, but will not be extended during this research. This theoretical framework based on the concepts which derived from the main- and sub questions.

### ***2.1. Multi-actor decision-making in networks***

The first step is to define multi-actor decision-making in networks. This is an important topic when looking at the decision-making in DementiaNet networks towards crisis situations. Each network can be characterized by a collection of rules, which form a network's social infrastructure. Those rules survive, because they are an alternative for the time-consuming decision-making processes (Klijn, 2001). Group decision-making can be seen as a process where a group of professionals interact with the intention of choosing the best alternative out of the available decisions (Urena et al., 2019).

There are several elements that form criteria for multi-actor decision-making in complex networks. Complex decision-making is a multi-actor process where occur complex interactions between multiple actors (Kickert et al., 1997). Networks are able to explain mostly the reason why processes of decision-making are complex. According to Bekius (2019), there are several criteria of complex decision-making in a network: (I) interdependency between actors; (II) multiple actors with a variety of goals and incentives; (III) the relations between the multiple actors might be hierarchical, usually between two actors; (IV) the aim of the process is to reach a collective decision; (V) the strategic behavior of an individual plays a role too; (VI) the process of decision-making is dynamic.

Regarding this study, a distinction has been made between three different levels of complexity. The different levels of complexity are founded by looking into the medical

environment the patient lives in and needs. The distinction in different levels is made, based on the available data from DementiaNet. This data will be elaborated in the next chapter. The first level of complexity is the complexity around the patient with Dementia. Within this complexity, the content of the Dementia case of the patient and the problems, situations and conditions of the patients are part of this complexity. The second level of complexity includes the actors from the patients' network. This might be the relatives of the patient, but also the network of health care professionals and actors in the personal life of the patient. There is also a third level of complexity, which contains the context of the Dementia case of the patient and the (health care) system the patient is part of. The three different levels of complexity can be found in the figure below. To contribute to the (main) questions of this study, the first two levels that will be used in the analysis of this research. However, the focus is on decision-making processes of the health care professionals, which are part of level two and will highlighted during the coming chapters. These different levels of complexity can be found in the figure below this paragraph (Figure 1).

Decision-making in networks focuses on the consensus reaching process and the selection process. Actors in the network might need to adjust their opinions for the decision-making, in order to reach consensus. Trust relationships are important factors when speaking of the consensus reaching process. However, the trust relationships are evolving dynamically between actors in the network. This can influence the consensus process. Other factors which have an effect on trust relationships are feedback mechanism, aggregation and incomplete preference estimation (Dong et al., 2018).

So, for implementation of this research, the elements that will be used from this theoretical part are the six criteria for complex decision-making in a network and the first two levels of complexity. Regarding the levels of complexity: the first two levels are of use for the general analysis, but the main focus is on the second level of complexity where the health care professionals are part of.

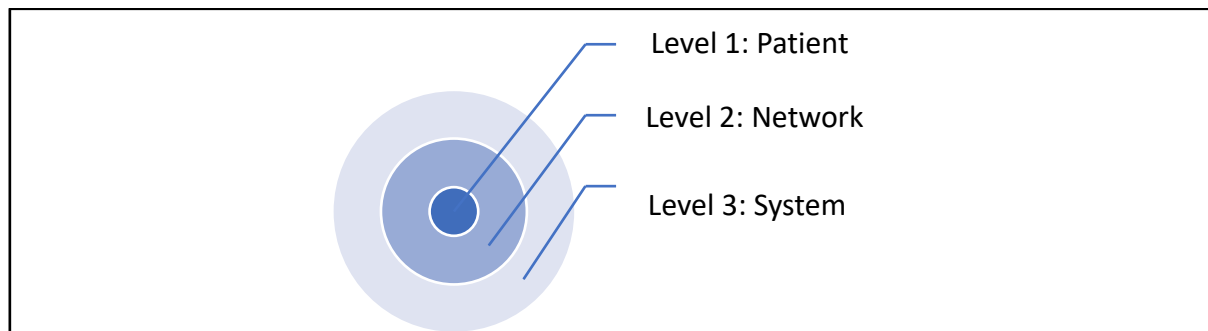


Figure 1 - Levels of complexity in decision-making of interprofessional collaboration towards crisis situations in DementiaNet networks.

## 2.2. Game theoretical models

As mentioned before, game theoretical models are one application on decision support methods. The processes of the decision-making can be remarked as ‘games. Game theoretical models are able to describe interactions between multiple actors while reaching a certain outcome during the decision-making process. Game theoretical models are just one of the methods that are able to characterize multi-actor decision-making, but since DementiaNet networks consist of multiple healthcare professionals, there are multiple actors who make decisions together while having different incentives (Bekius, 2019). Thereby, the DementiaNet networks are interdependent networks where complex decision-making can be characterized. Besides, the decision-making process is dynamic, as every decision is based on the current activities and proceedings, the actors within the networks are reaching for the same goal, while the behavior of the individual strategy also affects the decision-making. So, game theoretical models can be used to describe and characterize the decision-making within DementiaNet networks (Bekius, 2019). Seven game concepts are selected to “*describe the interactions between actors in complex decision-making situations including and representing interdependencies, actors’ agency, and path dependency of decisions*”. These seven are selected, because they occur frequently in decision-making in other networks than DementiaNet networks. Thereby, these seven are applicable to complex decision-making processes which include multiple actors with different incentives and a common goal. (Bekius, 2019). These seven game theoretical models are summarized in Table 2, which can be found at the end of this paragraph (Bekius et al., 2022). The seven game theoretical models include elements that help investigating complex decision-making processes: the information during the game, the actors that participate in the game, together with their actions and payoffs (Rasmusen, 2007). The theoretical models are elaborated below, by making the specific elements per game clear. How does each game apply on decision-making and how seems that related to decision-making

(towards crisis situations) in DementiaNet networks regarding the literature? These elements can be used to identify and characterize this decision-making. At the end of describing each theoretical game model, an example of the game is given regarding a Dementia case. This includes small examples and is based on the literature (Nieuwboer, 2019; Nieuwboer et al., 2017; Oostra et al., 2021). At the end of this paragraph, a table (Table 1) is shown with a summary of the definitions per game and is supplemented with examples. This table is, together with the elements of the games that are described below, the basis for the codebook and the analysis of this research.

- Multi-issue game

The first theoretical game concept that will be mentioned is the Multi-Issue game (M-I game). A situation with multiple actors with different incentives from the same network of interdependencies can be characterized by this game. Despite the different incentives, the actors aim to reach a common goal (Bekius, 2019). Since multiple professionals from DementiaNet networks are involved in caring for patients with Dementia and trying to reach the same goal, namely taking care for the people with Dementia, cooperation and communication is required (Nieuwboer, 2019). Therefore, it is likely that the Multi-Issue Game will occur towards a crisis situation where multiple professionals have to collaborate. Because there are large numbers of actors, it intensifies the moment when a decision is need to be made. When there are too many actors, it can become too complex and the decision-making process can be delayed. Besides, the number of issues and scenarios will increase when there is a large number of actors. Therefore, the possibility arises that the complexity increases further and the decision or situation will not be reflected or solved (Roungas et al., 2019).

To give an impression about the Multi-Issue Game, an example is drawn. Imagine there is patient with Dementia who is living alone. This patients at one time forgets to use his walker to walk to the kitchen, which causes the patient to fell and injures his leg. The patient has a network where the general practitioner and the physiotherapist belong to its network. They all share a common goal: that the patient feels well. However, they have different incentives to reach this goal. The physiotherapist wants to reach this goal by giving the patient exercises to loosen his leg and advice on how to use his walker. The general practitioner has the idea that this kind of accidents will happen more often, so the general practitioner wants the patient to go to a nursing home where he has 24-hour care. But the patient thinks he feels the best

when he can just stay at home and stick to his own habits. Therefore, every player in this game (patient, general practitioner and physiotherapist) causes to add more scenarios and the situation gets stuck in a deadlock. Reaching consensus and resolving the deadlock is necessary if the common goal is achieved.

- Principal-agent game

The second game theoretical model is the principal-agent game (P-A game). This game is about the relationship between the principal who is dependent on the agent, since the agent has the knowledge and expertise on a certain situation or decision. Therefore, a hierarchical relationship is represented by the difference in the power position between the principal and the agent. In most cases, the principal and the agent have different or conflicting interests. Because the agent has more knowledge on a certain situation or decision, asymmetric information occurs. It is up to the agent if this person accepts or rejects the proposal of the principal to gain the knowledge of the agent. Hence, the principal is entirely dependent on the agent. When the agent decides not to share the knowledge, the relationship between the agent and the principal might be affected in a negative way (Bekius, 2019). Therefore, the P-A game can be seen as “a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent”. There are two ways to reduce the agent’s risk by the principal. The first way is monitoring the performance of the agent and applying sanctions based on the information that is gained during the monitoring. The other way is to connect the performance of the agent to positive incentives, so the agent will bind to fulfilling the aims of the principal (Buchanan, 1988).

This game happens when for example when a general practitioner and a district nurse have to make a decision about a patient based on the information from the reports. In general, a general practitioner has a higher position in the hierarchy than a district nurse. The district nurse has access to the report system from the district nurse network. In this system are the reports with the information from the district nurses of the provided care. The patient mentioned that he does not want to acquire care anymore and he seemed anxious when telling the general practitioner. The general practitioner suspects that something happened during the home care from the district nurses. To be sure, the general practitioner needs the reports from the district nurses in order to make a decision whether it is rational to end the home care, but only the district nurses have

access to these reports. So, in this case, the principal is the general practitioner and the district nurse is the agent. On the one hand, the general practitioner has more power. But on the other hand, the district nurse has more information and knowledge about the patient. In this case, the district nurse has the tools to argue and convince the principal with the information the district nurse has.

- Cascade game

In case of uncertainties, the tendency of intelligent actors can be showed by the Cascade Game (CC) (Bekius, 2019). An intelligent actor represents an entity which is able to make independent decisions and is given an ultimate goal (Tserkovny, 2022). The Cascade Game follows the decisions of other actors independently of the decision's quality of the content. Those decisions are made at different levels or parts of an organization. Between the decisions occurs path-dependency and they are taken sequentially. One actor at a certain level in the organization provides input for a decision that will be taken in the next level of the organization. The decisions are based on private information and observed decisions from other actors. Therefore, this game can also explain irrational decision-making and can specify how information leads to a final decision, even if it the cascade of decisions is wrong (Bekius, 2019). Actors must make their decisions based on their own private noisy signals and their knowledge about prior choices of other actors. This means, that an actor is dependent on the revelation of another actor's private information (Berger et al., 2018).

An example of a Cascade Game is when a patients' relative notices that the patient shows different behavior. The relative does not trust the situation and decides to call the district nurse to ask for help. The district nurse comes by to check on the patient and recommends to sign the patient up for a district nurse. The relative decides to do so, but when the specialist elderly care stops by for a visit, the specialist elderly care mentions that the situation of the patient is completely normal and usual for people with Dementia. The advice from the specialist elderly care is therefore to do nothing so far, because as long the patient stays at home, the situation will stay stable for a long time. So, it is an either-or decision. Either the relative will follow the advice of the district nurse and sign the patient up for a district nurse, or do nothing, as told by the specialist elderly care. So, the actor makes the decision itself independently, but tends to follow others which creates this cascade-effect. The first actor who made a choice has impact on following actors.

- Hub-spoke game

The Hub-Spoke Game describes the decision-making between multiple actors. These actors are “the spokes”. Those spokes have different incentives and are steered by one actor, which is “the hub”, through a command-and-control style. This game develops a stimulus for inflated claims, where the actors can reach consensus and develop strategical issues for the hub. So, one main actor has determined a decision or a plan for the other actors that this one main actor need to convince. This means that there is a hierarchical relationship between the one main actor (the hub) and the other actors (the spokes), for example between the general practitioner and the district nurses. The one main actor will negotiate with every other actor individually, in a sequential order. Thereafter, the spokes are able to communicate with each other, which might influence the negotiations. After several negotiations, a decision will be made. The risk of this game is that it might create distance and separations between actors, because non-cooperative behavior and limited amount of learning are characteristics of the Hub-Spoke game (Bekius, 2019). Another important factor from the Hub-Spoke game is that the game does not provide a combination of possible issues. There is one possible option of which the hub needs to convince the spokes (Bekius et al., 2016).

Often, the general practitioner in the network is seen as the network leader within a network and can therefore be seen as the “Hub” in this game. Pretend that the district nurses provide the home care, after the general practitioner allows. At this moment, a patient with Dementia acquires home care where the patient will be showered every morning after getting out of bed. Since the patient became completely incontinent, the general practitioner plead for shower the patient twice a day due to hygiene: after getting out of bed and before going to bed in the evening. It is dedicated to the district nurses to shower this patient twice a day. However, the district nurses are very busy with a lot of patients and due to lack of time the district nurses decide to sometimes skip the shower in the evening. Now, it is possible for the general practitioner to negotiate and make agreements with every district nurse separately and propose a unique deal to each. This could be for example that the general practitioner calls the patient every day to ask if the patient got a shower the last day and which nurse did the care that night, in order to tell the supervisor of this particular nurse about the malfunctioning practices of this nurse. Another option is to step up to the supervisor anyway and bring this issue up, so



all nurses will be warned and it will not happen again that the patient get showered just once a day.

- Volunteer's dilemma

The volunteer's dilemma (VD) can be applied on decision-making in networks when one or more actors take their responsibility to prevent a worst-case scenario for the group from happening. Actors often have a passive attitude, which can increase the risk of having a bad outcome of the process of decision-making. Actors are waiting for another actor to make a decision. Since all actors share a common responsibility, individuals might volunteer to take the decision, to prevent personal blame. It is also possible that no one volunteered, so there was not any decision made (Bekius et al., 2018). Many decisions have to be made, especially towards crisis situations. District nurses have to work together and it might occur that one nurse sits back till another nurse makes a decision. Every actor in that is involved in the decision-making would rather avoid the costs of volunteering to exploit public goods which are produced by others. When public goods are not produced at all, all actors have to pay a higher cost than the costs of volunteering. When the costs of cooperating and the function of the public goods change, the results might also change. It is also possible to reach an equilibrium during the volunteers dilemma (Archetti & Scheuring, 2012). When no one takes action, it will result in a loss for everyone. But when someone does volunteer, this person might be blamed for it. However, a volunteer might also be followed by other actors. Because multiple actors follow the volunteer, the volunteer will not be blamed (Bekius, 2019).

So, to get a better picture of this game: imagine there are several health care professionals involved to a patient with Dementia who still lives at home. This are the general practitioner and several district nurses. They all noticed that the behavior of the patient changed. There was a decline in mobility, the patient was often brought home by neighbors due to confusion and one time the patient forgot to turn off the gas after cooking. Despite noticing these changes, no health care professional did take the time or effort to investigate the options taking into account the wellbeing of this patient. They all showed wait-and-see behavior. This finally caused a crisis intake, because no one took action when it was needed so a crisis situation could have been prevented. Therefore, the wait-and-see behavior led to a loss for everyone, because a crisis situation is the least favorable option for all involved parties.

- Diners dilemma

A Diner's dilemma (DD) is a symmetric, non-strictly competitive and a non-cooperative game. The difference between the marginal costs and marginal benefits determines the value of the payoff (Anand et al., 2020). In this game, multiple actors have to come to an agreement about the decision-making in terms of collaborations or mutual interactions. For the actors, it is attractive to be the first person that profanes the agreements. The risk of this game, is that actors benefit from the other actors by free-riding. They will do this by taking advantage of the actors who do stick to the agreements. It can also turn out in a way that is beneficial for all actors when everyone sticks to the agreement, but mostly there is an actor that profanes the agreement. This causes that the costs for the other actors will become higher than expected (Bekius, 2019). The actors of this game have mostly conflicting interests and act just within their own concerns (Lake & Wong, 2007).

Imagine there is a patient with Dementia who acquires home care. This patient sees a lot of nurses through the week who all come to provide home care. There is made an agreement between these nurses about this patient. The agreement is to encourage the self-reliance of this patient for as long as possible. This means that the patient has to provide her own meals, dress herself up and walk around the house with a walker. Some nurses keep up to the agreement, but others pamper the patient due to pity or a lack of patience. Because it is a fact that letting the patient do all these above-mentioned things by herself, it will take more time. It is sure that the patient benefits the most when the nurses encourage the self-reliance, but this means that the nurses who break the agreement, can benefit from the other nurses. The reason for that is that this self-reliance motivates that the patient can do as much as possible by herself, which will stimulate and foster her life at her own home. So, the profit is high for the nurses who did break the agreement, because it did not cost them any effort. While the credits should go to the other nurses who did put a lot of effort in this patient.

- Battle of the Sexes

In a Battle of the Sexes (BS), two actors have to make decisions totally dependent on each other. These actors have a common goal, but other motives. In order to make a decision and reach a consensus, one of the actors have to adapt to the other motive (Bekius, 2019). In a Battle of the Sexes game, information is an important factor. When

the information is incomplete, communication and mediation might be necessary to reach an optimal tradeoff (Banks & Calvert, 1992). The context of the Battle of the Sexes game, is that both actors have the same goal, but they want to achieve this goal by other interests. However, they make their decision simultaneously and they are not able to communicate about their decision and the decision-making process. The actors have to anticipate upon the decision of the other actor. Every actor has two possible options which they can choose during their decision-making. So, in the end, there are four possible outcomes. Choosing the same option, will lead to a Nash-Equilibrium. The risk of this game is that there is no optimal outcome, since one actor always have to adapt to the others preference (Bekius, 2019).

There is a man living with Dementia at home by himself. At one point, health care professionals and relatives conclude that this man has to go to a nursing home, since he is not able to take care of himself anymore. This man has one son and one daughter, who both live an hour away from each other. There are two nursing homes who have a place for the man to live, one is near the daughter and the other is near the son. Both children of the man visit their father often and would like to have their father as close as possible to them. It is up to the two children to decide where their father will be living. Daughter and son share the same goal, namely getting father in the best nursing home. However, their incentives are different. There is just one possible outcome, so in order to reach a decision, one of the two children has to adjust to the others preference. There is no optimal outcome, which might delay the decision-making process, since it is not easy to make a decision.

So, the theoretical game models that are described above are mentioned because they seemed to occur often during decision-making in networks, like for example in the Dutch Railway Sector (Bekius et al., 2018). Game theoretical models often help to simplify a situation on one game and explain only a part of the complex decision-making process, which is necessary if this process needs to be characterized. Game theoretical models are able to do that, because they describe the behavior of interaction(s) between multiple decision-makers that can be seen as actors in a network. Therefore, looking at multiple game theoretical models will represent the decision-making process and its dynamics.

Definition of game theoretical models	Example
Multi-Issue Game	
“The Multi-Issue game (M-I game) characterizes a situation with multiple actors having different incentives. They aim to reach consensus in a decision-making process that was in a deadlock in the first place” (Bekius et al., 2018).	Multiple health care professionals having the same goal, namely creating the best wellbeing for a patient with Dementia, but they have all different incentives. Like a general practitioner want to reach the wellbeing by applying medicines, while a district nurse just wants more ours to provide care for the patient.
Principal-Agent Game	
“The Principal-Agent game (P-A game) represents a hierarchical relation between principal and agent. The principal is dependent on the agent because of its knowledge and expertise regarding a certain decision. The game explains the power position of the subordinate, i.e., the agent” (Bekius et al., 2018).	When there is a hierarchical relationship between the general practitioner and the district nurse. The general practitioner depends on the district nurse, because the district nurse has more knowledge than the general practitioner since the district nurse has access to another report system.
Cascade Game	
“The Cascade Game (CG) shows the tendency of intelligent actors, in case of uncertain- ties, to follow the decisions of others independently of the quality of the content of the decisions” (Bekius et al., 2018).	A relative of a patient with Dementia has to follow the decisions of the health care professionals independently of what kind of decision it is. There is path-dependency between the decisions, which are taken in a sequence. This means that every decision the relative has to follow, will be followed by basing the next decision on the decision of another health care professional.
Hub-Spoke Game	
“The Hub-Spoke game (H-S game) describes a situation with multiple actors (spokes) having different incentives who are steered by one actor (hub) via a command-and- control style. The game creates an incentive for inflated claims, the spokes can reach agreements among each other and create strategic issues for the hub” (Bekius et al., 2018).	A general practitioner, who can be seen as the hub is the network leader, and the district nurses are the spokes. The general practitioner has another incentive with a patient than the district nurses. Despite that the nurses are steered by the general practitioner; they still keep the control and do the things how they want to do it. Therefore, the district nurses can reach an agreement among each other, where the general practitioner has an issue, since it cannot be justified to the patient with Dementia.
Volunteers Dilemma	
“The Volunteers Dilemma (VD) explains why one or more actors take the responsibility for the group to prevent a worst-case scenario from happening. Performing wait-and-see behavior is beneficial, but increases the risk of a bad outcome of the decision-making process” (Bekius et al., 2018).	A general practitioner, a specialist elderly care and district nurses are all in the same network. They share the responsibility for a patient with Dementia. All of them mentioned the patient become worse, but none of them took action. They all showed wait-and-see behavior till the situation escalates and the patient received a crisis intake.
Diners Dilemma	
“The Diners Dilemma (DD) represents a situation in which multiple actors come to an agreement about the process of decision-making (e.g. collaboration and mutual interac- tion). Due to the agreements made it becomes attractive to be the first one to violate the agreements” (Bekius et al., 2018).	Several district nurses have to provide care for a patient with Dementia and they all have to stimulate the self-reliance. That is the agreement that was made between the nurses. Some keep to the agreement, others not. Self-reliance results in a better wellbeing of the patient. It is attractive for a district nurse to not keep to the agreement, because that requires less effort. However, the first nurse who violate the agreement, can still benefit from the other nurses who do keep to the agreement.
Battle of the Sexes	

<p>“The Battle of the Sexes (BS) describes a case in which two actors are completely dependent upon each other. Moreover, they share the same goal, but have different incentives. In order to reach a decision one of the two actors needs to adopt the others idea” (Bekius et al., 2018).</p>	<p>Two children of a patient with Dementia have to decide in which nursery home their father will be getting an intake. One nursery home is close to one child and the other nursery home is close to the other. They both want their father as nearby as possible. There is only one outcome possible, which is not optimal for both children. This means that one child has to adopt to the fact that father will live near the other child.</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 1 - Seven selected game theoretical models and examples

### 2.3. Crisis situations

First, it is important to define the definition of a crisis situation. This definition will be used to recognize the moments a crisis situation occurs. Coordination and communication within (DementiaNet) networks are important. Since this study is about decision-making in networks towards crisis situation, it is important to understand and define a crisis situation. A study from (Strandberg & Vigsø, 2016) highlighted the role of communication during a crisis situation. There are different definitions of a crisis situations (Appendix 1). The definition of a crisis related to dementia that will be used in this study is *“a process where there is a stressor(s) that causes an imbalance requiring an immediate decision which leads to a desired outcome and therefore crisis resolution. If the crisis is not resolved, the cycle continues”*. This definition is based on three perspectives, namely the person with dementia, the caregivers and healthcare professionals. They all have different ways of acting towards a crisis situation. A crisis situation for a person with dementia can arise when personal challenges like loss of control and change that can cause great frustration and anxiety. Caregivers on the other hand, can feel guilt for being unable to cope with certain reactions from the person with dementia, which can lead to a crisis situation. Health care professionals, on the other hand, might be unable to empathize and understand the untenable situation, which can also lead to a crisis situation. Placing a crisis situation in a practical perspective, it means that a crisis situation is the situation where it is for one or multiple parties (patient, relatives and health care professionals) not achievable anymore to let the patient live at home. Therefore, an intake in a nursery home is necessary within a day.

Since the definition of a crisis situation is different for each perspective, the stressors and predictors are also different for the perspective of the patient with Dementia and the care givers (Vroomen et al., 2013). These stressors are shown in the table below this paragraph and represent the different predictors of a crisis situation (Table 2). These stressors will be used in the codebook and as a basis for the analysis for this research. The reason that the perspective of the health care professionals is not taken into account in the table below, is because health care professionals need to act based on the stressors of the patient with Dementia and their care

givers. However, all three perspectives of the crisis situations are involved in networks which will be highlighted in the next chapter. Crisis situation will also be looked at through a micro level of integrated, primary care. This means, that the crisis situations will be seen like person-focused care (Valentijn et al., 2013). “Person focus is the notion that attention to patients’ problems in the context of their multimorbidity is at least as important as appropriate care for their individual diagnoses”, (Starfield, 2011). In terms of DementiaNet networks, this means that the focus of the care by healthcare professionals is on the individual patient on clinical integration, instead of focusing taking care of the population in general, based on functional or normative integration.

Since this study is about crisis situations in DementiaNet networks, the crisis situations depend on the way networks operate and communicate. This will be highlighted further in the next paragraphs. In this thesis, the term “crisis situation” is used as a given fact, which means that in this thesis, everything is based on a crisis situation and assumes that all provided information about the cases are from cases that are crisis situation cases.

<b>Perspective</b>	<b>Stressors/predictors of crisis</b>
Person with Dementia	Diagnoses Inability to live on their own Comorbid conditions Malnutrition Falls Behavioral and psychological symptoms of Dementia Newly institutionalized
Caregiver	Lack of knowledge Miscommunication with general practitioner Lack of time for personal or social activities due to increased caring Emotional toll of increased Dementia severity Escalating costs due to Dementia severity Caregiver exhaustion Caregiver illness Death of caregiver

Table 2 - Identification of stressors and live imbalance (Vroomen et al., 2013)

## 2.4. Conceptual model

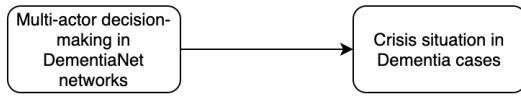


Figure 2 - Conceptual model

The figure above showed the conceptual model of this study globally. This study is about characterizing the decision-making process in DementiaNet networks towards crisis situations. First of all, decision-making in networks might be related to crisis situations in Dementia cases. There are a lot of factors that influence this effect, for example the situation of the patient and their relatives and the way of communication and collaboration. This relation between the multi-actor decision-making in DementiaNet networks and crisis situation in Dementia cases will be analyze through the lens of game theoretical models. This study focuses on the game theoretical models that can describe the effect on decision-making in the DementiaNet networks towards crisis situations, because in DementiaNet networks there are multiple actors with different incentives during complex decision-making. Therefore, the theoretical definitions of crisis situations will help looking at the decision-making in networks which plays a general role. There are seven game theoretical models that will be used to characterize the decision-making process.

### **3. Methodology**

This research is a deductive, multiple-case study that consists of different steps, which are described below. The methodology is based on the three sub-questions, in order to answer the main research question. The study aims to contribute to the theory by applying game theoretical models in order to characterize the decision making in another field than is ever researched before, decision-making in healthcare will be specialized on Dementia cases and adding more characteristics on DementiaNet networks themselves. Therefore, the decision-making towards crisis situations in DementiaNet networks will be characterized.

#### ***3.1.Data collection***

Beside the literature research that has been done for this research, this paragraph will explain how the other required data will be collected. This paragraph is divided within two sub sections: one for secondary data and one for primary data. During the data collection, the different levels of complexity around the patient with Dementia has been taken into account to describe the process towards a crisis situation over time in terms of the different levels of complexity.

#### **Secondary data**

The secondary data that will be used for this research, is previously been gathered and assessed by one member of DementiaNet. There were different DementiaNet networks which contributed to gathering data about different cases that had to face a crisis situation. There was data gathered from each network. This data is all saved and regulated in a secured environment, which is called MyDre. The data which is gathered in MyDre, is gathered in order to analyze the performance of the DementiaNet network and will be saved for the next couple of years. DementiaNet used this data at first to gather information about the way the networks are performing. This information is and will be used to improve the network programs organized by DementiaNet in order to contribute to their goal to decline the amount of crisis situation cases. The data that is saved in the MyDre contains several interviews about specific crisis situation cases from patients who all ended up with an intake in a nursery home. The data from the interviews are documents of reports of the interviews and recordings, which are documents from four till five pages or recordings that all lasted approximately 60 minutes.

The interviews all started with a description of the content of the case and the proceedings from the patient, healthcare professionals and relatives from the first time a health care professional was involved till the crisis intake in a nursery home. So, this process is



described and discussed in the interviews. There were moments or signals from the patient that changed the patients' condition, the moment relatives were involved and how and when were the health care professionals concerned in this process. So, in the interviews was tried to draw a kind of timeline of the events and everything what was going on during the process towards a crisis situation. After the timelines were discussed, questions about how people felt during this process and what were things that went well and what could have been done better were reviewed. This all happened for individual cases and with different people. For each case, five till six people were interviewed, so case was heard from different perspectives.

The data includes interviews from DementiaNet networks, but also from networks which are not officially called DementiaNet networks and often did not even take part in the DementiaNet program. Therefore, there is chosen to select three different networks to use in this thesis, which are all official DementiaNet networks who took part in the DementiaNet program. This in order to compare peer networks who followed the same program so a solid analysis can be done. Unfortunately, the interviews from these networks were also recorded, but these recordings are not available in the MyDre. Therefore, only the reports are used and analyzed for this research. The three DementiaNet networks that will be used for this research are due to anonymity called network A, B and C.

The interviews about the crisis situation cases were, to our knowledge, used to analyze the performance of the DementiaNet networks in order to improve the networks. The knowledge that arose from this data was also used to improve the DementiaNet programs for the networks.

Since this data is already specific about the proceedings and the interprofessional collaboration during crisis situations, this data can be used again for this particular study. In this data, information about multi-actor decision-making processes, the different incentives of the healthcare professionals, hierarchies and individual behavior is taken into account. Thereby, the cases are described over time and the moments events took place were mentioned. By events is meant the moments when something happens what changes the condition of the patient, for example a heart attack or showing aggressive behavior. Events are also indicating moments of relatives who start feeling different about the condition of the patient. Other events are for example moments where the health care professionals are involved for a particular reason.

For this thesis, the data will be examined through the perspectives of multi-actor decision-making and game theoretical models, which were mentioned in chapter two. Each network has data available about one or two different crisis situations with people who were diagnosed with Dementia. There is been chosen to pick one case per network for this study. So, there are three different DementiaNet networks of which one case per network will be

investigated during this study. The selected cases are chosen, because those cases contained the most interviews with different people, which are health care professionals and care givers. So, the interviews were with people from the second level of complexity, as described above in paragraph 2.1. Below is a table which showed the people who were interviewed per network.

	Network A	Network B	Network C
General Practitioner	X	X	X
Practice supporting general practitioner			X
Specialist elderly care	X	X	
Care program counselor	X	X	X
District nurse	X	X	X
Caregiver of the patient	X	X	X
Son of the patient		X	

Table 3 – People that were interviewed per DementiaNet network

### Primary data

As a supplement to the secondary data, the data is expanded with the primary data, in order to create more depth and increase the reliability of this study. The primary data that will be collected for this research is gathered through quality in-depth interviews. The interviews were with two members from the same DementiaNet network B. One interview was with a general practitioner and one with a district nurse. These interviews took about 30 till 60 minutes and one was held online and one at the office of the district nurse. The reason for interviewing only people from the network B is related to the availability of the DementiaNet members. All three networks were contacted with an invitation for an interview. The interviews were held in order to build further on the secondary data, which was data about the general collaboration of the DementiaNet networks with a focus on a medical and substantive perspective. With the primary data, the goal is to investigate the decision-making process in interprofessional collaboration towards crisis situations over time. The interviews started with the background of the interviewee and mentioning their function within the DementiaNet network. After that, the questions that were asked, were focused on the (sequence of) the decision-making process and on the elements of the game theoretical models. Furthermore, these interviews were used to get an impression about the feelings and opinions of the network members. There were questions asked about in which way the networks members are content with the way a DementiaNet

network operates, if the networks members always felt heard by their colleagues and what are things that could be improved in the collaboration, decision-making and proceedings in the DementiaNet networks. Moreover, questions about the way the interviewees felt during their work in crisis situations, even as their share in the situations, the collaboration with other network members and if the interviewees always felt heard by their colleagues during a crisis situation were discussed. So, in contradiction to the secondary data, this data did not focus on specific cases of crisis situations, but they were specified on the way the actors in the network acts/acted during a crisis situation. The interview guide with the specific interview questions can be found in appendix III The interviews are recorded and transcribed. Both recordings and transcriptions will be added to the environment in MyDre.

### ***3.2.Data analysis***

To answer the first sub question (“what does the decision-making process towards crisis situations in terms of interaction between actors look like over time in the DementiaNet networks?”) and the second sub question (“which theoretical game concepts are present at which moment in time in the interaction between actors in decision-making processes towards crisis situations?”), the transcriptions from the primary data and the interview reports from the secondary data will be coded. The reason why the transcripts and reports were coded, is because this helps to recognize the patterns that occur during the decision-making. By analyzing this coding, there will be searched for these patterns that became visible/noticeable during the coded transcripts. The coding will be done, based on a codebook that is developed on the basis of terminology from the theoretical framework. The coded transcripts and interview reports can also be found in the secured file in the MyDre.

The developed codebook can be found in appendix II. The codebook is created based on the first two sub questions and the literature. There are three different patterns that are divided. The first pattern is signals or events which are called stressors or predictors of a crisis situation. Those are mentioned in paragraph 2.3. For the patient, signals are related to the clinical picture of Dementia and events are moments not directly related to the clinical picture, but a moment which influences the decision of the caregiver or healthcare professionals. A signal for a caregiver is a moment where the task of being a caregiver is too much to handle. The perspectives that are used in the codebook are from the patient with Dementia and caregiver. The second pattern is decisions that are made by the caregiver or healthcare professional(s), in order to connect the moment of decision to a moment of a signal or event. The last pattern is to recognize the presence of game theoretical models, wherefore the decision-making process can

be characterized. The elements which are used in the codebook for this topic are based on the elements that can be found in paragraph 2.2. The codebook includes the elements of the game theoretical models, because these might support characterizing the decision-making process of the interprofessional collaboration towards crisis situations in DementieNet networks.

After the interviews of the three cases from the secondary data and the two interviews of the primary data have been coded, the topics from the coding will be used to create a timeline of the signals/events and decision-making moments of the patient, care giver and health care professionals, based on the three cases from the secondary data. This will be part of the elaboration in chapter 4, where the decision-making process towards a crisis situation in terms of interaction over time will be visualized by the timelines and which will be the result of the first sub question. As mentioned before, this research is mainly focused on the health care professionals, but to make a good analysis of the signals/events and decision-making moments, the establishment of those might be related to the actions and decision-making moment of the patient and the care giver of the patient. Therefore, the signals/actions and decision-making moments are taken into account during the development of the codebook. Most of these signals are stressors which can be found in table 2. The visual timeline will be supported by a short introduction with the context of the particular crisis situation case. The timeline will also be elaborated through a textual version of the timeline. Therefore, signals/events and decision-making moments are collected of people from the first and second level of complexity, in order to create a timeline for the signals/events and decision-making moments of the patient, the care giver and the health care professionals. Thereafter, the coding is used to recognize the game theoretical models which are present during the timelines of the cases. These present games will be added to the timeline as well and are/will be connected to moments something occurred in the timeline. A game will be recognized after one key element or more other elements of a game are present. To recall a game to be present, at least one of the people who were interviewed have to mention these elements directly or indirectly. Next, the second sub question will supplement the first sub question, which can also be found in chapter 4. This sub question will, based on signals/events and decision-making moments from the first sub question, find present game theoretical models which occur in the decision-making process towards a crisis situation. These game theoretical models will help describing this decision-making process. the game theoretical models are described based on the information from the three cases and the key elements of the cases. The description of these games includes the moment of occurring, which elements per game are recognized, who are involved and why decisions are made. This process for the first and second sub question will be repeated for each case in chapter 4.

The last step is a way to answer the last sub-question: “Comparing multiple case studies of decision-making processes towards crisis situations in DementiaNet networks, which patterns can be observed?”. To answer this question, a comparison between the three cases – which are described in chapter 4 – will be made by parallelizing them. This step is the basis for chapter 5. Firstly, this is in order to find patterns in the decision-making moments/elements between the crisis situation cases regarding the signals/events and decision-making moments which are described in the previous chapter. This comparison between the three different crisis situation cases will be made based on the signals – which are based on the stressors that are mentioned in paragraph 2.2. – and the elements of the decision-making. These will be all mentioned in chapter four. So, for chapter five a comparison of the information from chapter four has to be made. There will be looked at the differences and/or similarities between the cases. For example, it might be possible that there are other signals in network A than in network B. The same kind of decision had to be made in network C as in network B at the same time in the decision-making process.

Second, this chapter is also looking for patterns in the decision-making process between the three crisis situation cases regarding the occurrence of the game theoretical models. Therefore, a comparison between the three different crisis situation cases will be made based on the occurrence and characteristics of the particular game theoretical model which become clear in chapter four. There will be looked at the differences and/or similarities which happened in the cases. The presence of a particular game theoretical model might occur in network A, B and C, while every network had other motives and causes for the presence of the game theoretical model. The comparison of which game theoretical models occur on a particular time towards the crisis situation is supplemented by the comparison between the people who were involved in which games and how many times a game occurs in what kind of situation. These comparisons will be made in order to find eventual relationships between the game theoretical models and the moments when and which health care professionals are involved. So, this comparison is made, because this thesis is searching for generic patterns in the decision-making and these patterns can be found by comparing the three case studies of the crisis situations.

Third, this thesis has defined the patterns in signals/events and decision-making moments and it has defined patterns in the occurrence of the game theoretical models. Combining these two, the patterns might show relationships between the signals/events and decision-making elements/moments and thereby the present game theoretical models. For example, it might be possible that every time after a particular signal of the patient or a particular decision made by a health care profession, the same game theoretical model occurs every time. Then there might

be a relationship in these patterns. It is not specifically the goal of this thesis, since this just describing research, but if these relationships occur, this will be discussed shortly at the end of chapter 5. These relationships will be found by connecting the facts from the comparison between the signals/events and decision moments within the and the comparison between the game theoretical models which were present in the three different crisis situation cases. Then, there will be search for eventual relationships.

### ***3.3.Limitations***

Since there are a lot of game theoretical models, the decision was made to focus on only seven different game theoretical models, selected by Bekius, 2019. These particular games were used in other studies to characterize the decision-making (process). See paragraph 2.2. To continue conferring to the theoretical contribution, there has been chosen to focus on seven game theoretical models. Besides the game theoretical models, there are also other methods to gain understanding of decision-making processes (Bekius, 2019).

Within DementiaNet, there are several local networks. Only three of them have gathered data regarding crisis situation cases and saved this data in MyDre, with each one to three crisis cases available in existing data. In case DementiaNet does not have the complete information to conduct this study, interviews will be performed. Of every network, only the DementiaNet network B had network members available to participate in interviews. So, the interviews were held with only two members of B. That both DementiaNet members who were able for an interview, were from the same network by chance.

### ***3.4.Ethical considerations***

This study will be fully transparent about the goals and freedom. The research participants will be treated ethically and adequately informed about the way they will participate and how the findings of the study which they have participated in will be used and applied. However, since this study is about crisis situations, the study contains personal and confidential information about patients, relatives of the patients and healthcare people of the DementiaNet network. Therefore, it is important to ensure this confidentiality and anonymity, which will be highly taken in account. In this study, no names or personal information will be revealed.

Data that is gathered by DementiaNet, is saved in the digital and safe environment MyDre. Data from MyDre will only be used for this study and not saved or used for other purposes. New data that will be gathered during conducting this study, will be obtained by means of informed consent. The data and contributors of the data will be anonymized and are

able to quite the study at any moment. New data will also be saved in the safe and digital environment MyDre. Earlier researches that will be used, will be referred properly. Thereby, a codebook is used to characterize the interactions in the decision-making process in networks and developed only for the purpose of this study.

## 4. Results

Where the previous chapter demonstrated the methodology of this thesis, this chapter will focus on the empirical part of the research. In this chapter, a timeline for each selected case per network will be composed. Each case in this chapter will start with a short contextual introduction, to make sure the background of the particular case is clear. This will be followed by the signals/events and decision-making moments which were found after coding the transcriptions of the interviews. Those are the signals/events and decision-making moments that occurred towards a crisis situation are partly based on the stressors from table 2 and are taking in account the different levels of complexity (see paragraph 2.1). Besides, other signals/events and decision-making moments are based at the other patterns which are mentioned in the codebook (appendix II). Every case will end with a description of the found game theoretical models which will be linked to the present game theoretical models in the decision-making process towards crisis situations in terms of interaction between actors in the DementiaNet networks. The game theoretical models that will be described based on the three different crisis situation cases and on the elements of the game theoretical models that are described in paragraph 2.2. All this will be showed in the timelines. The focus in this chapter is on the proceedings of the healthcare professionals. Therefore, the signals/events of the patient with Dementia and the caregiver are also taken into account to provide a good impression of what happens when. All information in this chapter is based on the three selected cases from network A, B and C. However, the case of DementiaNet network B will be complemented with the two interviews about the collaboration within this network (see Primary Data in paragraph 3.1.).

### 4.1. Case 1: *DementiaNet network A*

#### Context

The first case that has been studied is the DementiaNet network A. This case is about a man who was diagnosed with Dementia and lived at his own home with his wife before his crisis intake. For this case, five interviews have been conducted with each another perspective, namely: the caregiver (the patient's wife), the general practitioner, the specialist elderly care, the care program counselor and the district nurse. Each of them highlighted the development of this man with Dementia towards the crisis intake. They all explained who were involved, how the involved people passed through it themselves and how they experienced the collaboration



with all other people involved. So, those people are all in the second level of complexity around the patient. The data for this case is all gained through interviews from the secondary data which was gathered by DementiaNet.

### **Signals/events and decision elements**

As is shown in the figure below, most actions and decisions happen consecutive on events that are experienced by the patient. These are situations that are experienced or performed by the patient themselves, like a restless night or a runaway to the neighbors. The only moment of the timeline of the patient which was not a situation which was experienced or performed by patient was the reception of the Dementia diagnosis.

The timeline of the care giver is a personal answer of the care giver self to the patient. At the first moment is the situation of the patient too much to handle for the care giver, which is an element in the timeline, and later in time the situation of the caregiver is so bad that the conversation about the Multiple Disciplinary Consultation (MDC) did not even get to the awareness of the care giver. Just before the crisis intake, there is a moment of decision-making for the care giver. The proposal of the health care professionals to prepare for an intake of the patient, lead to a decision moment of the care giver where was decided to reject the intake at a vacant spot in a nursing home.

Actions or decisions that are not directly in line with actions or moments of the patient, are due to prevention or arranging businesses in order to contribute to the wellbeing of the patient. The timeline and the involvement of health care professionals starts with the decision to deploy a specialist elderly care as a response to the deteriorated situation of the patient, which was noticed by the general practitioner. The next response to the situation of the patient was to decide to insinuate the patient at the MDC, which was followed by explaining the proceedings to the care giver of the patient. From there on till the moment of the offer from the nursing home, decisions are made by health care professionals to involve the care based on the needs of the patients. This care includes the care program counselor (CPC) and daily care of the district nurses. In the meantime, the decision was made by the general practitioner (GP) to prepare for an intake in a nursing home by arranging WLZ (long-term care law). This led to an offer of the nursing home as mentioned before. Since the care giver rejected the intake of the patient, the GP and the specialist elderly care (SEC) decided to arrange a crisis intake for the sake of the patient and the care giver. Most of the actions and decisions involved the network

leader, which is in this case the general practitioner (GP). This GP is involved in all the decisions and was notified by all other network members.

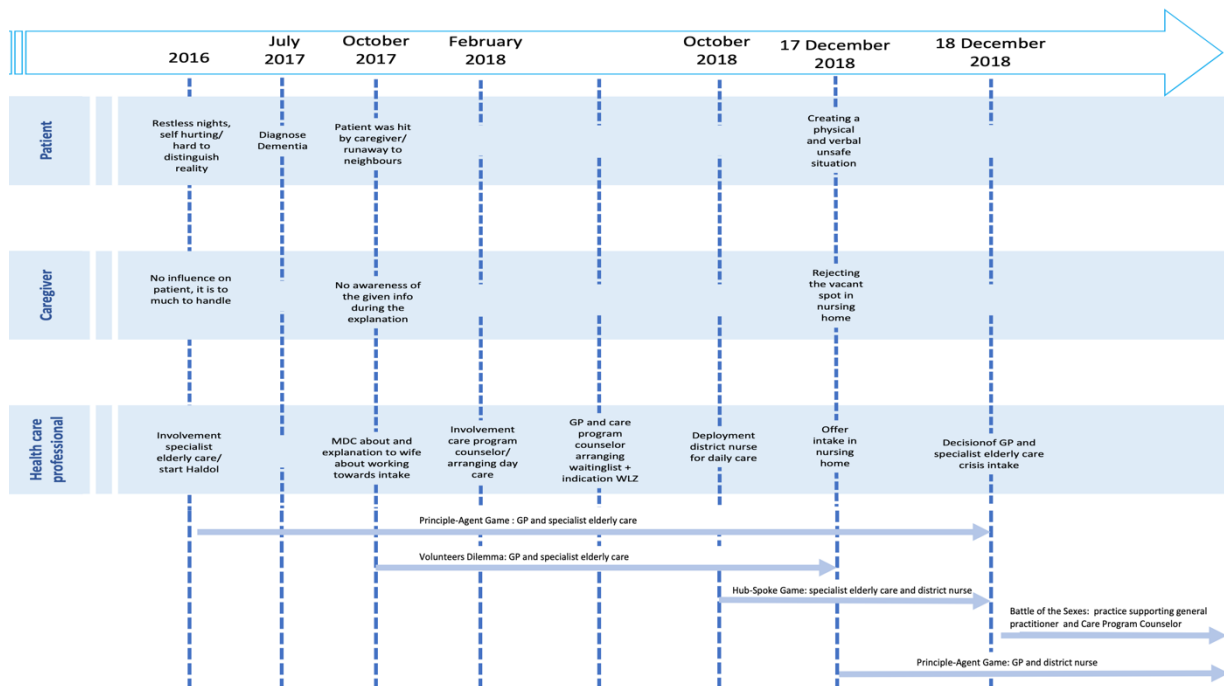


Figure 4 - Timeline DementiaNet Network A

## Game theoretical characterization

Based on the different interviews about this case, decision making can be characterized by the game theoretical models that are present. This is been done on the basis of a codebook which can be found in appendix 4.

The first Game Theoretical Model that has been noticed is the Principal-Agent game. This game, as is mentioned in paragraph 2.2, occurs when there is a hierarchical relationship between a leader and other members during the decision-making. Thereby, during a Principal-Agent Game there is asymmetric information between this leader and the other members of the decision-making process. During an interview with the GP, the GP mentioned that the specialist elderly care (SEC) has more information about people with Dementia. That is why the GP finds support on this case by the SEC. So, there is obviously a hierarchical relationship between the GP and the SEC, where the SEC also has more available information than the GP about people with Dementia. However, this relationship also causes that the GP depends on the decision of the SEC about the crisis situation. This game started the moment the SEC got involved and endured till the moment of the intake of the patient, since the patient is from there on the responsibility of the nursing home where the patient will live.

The Principal-Agent game was also noticed during an issue the district nurse mentioned about the availability of the information. The information was asymmetric when the patient was transferred to a nursing home for the crisis intake, because the GP shared only the medical data when the district nurse shared their file with data. So, the district nurse was not sure if the nursing home got complete information. So, in this case, there was also a hierarchical relationship, only with the GP and the district nurse this time. The GP made the decision to only share the medical data from the general practice, while the decision should be made to transfer all the available data about the patient, from all the (digital) systems that were used to report information about the patient. There is no clear explanation emerged from the data for the decision of the GP.

The following Game Theoretical Model that has been noticed is the Volunteers Dilemma. During this game, one or more actors share responsibility. However, at least one of them has a passive attitude by showing “wait and see behavior”. In this case, it was the GP who mentioned that there was “wait and see” behavior, because the GP and the SEC did not persevere when the family did not cooperate, while they should have taken responsibility by taking the decision for the patient and family. This behavior can be characterized as the Volunteers Dilemma. This “wait and see” behavior was also recognized by the district nurse and the care program counselor (CPC), who was concerned about the patient and did not want to wait for someone who did not take any action, whereas the CPC did not take any action themselves. This behavior from the GP and the SEC started after the decision to interfere the patient in an MDC where was spoken about the preparing of an intake. From that moment, the GP and SEC had to anticipate and persevere in order to achieve an intake, but they did not. This behavior continued till the nursing home offered a place for the patient.

Another dilemma is the Battle of the Sexes. The Battle of the Sexes is defined as a game where two actors who are dependent on each other make a decision simultaneously where they have a common goal. However, they have other motives which are conflicting. This causes that there is no optimal outcome, since there is only one possible option. This game was played while the CPC discussed whether to the patient after the crisis situation or not. Where the practice supporting general practitioner insists on a visit to the patient, the CPC decided not to do so. The CPC did not feel the need to visit, since it would only bring confusion for the patient. Besides, the patient was from there on the responsibility of the nursing home. Therefore, there were two actors who both wanted the best for the patient, but have conflicting motives. There was no optimal outcome, since one of those two would be disappointed when the final decision of the CPC was not to visit the patient. This behavior can be characterized as the Battle of the

Sexes. The conflicting motives appeared after the crisis intake of the patient. The game ended when the CPC definitely decided not to visit.

That the relationship between the SEC and other people within the network is hierarchical was confirmed by the SEC. The SEC is the actor/hub that steered the spokes within the network during this case. The SEC talks about the network as an oiled machine, where its spokes have different incentives. Where the SEC did not have the incentive on preventing a crisis situation, the district nurse especially wanted to prevent an escalation. The SEC did not feel the need already to act in order to prevent escalation. It was too soon. So, there is only one option, which is made after negotiations. Nevertheless, the SEC is the person who is seen as the network leader/hub in the network and given the hierarchical relationship, the SEC is the one who determines. People that are seen as spokes in this network are the GP, the care program counselor (CPC) and the district nurse. Besides the decision whether prevent an escalation or not, the SEC is also the person who reflects and provides advice to the other network members. From the moment the district nurse was involved in this case, there was a difference in incentives. By the time there was a crisis intake, it was too late for the SEC to rearrange the opinion, because the escalation was already there. The behavior that is described in this Alinea, represents the behavior of the Hub-Spoke Game. In this game, there are multiple actors with different incentives. Nevertheless, the actors (the spokes) are steered by one actor, the so-called hub. Therefore, the relationship between this hub and spokes is hierarchical. Just as the Battle of the Sexes, only one outcome is possible. This outcome will be reached after negotiations, which are also steered by the hub.

There also happened to be different incentives between the SEC and district nurse. They still wanted to reach a common goal which is keeping the patient with Dementia home for as long as possible. However, where most people in the network see the SEC as the “hub” in the network, the GP assumes the GP as the leader and thereby the hub of the network. According to the district nurse, decisions depend on the GP. Thereby, the district nurse even highlights that there was discussion about the dividing of the responsibilities and the role of network leader. According to the district nurse, this function is never officially assigned to anyone.

#### **4.2. Case 2: *DementiaNet network B***

##### **Context**

The second case that has been studied is the DementiaNet network B. In this case, a man has lived alone for ten years after his wife died. He was only diagnosed with Dementia a year before his crisis intake. After his wife died, his daughter took the responsibility for her father as a care giver. In this case too, interviews have been taken with six different people, existing from four health care professionals, one caregiver (the patients' daughter) and the son of the patient. The health care professionals were the general practitioner (GP), the care program counselor (CPC), the specialist elderly care (SEC) and the district nurse. As in the former case, each of them highlighted the development of this man with Dementia towards the crisis intake.

##### **Signals/events and decision elements**

The timeline below shows the actions and decision moments that occurred during the process towards a crisis situation. This timeline shows medical incidents or changes of the patients' condition. The patient lost his wife ten years before his intake in a nursing home. In those ten years, his condition worsened which started with his bad walk, followed with a heart attack, rectal blood loss and falling multiple times. The patient was struggling to accept the arranged care and, in the meantime, the patient was officially diagnosed with Dementia, which could explain a bit of the patients' behavior. The patient self does not make any decisions, since the decision pertaining to the patient are made for the patient by the care giver or the health care professionals.

The care giver becomes involved after the heart attack of her father. The care giver decides that the patient should be monitored more. Therefore, the care giver takes on that task, because there was a strong feeling to take care of the patient. Thereafter, the care givers' actions are related to receiving information about the patient in combination with understanding the current situation. The last action/decision of the caregiver was a decision which was made together with the GP, to discuss the situation with the patient, in order to arrange an intake.

The GP and the patient knew each other already before the wife of the patient passed away. Therefore, the GP was involved with this patient for a long time. When the GP noticed that the patient had trouble walking, the GP decided to involve the physical therapist to support

the patient. A year after that, the GP arranged that the patient became part of an elderly care program, to monitor the situation and condition of the patient. For a year, being part of the elderly program was enough. Thereafter, it was the elderly care program who insisted on starting home care for the patient and linked one specific specialist elderly care to the patient. The patient was involved during an MDC, where the specialist elderly care, physical therapist and district nurse started with committed a care program counselor (CPC) to contribute to the wellbeing of the patient. When the patient suffered from a heart attack, the involved care givers decided that the GP and the district nurse where together with the care giver the actors in the network of the patient who should start monitoring the patient. Since this was a high responsibility and a heavy burden for all involved. Therefore, another MDC was arranged in the summer of 2019 to discuss the situation of the patient and how the people in the environment of the patient should proceed. The beginning of 2020 brought the COVID-19 virus which caused a scaling down of the home care. It was the occupational therapist who decided that it was no option to scale down the home care, even COVID-19 was a risk to both patient as health care professionals. The patient suffered from rectal blood loss and the condition has deteriorated. Just a month later, the patients' walk was worsened, he fell four times and he had a lot of trouble undressing. The home care together with the GP decided together with the children of the patient (including the care giver) to direct towards a crisis intake, because it was not achievable anymore to let the patient live alone in his own house.

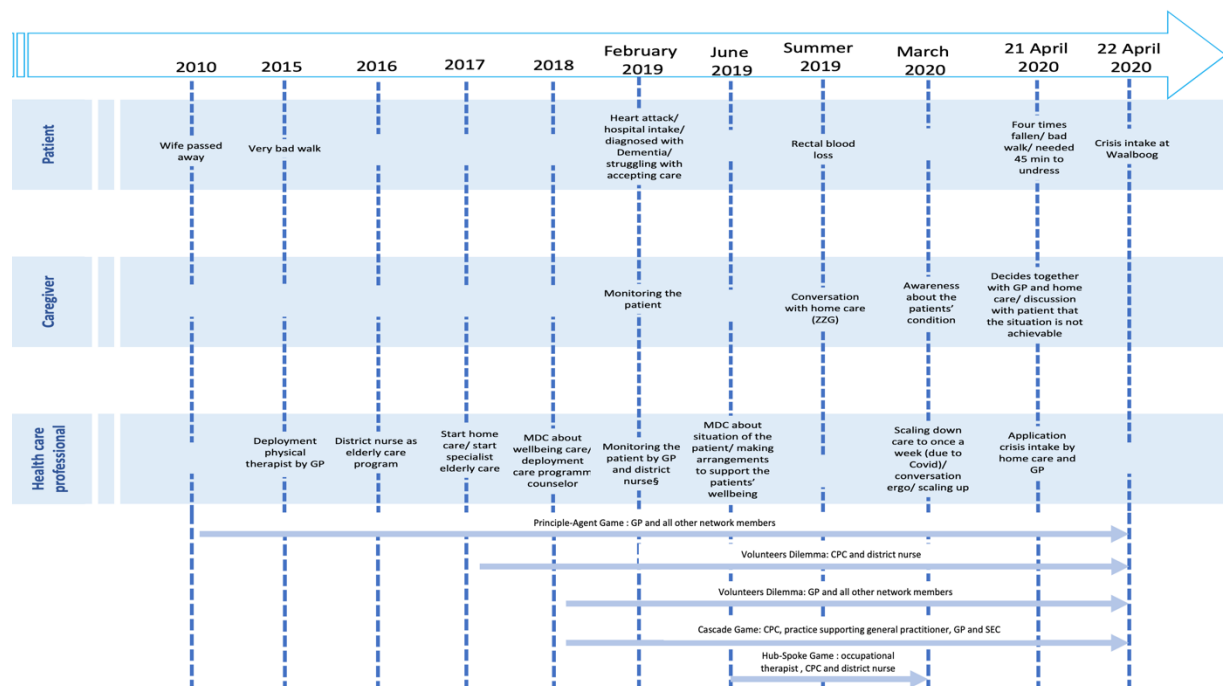


Figure 5 – Timeline Case DementiaNet Network B

## Game theoretical characterization

As in the previous case, this paragraph is also based on the different interviews which are coded regarding the codebook (see appendix II).

The first Game Theoretical model which was noticed, was the Principal-Agent Game. As described earlier, this game occurs when there is a hierarchical relationship between a leader and other actors during the decision-making. Besides, information is asymmetric between this people. In an interview with the GP, the GP was convinced to be the network leader and is aware of the fact that the information in the (digital) systems. The GP mentioned that there was not enough consequence in keeping the systems up to date. Reports are not written down properly, wherefore the information in the systems is not clear to all network members. This caused asymmetric information, since the providing of the information to the patient was not complete. This led in this case to acceptance of decisions by the health care professionals, while the patient was not informed well enough. So, the Principal-Agent game is definitely present during the whole involvement of health care professionals in this case and does not stop till the intake of the patient in the nursing home.

Thereby, the GP did not acknowledge the need of letting the practice supporting general practitioner become involved. With that, the GP emphasizes the hierarchical relationship between the GP and the practice supporting general practitioner. This was confirmed by a GP (interview with an anonymous general practitioner, 9 June 2022). This GP mentioned to be the network leader and the person with the expertise on elderly care. However, this GP mentioned on the one hand that there is no hierarchical relationship experienced, while on the other hand this GP claimed to be the network leader. Besides, this GP mentioned that there was no visible asymmetric information, which is interesting, since this GP also claimed to have the expertise in the network and therefore know more than others. The GP appointed that there should be no asymmetric information, because everyone has access to VIP-life. This is a software platform for sharing knowledge and care processes (Viplive, 2022). The hierarchical relationship of the GP towards other actors in the network is also confirmed in the interview with the district nurse who also worked as a CPC in particular cases (interview with an anonymous district nurse, 30 June 2022). This district nurse experience that the GP was on top of the hierarchical relationship.

The second game that was noticed, is quite contradictory with the previous game. This game is characterized as the Hub-Spoke Game. In this game, there are multiple actors (the spokes) with different incentives. Despite the different incentives, there is one actor (the hub)

who steers the network. A decision is made after negotiations, but only one outcome is possible. In this case, the district nurse and the CPC state that they interpret the occupational therapist as the leader in the network, because this person has more information and knowledge about cognition and therapy and is the one who is leading the decision. So, there is a hierarchical relationship where the occupational therapist stands at least above the district nurse and the CPC. It is the occupational therapist who performs the role of a hub in the network. During the second MDC, it was the CPC who had the feeling that their opinion was not taken seriously. The CPC could not get through the rest of the team to make themselves clear about the frequency of the home care. The CPC simply was not heard. The CPC needed support from the occupational therapist before the team agreed on the fact that the care should enter the house of the patient with a key, instead of knocking on the door which caused a lot of stress with the patient. According to the CPC, this might be due to the lack of knowledge in the team of district nurses, because some district nurses do not have affinity with Dementia. This person experienced colleagues did not provide the right information about the case for other colleagues. There was not even a consultation for the transference of the patients' (medical) data. There is a lack of sufficient documentation, which is a shortcoming regarding the relationship with the patient. Finally, it was the occupational therapist who heard the CPC and made the decision that was in line with the opinion of the CPC. So, there was one option possible which was made by the occupational therapist (the hub) after hearing the opinions of the other network actors (the spokes). This game started at the second MDC, where the situation of the patient was discussed. The CPC was determined about the frequency of the home care and the way of entering the house of the patient for providing home care, which still played a role till – due to COVID-19 – the general policy of the home care wanted to scale down the frequency of home care. Again, it was the occupational therapist who made the difference.

The next game that is present in the decision-making towards the crisis situation in this case, is the Volunteers Dilemma. The CPC mentioned the fact that a district nurse should be more proactive and focused on the coordination. There is a lot of difference between the district nurses, but the CPC notices “wait and see” behavior of the district nurses while they should be proactive instead of passive. This was constituted during the second MDC. As mentioned in the former game that was discussed – the Hub-Spoke Game – it was a district nurse who discussed the frequency of the home care and the way of entering the home of the patient in order to offer safety to the patient. It was clear that there were different incentives between the district nurses. However, none of them were willing to make a decision on these topics in order to contribute to the wellbeing of the patient. If there was more proactiveness, the crisis could have been



prevented. The district nurse who was interviewed could confirm this behavior, since a GP is on top of the hierarchy, decisions will not be made. In this case it was the decision on how to enter the house of the patient during a service of the home care that has not been made. The district nurses show passive behavior and wait till the GP made a decision (interview with an anonymous district nurse, 30 June 2022). So, on the one hand are the district nurses in this case convinced the occupational therapist is the leader/hub of this network, but on the other hand are they waiting for the GP to make a decision, since this is the person on top of the hierarchy.

Another situation in the decision-making that contributed to a Volunteers Dilemma started with the patient having a heart attack. The decision was made by the involved health care professionals to let the patient be monitored by the district nurses and the GP. The GP themselves, mentioned that there was a passive attitude and “wait and see” behavior against the district nurse, the CPC, the SEC and the patient. The GP made a conscious choice not to act on changing situation of the patient. This situation was the situation during and after the heart attack and the rectal blood loss. Therefore, the GP waited until other actors observed and mentioned that the situation of the patient was not achievable for the patient themselves, but also for other health care professionals. Finally, it was the district nurse who signaled and directed towards a crisis intake, which is supposed to be picked up by the GP. So, the GP’s share at the end of this case was forced, since the GP did not intend to act on the current situation earlier. The intake of the patient was also the end of the Volunteers Dilemma.

A game that was not found before is the Cascade Game. During this game, actors act based on actions and decisions from the other. Besides, the decisions are made sequentially. The decisions that are made, might be made in different parts or layers within an organization. This case was vulnerable and complex, since the patient was fragile due to the medical situation (heart attack, blood loss, etc.) and different health care professionals with different responsibilities were involved in order to support the wellbeing of the patient. This game started at the moment a district nurse who functioned as a SEC decided to leave the case when the CPC entered the case. During the MDC, the health care professionals had to make a decision on how to proceed now the SEC left the case. So, now the SEC left, the home care organization had to make a decision on how and who to assess on the case. The CPC had to wait for this decision of the home care organization, because after that, the CPC negotiated with the practice supporting general practitioner and the specialist elderly care (SEC) on how to proceed on the case. Therefore, the SEC and district nurses could not make a decision before the practice supporting general practitioner had made a decision. That moment, the actors became dependent on the home care and the actors had to act on that. It was the practice supporting

general practitioner who had to anticipate when they gained awareness on which home care organization was involved, since there is variety between the quality of the different home care organizations. After the heart attack of the patient, the practice supporting general practitioner decided that the GP and the district nurses had to monitor the patient. The district nurses decided to do so, while the GP stayed on the background. Therefore, the CPC decided to arrange another MDC, since the situation of the patient was still critical, despite all former decisions to support the patient. So, the decisions that have been made and the decisions that should have been made, but are not, lead to the MDC in order to make more arrangements for the patient. Those arrangements included, as mentioned before, the frequency of the home care and the way of entering the patients' house. So, this is a Cascade Game, based on several decisions that had to be made, but could not be made before the another made a decision which influenced the following decision. It was a series of decision-making moments and actions that were dependent on the action or decision-moment therefore.

#### ***4.3. Case 3: DementiaNet network C***

##### **Context**

The last case that has been studied is the DementiaNet network C. For this case, three interviews were performed with four different people: the care giver (niece of the patient), the district nurse and the general practitioner together with the practice supporting general practitioner. This case is about a man who lived – while looking back by the involved health care professionals – with Dementia for a long time. However, this man was only diagnosed two months before the crisis intake. Like the other cases, the people who were interviewed highlighted each the development of case of a man with Dementia towards the crisis intake.

##### **Signals/events and decision elements**

The figure below shows the actions and decision moments that occurred during the process towards the crisis situation of the patient. The first known moment in the timeline of the patient is when the patient showed confused and sexually disinhibited behavior. Two months after this behavior, the patient was officially diagnosed with Dementia. Within two months, the somatic and psychic condition of the patient worsened that much, the situation became unsafe for the patient and their environment. The patient threatened the district nurse

with a knife, which was the final action that made a difference and led to an intake in a nursing home.

The niece of the patient who functioned as care giver, was gutted by the fact that her uncle was that disoriented and sexually disinhibited, she decided to contact the general practitioner (GP) of the patient. She did not trust her uncle anymore and decided after contacting the GP to take away the drivers license of the patient. Since the care giver had two jobs and a family to run, taking care of the patient was too much, so the care giver decided to hire home care. When the patient was officially diagnosed with Dementia, the care giver spoke to the CIZ (assessment care center) about an intake in a nursing home.

Since there is only a timeline known about this patient about a few months, health care professionals were involved for just a short time. The GP was involved in this case, but was hesitant in giving a diagnosis of Dementia. It took the GP two months before the diagnosis of Dementia was official. However, the GP decided a month before the official diagnosis to arrange a WLZ (long-term care law) declaration in case the diagnosis was necessary. It was the district nurse who insisted on a diagnosis and arranged an MDC. During the MDC was decided by the GP and the district nurse to let CIZ give an indication in order to complete the WLZ. After the incident with the knife, the district nurses had trouble providing care for the patient. This was the definitive occasion which forced the GP to arrange an application for a crisis intake.

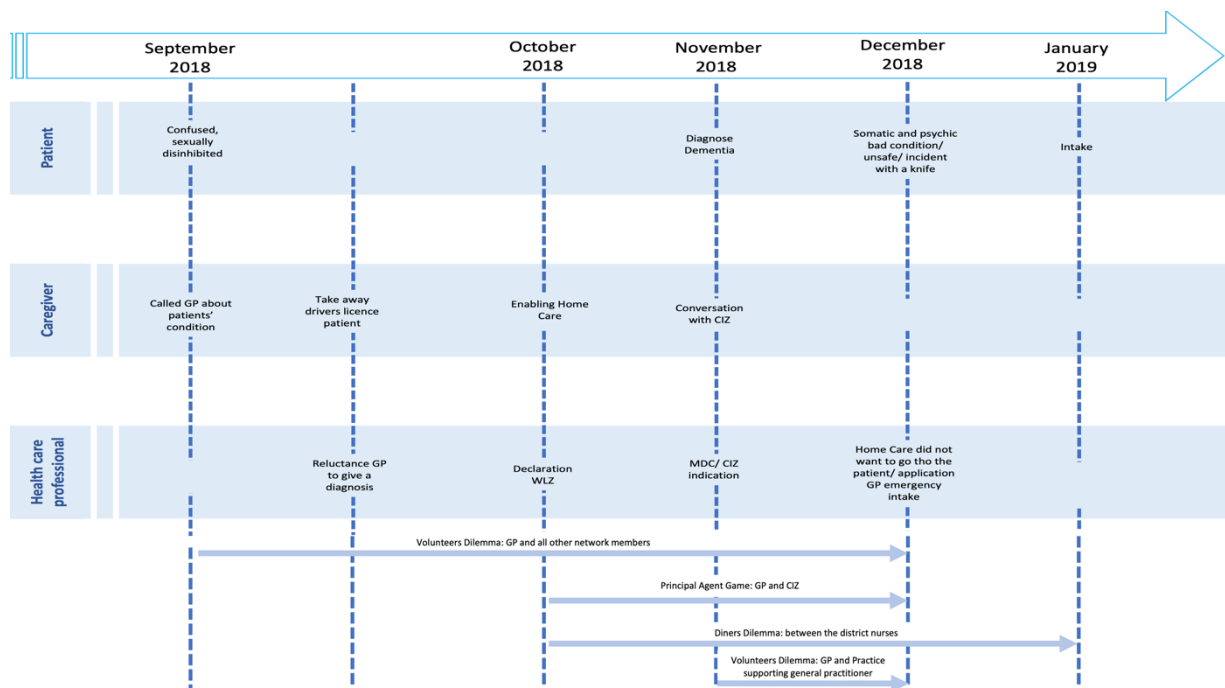


Figure 6 - Timeline Case DementiaNet Network C

### **Game Theoretical characterization**

Despite the fact that there are not many events described within the timeline, several game theoretical models have been noticed. The first game that was present in this case was the Principal-Agent Game. At the moment the general practitioner (GP) thought this case could lead to an intake in a nursing home, the GP faced the asymmetric information, since the GP had not the knowledge to start the crisis procedure. The GP was dependent on CIZ (assessment care center). So, there was a hierarchical relationship between the GP and CIZ, and there were different interests. The GP wanted what was best for the patient and CIZ just gives indications for care. Thereby, CIZ had more information and knowledge available on the crisis procedure than the GP, which caused asymmetric information as mentioned above. This hierarchical relationship and the asymmetric information lasted till applying for a crisis intake.

The other game that was present in this case was the Volunteers Dilemma. It was the GP who showed passive behavior on giving the diagnosis of Dementia to the patient. According to the GP, there was no added value for the patient to have this diagnosis. Therefore, it took a while before the GP gave the diagnosis. The GP mentioned that it is naturally to lean back and take it easy before taking action. This dilemma is endorsed by the practice supporting general practitioner. However, the practice supporting general practitioner blamed all actors within the network on this case for the passive attitude, because the Volunteers Dilemma also occurred when all actors in the network were familiar with the bad situation of the patient and the several signals which indicated the bad situation, but the actors in the network did not act on it. They showed a passive attitude and “wait and see” behavior for someone to finally take some action. Therefore, the actors in the network waited for someone else to make a decision. This Volunteers Dilemma started from the moment the patient showed the confused and sexually inhibited behavior and lasted till the moment of the appliance of the crisis intake.

Another decision that – while looking back – should have been made, is the decision to assess a Care Program Counselor (CPC). Both GP and the practice supporting general practitioner claimed that they made the mistake by not involve the CPC. The GP and the practice supporting general practitioner dedicated the mistake by believing the CPC was too busy. Besides, the GP claimed to be too busy themselves. So, they were volunteering to preventing personal blame, which is one of the characteristics of the Volunteers Dilemma. Thereby, the GP and the practice supporting general practitioner showed the passive attitude by performing the “wait and see” behavior. This has – just as in the previous game – to do with a decision that should have been made, but was not. After the MDC where the situation of the patient and the next steps regarding the care for the patient were discussed, the CPC should

have been involved to support the home care and the care giver. This did not happen. After the intake of the patient, the GP and the practice supporting general practitioner looked back to confirm this passive behavior.

A game that did not occur before in one of the cases is the Diners Dilemma. In this game, one actor is violating an agreement that is made by multiple actors. The one who is violating, benefits from the value of the payoff and rides free on the achievements of the others. Thereby, the actors in this game are not willing to cooperate. This is what happened between different district nurses. The agreement was to exploit the self-reliance of the patient from the moment the district nurses became involved in this case and should last till the patient was not the responsibility of the health care professionals anymore, which was till the intake in a nursing home. However, some district nurses keep the agreement by valuing the care planning, but other district nurses work with intuitive care. Intuitive care makes a nurse act on beliefs and preferences which are based on culture (Monareng, 2013). This intuitive care caused that patients will be pampered, where all other actors in the network will experience the disadvantages. On the other hand, district nurses who work with intuitive care will benefit free riding on the achievements of the district nurses who work stick to the care planning.

#### ***4.4. Concluding remarks***

This chapter focused on answering the first two sub questions. For each case, it was possible to construct a timeline for the events and decisions of the patient, care giver and health care professionals and thereby to answer the first sub question. This timeline also includes the game theoretical models, which answered the second sub question. The second sub question was further answered by explaining how every game theoretical model occurred during the cases. Therefore, the most important results to remember from this chapter are the following: (1) it is possible to define the decision-making process towards crisis situations in terms of interactions between actors over time; (2) events or decision-making moments are in general depending on the (medical) events and situations of the patient and the care givers. Health care professionals act on those events and situations in order to improve the situation or to prevent a situation for getting worse; (3) game theoretical models are present over time in the interaction between actors in decision-making processes towards crisis situations in DementiaNet networks; (4) game theoretical models do help characterize the decision-making in crisis situations by mapping the actions and decision moments of the health care professionals and how the different actions and decision moments are related to each other.

Thereby, this chapter contributes – as mentioned before – to the theory indeed by applying the game theoretical models to a new area, namely to crisis situations in DementiaNet network. How this research contributes to more than the crisis situations in DementiaNet networks will be made clear in the next chapter.

## **5. Comparison**

Based on the results from the previous chapter, a comparison will be done in this chapter by comparing the three different case studies which are described in the previous chapter. This will be done, because this research seeks to generic patterns within the decision-making and this can be done by comparing the different cases. This chapter will make comparisons on different levels, namely on the difference in signals/events and decision moments and the different game concepts, at different moments in time. The comparisons aim to find similarities and/or differences between the three different crisis situation cases.

The patterns that will be found might also show relationships between the decision-making elements/moments and the presence of game theoretical models. These relationships will be discussed briefly at the end of this chapter.

### ***5.1. Comparison between the cases studies on signals/events and decision moments***

timelines from the previous chapter are the base for the comparisons. During the comparisons, the following topics were taken into account: (I) when and why healthcare professionals made decisions in combination with the number of medical events/changes for the patient; (II) the degree of involvement of the General Practitioner (GP); (III) the behavior of the healthcare professionals; (IV) the degree of involvement of the caregiver; (V) the way arrangements are made between healthcare professionals.

After a comparison between the signals/events and decision moments from the three different crisis situation cases, a couple of similarities appeared: (I) The first one was the presence of a general practitioner and home care/district nurses. Those people played a part in every case study. This is not strange, since from the data of the interviews turned out that a general practitioner is considered to be higher in the hierarchy than other network members and are seen as a network leader, even though there is no striving for hierarchy. Thereby, the district nurse is the one who mostly is the first to signal changes or events in the medical situation of the patient. (V) Another similarity is the arrangement on when to schedule a Multi-Disciplinary Consultation (MDC). There is no preference on who should arrange. It is just the member who sees the urgency to arrange an MDC. So, everyone within a DementiaNet network has the freedom to take action in or on behalf of a case. (V) Thereby, each network strives to create a clear division of tasks and responsibilities in theory. As seen in earlier in this paragraph, practice sometimes turns out to be different, but all networks have the same intention to provide such a division of tasks.

Besides the visible similarities, several differences between the case studies became discernable. (IV) The first case (Network A) was a case where there were a few medical changes for the patient themselves on which the health care professionals acted. But more important in this case was the care giver, which was the wife of the patient. This woman (wanted to have) had a lot of influence on her partner, even it was too much to handle for this woman. So, in this case, the health care professionals had to act on the situation of the patients' wife as well. Besides answering the patients' wife's needs, this case was about preparing the patient and his wife for an intake. The health care professionals were aware of the deteriorated situation and the fact that the health care professionals should prepare for a crisis intake and arranged an MDC.

(I) Compared to the first case study (Network A), the second case study (Network B) has more activities which are due to medical changes or events of the patient, like a heart attack, rectal blood loss and falling several times. Therefore, different health care professionals became involved as the medical changes or events occurred. The health care professionals were involved at moments where they were needed by the patient and functioned as an answer to medical changes of the patient. Since there were more medical changes/events than in the former case where there was the heart attack, the rectal blood loss and the many falls, decisions and activities of the health care professionals did not relate to prevention, because there was not much time left for actions that contributed to the prevention of a crisis intake. (II) Moreover, where in the first case the GP was involved in almost all decisions/activities, the GP is in this case more on the background. It was mostly the home care who took the actions and made (together with others) decisions. The GP was involved in the beginning to set up a proper health care network for the patient and just before the intake, because it is the task of a GP to arrange a (crisis) intake.

(III) The last case, Network C, was a case where the health care professionals became actively in the picture just two months before the intake. As been notified in the previous chapter, there was a lot of passive behavior which caused a diagnosis very late. Therefore, there were not many actions or decision-making moments for the health care professionals.

So, to conclude, the actions and decision-making moments are dependent on the patient and their environment. The situation of the patient and their environment are determinative on how the health care professionals should act. There did not seem to be one way or one standard process the health care professionals followed towards a crisis situation. This is the same for the variety of present people within one crisis situations. Depending on the situation of the patient and their environment, care will be deployed.



## ***5.2. Comparison game theoretical models***

As became clear in the previous chapter, there were different game theoretical models present during the decision-making process towards crisis situations. This paragraph will compare the presence of the game theoretical models in relation to the decision-making moments and elements. There will be a comparison on how often a particular game theoretical model occurred, linked to the moment the game occurred and who were involved.

To start, the Principal-Agent Game occurred in every case that was examined. The fact that a leader in the network (the principal) stood hierarchically seen above someone else (the agent) was in every case combined with a variation of information which was asymmetric. This could be that the agent had more knowledge due to their function, but there was also asymmetric information due to members of the network that did not share the information they should actually share. Asymmetric information has different causes in the three cases. The reason that asymmetric information occurred is due to the difference in knowledge, which is dedicated to the difference in professionals. It had been found in the three cases that asymmetric information is therefore not always undesirable, because it might lead to situations where the one with the knowledge is of great support to the one who does not have the knowledge. This seemed to foster the collaboration between the health care professionals.

According to the GP that was interviewed for primary data (interview, 9 June 2022), there were no consequences on not consequently sharing data with colleagues. Interesting to notice during this Principal-Agent Games was that of the four times this game occurred within the three cases, all these games involved a GP. From these four cases the GP played a part in the Principal-Agent Game, there were two times the GP was the leader/principal in the games. The other times the Principal-Agent Game was analyzed, it was one time the district nurse who was the Principal and one time it was the specialist elderly care. In primary care, which is a base in DementiaNet networks, the general practitioners and community nurses are having key professions. Towards a crisis situation, these two professions are part of the communication. However, they might have different interests and there might be asymmetrical information (Nieuwboer, 2019). The times in the cases where the GP was the leader/principal in the game, the whole game lasted from the first involvement of the health care professionals to an intake in a nursing home.

Another game that occurred frequently in every game was the Volunteers Dilemma. From the five Volunteer Dilemma's which were present during the three cases, three of them started after an MDC was performed. During these three Volunteers Dilemma's, it was the GP who showed passive behavior, while other members from the network would have liked to see

that the GP had taken action. It is remarkable that this happens after an MDC, since MDC's are arranged in order to promote communication and tuning of care, targeting the individual needs for a patient (Eliens & ten Have, 2014). Where in the Principal-Agent Game the GP played a part in every game occurred, the GP plays a part in four of the five the Volunteers Dilemma's. Every time the GP was involved, it was at least the GP who showed passive and "wait and see" behavior. This behavior emerged on moments where the GP should act but did not, because it is "naturally to lean back and take it easy before taking action". Therefore, a patient had a late diagnosis on Dementia, the CPC was not employed when they should be and there was no perseverance when the family was holding back, but the situation of the patient was critical. Other actors who were involved during a Volunteers Dilemma were the practice supporting general practitioner, the CPC, district nurses and the SEC.

The Hub-Spoke Game characterized the decision-making process while there was a difference in wanting and acting on preventing a crisis situation. This game was discovered two times. Interesting to notice from these two times the game was present that both games ended with a hub in the game who made a decision which brought clarity to other actors (spokes) in the network and solved the difference in incentives between the spokes. There was no specific person who was the hub or spoke in each Hub-Spoke Game.

Then there are game theoretical models that just occurred once in the three cases. Since those games were only present a single time, it is hard to make statements about the time these games were present. One game that happened once was the Battle of the Sexes, where the practice supporting general practitioner insisted on visiting the patient after intake, while the CPC did not want to visit the patient.

Another game that happened once was the Cascade Game, where the actors in the decision-making process had to make decisions sequentially. It was the CPC who had to make a decision after acts of the district nurses. After that, it was the practice supporting general practitioner who had to anticipate on the decision of the CPC and finally the GP and the SEC had to make a new care plan for the patient after the anticipation of the CPC.

The last game that occurred was the Diners Dilemma. During this game it were the different district nurses who had conflicting incentives and therefore some of the district nurses did violate the agreement about how to treat a patient.

So, to conclude, especially the Principal-Agent Game and the Volunteers Dilemma seemed to occur often in decision-making processes towards crisis situations in DementiaNet networks. During these two games, the GP played a major role and was often a part of these games.

### ***5.3.Relationship decision-making moments/elements and game theoretical models***

It was not the aim of this study to focus on finding relationships between decision-making moments/elements and game theoretical models. It was the goal to describe and characterize the decision-making process from DementiaNet networks towards a crisis situation, by using game theoretical models. However, while reaching this goal, this thesis found two interesting relationships which will be mentioned in this paragraph briefly. Because there were only three case studies used in this thesis, more relationships will be found probably when using more case studies.

The first relationship that stood out was the relationship between the occurrence of a Volunteers Dilemma and the moment of decision-making. The moment of the decision-making was at a Multi-Disciplinary Consultation. Each time, several health care professionals were present at the decision-making in this consultation. Despite the fact that a Multi-Disciplinary Consultation is used to make collective agreements and decisions, it was not clear to most of the health care professionals had which responsibility. Four of the five times a Volunteers Dilemma occurred, it was right after a Multi-Disciplinary Consultation, because the members from the network showed wait-and-see behavior at a moment the responsibilities should be fulfilled.

The second interesting relationship between a decision-making element and a game theoretical model is that for all other the games that were present in the decision-making process, it was not present at a specific moment within the decision-making process. The occurrence of a game theoretical model turned out to be dependent on the involved people, which was often the general practitioner. So there seemed to be a relationship between the person who is involved in the decision-making process and the occurrence of a game theoretical model.

## **6. Conclusion and discussion**

### ***6.1. Conclusion***

The decision-making processes towards crisis situations of the different cases indicate the signal/events, actions and decision moments of the patient, care giver and health care professionals over time. Every timeline of the decision-making process contains different actions and decision-making moments of the health care professionals are responses or preventions to the actions and sometimes decision-making moments of the patient and care giver. In the decision-making processes, several game theoretical models were analyzed. By comparing the game theoretical models which occurred during the decision-making processes towards crisis situations, it seemed that there was a pattern in more common game theoretical models which abled this study to characterize the decision-making of interprofessional collaboration towards crisis situations in DementiaNet networks. The games that occurred more often were the Principal-Agent Game, the Volunteers Dilemma and the Hub-Spoke Game. During these games, the GP was involved multiple times and played an important role in the games. Thereby, the relationships between the general practitioner and other network members were major in the games. The similarities and differences between the three different cases were found based on change in medical conditions or arrangements, the involvement of the caregiver, when and how many healthcare professionals were involved, the role of the general practitioner and the behavior of the healthcare professionals. The extent of the appliance of game theoretical models in decision-making in this study is that the game theoretical models are tool to analyze complex decision-making of multiple actors. This thesis searched globally for relationships between the game theoretical models and decision-making elements in the decision-making process towards a crisis situation. Two remarkable relationships were found: (1) the Volunteers Dilemma was mostly present after the arrangement of a Multi-Disciplinary Consultation. (2) For all the other selected games, the moment a game occurred was not remarkable similar with other games, but at the occurrence of the other games, it was mostly the behavior of actors which was the cause of the of the game.

### ***6.2. Discussion***

There are several results that can be interpreted after an analysis of the multi-actor decision-making towards crisis situations in DementiaNet networks. These interpreted results are not gained without any limitations. The results are based on only three different cases from three different networks, while there are more networks and many more occurred Dementia cases.

Thereby, these results are obtained by analyzing with game theoretical models. There are several other ways to analyze complex decision-making, but for this research game theoretical models seemed the most applicable. However, other methods were not confiscated at all.

While analyzing the constructed timelines and the noticed game theoretical models, there were some other interesting additional remarks in this research. First, the presence of the role of the GP became clear in the previous paragraphs. It often occurs that the GP is indeed the leader of the network. However, there are cases where the GP thinks to be the leader, where other network members have the opinion that the leader of the network is someone else than the GP. This means that the division of the tasks is not explicit in practice. Thereby, the district nurses have blamed the GP some times to be passive and absent. During the interviews – in the primary and secondary data – the GP is the person who thinks very positive on the process towards crisis situations, even if other network members claim that not everything is working out the way it should be. The role of the district nurses is remarkable in this topic. Even when a district nurse claims that a GP is not the network leader, the district nurses will still wait sometimes for the GP to make a decision before a district nurse takes action.

The GP mostly thinks that everyone felt heard and that everyone is content about how the process proceeded. However, it seemed that the district nurses are a lot more critical on that area than the GP. The district nurses are the people who are very close to a patient and see a patient more often than a GP. The nurses were noticeable less involved than other parties as well in the decision-making, but also in the interviews for the secondary data. There have been situations where the GP did not appreciate the notifications of the district nurses, because the GP valued the own direction of the patient more, despite the fact that the district nurses were seeing the patient much more often than the GP.

Besides the interpreted results, this study contributes – as mentioned in the introduction – to the theory in three different ways: applying game theoretical models to a new network, namely a DementiaNet network; specializing decision-making in healthcare on crisis situations in Dementia cases; adding more characteristics to a DementiaNet network.

Beside the fact that this research contributes to applying game theoretical models in a new field, namely crisis situations in DementiaNet, the game theoretical models are in particular interesting for the decision-making processes that occur between health care professionals. The reason for this is that healthcare professionals are multiple actors with different professions and have therefore different incentives. Those are criteria to apply game theoretical models in complex decision-making. Those criteria are applicable to all DementiaNet networks, since they include multiple healthcare professionals who make decisions (together), even though

there are different incentives. In this research, the interprofessional collaboration between health care professionals is highlighted during the decision-making process. Therefore, it turned out that the game theoretical models also could be applied to characterize the decision-making process during the interprofessional collaboration. Hence, this research contributes to more than just applying the game theoretical models in the decision-making process towards crisis situations in DementiaNet networks.

This is according to the next theoretical contribution, namely adding a new field on analyzing decision-making in healthcare. This study analyzes the decision-making on a specialized field in healthcare, to wit in crisis situations in Dementia. In this study, the multi-actor decision-making of healthcare professionals within a DementiaNet network towards a crisis situation are analyzed. Therefore, decision-making is applied on a more specialized field than just in healthcare.

The literature about DementiaNet networks highlighted a selection of characteristics which a DementiaNet network contains. Several other characteristics subjoined this selection. The first characteristic that became visible during this study was that every DementiaNet network contains a general practitioner and a district nurse who play major roles during a crisis situation. Thereby, in every DementiaNet network, all members have the freedom to take action and make arrangements on the proceedings of the care for a patient at any moment they feel the urgency to do so. Another characteristic that appeared during this study was that every DementiaNet network aims to work with a clear dividing of the tasks, wherefore everyone strives to create this dividing. However, these characteristics became clear during this multiple case study of only three networks. To assure these characteristics cover all DementiaNet networks, a multiple case study of more cases/networks is recommended.

Besides this recommendation on further research, the next studies are also recommended to perform:

- The secondary data of DementiaNet now consists from only interviewed people of the second level of complexity. For further research, interviews of the first and third level of complexity should be included in the data too.
- Further research can include interviews with members of all three DementiaNet networks, instead of only two members of only one DementiaNet network. These interviews should include interview questions on the specific characteristics of the game theoretical models, since this thesis gained most information from data which did not focus on the games especially.

- To assess the effectiveness of DementiaNet networks who follow the program of DementiaNet, a comparison could be made with DementiaNet network who do not follow the program of DementiaNet and are thereby not an official DementiaNet network.
- One of the results of this study is that game theoretical models start after participating a Multiple Disciplinary Consultation (MDC), which meant that there is no clear dividing of the tasks, responsibilities and arrangements. Further research could be done about the effectiveness of Multiple Disciplinary Consultation.
- The games that were identified in the decision-making processes towards crisis situations in DementiaNet networks, can be validated by the healthcare professionals in an intervention or workshop setting.
- When the games are validated by the healthcare professionals, research should be done on how to prevent, solve these games when they lead to negative outcomes. Then, the research can be used to arrange workshops for the healthcare professionals on how to recognize and deal with these games.
- The relationships between the decision-making elements-moments and the game theoretical models were shortly highlighted. Further research should dig deeper on this topic. Quantitative research is recommended when testing these relationships. Thereby, these relationships should be tested on more than the three case studies which have been investigated for this thesis.

## 7. References

- Anand, A., Behera, B. K., & Panigrahi, P. K. (2020). Solving diner's dilemma game, circuit implementation and verification on the IBM quantum simulator. *Quantum Information Processing*, 19(6), 1-14.
- Archetti, M., & Scheuring, I. (2012). Game theory of public goods in one-shot social dilemmas without assortment. *Journal of theoretical biology*, 299, 9-20.
- Banks, J. S., & Calvert, R. L. (1992). A battle-of-the-sexes game with incomplete information. *Games and Economic Behavior*, 4(3), 347-372.
- Bekius, F. (2019). *Towards understanding and supporting complex decision-making by using game concepts: A case study of the Dutch railway sector*. Delft University of Technology.
- Bekius, F., Cunningham, S. W., de Bruijn, H., & Meijer, S. (2016). Structuring the multi-issue and hub-spoke games found in public administration. 2016 Portland International Conference on Management of Engineering and Technology (PICMET) (pp. 43-53). IEEE.
- Bekius, F., Meijer, S., & de Bruijn, H. (2018). Collaboration patterns in the Dutch railway sector: Using game concepts to compare different outcomes in a unique development case. *Research in Transportation Economics*, 69, 360-368.
- Bekius, F., Meijer, S., & Thomassen, H. (2022). A Real Case Application of Game Theoretical Concepts in a Complex Decision-Making Process: Case Study ERTMS. *Group Decision and Negotiation*, 31(1), 153-185.
- Berger, S., Feldhaus, C., & Ockenfels, A. (2018). A shared identity promotes herding in an information cascade game. *Journal of the Economic Science Association*, 4(1), 63-72.
- Buchanan, A. (1988). Principal/agent theory and decision making in health care. *Bioethics*, 2(4), 317-333.
- De Bruijn, H., & Heuvelhof, E. t. (2002). Policy analysis and decision making in a network: how to improve the quality of analysis and the impact on decision making. *Impact assessment and Project appraisal*, 20(4), 232-242.
- De Bruijn, H., & Ten Heuvelhof, E. (2018). *Management in networks*. Routledge.
- Dong, Y., Zha, Q., Zhang, H., Kou, G., Fujita, H., Chiclana, F., & Herrera-Viedma, E. (2018). Consensus reaching in social network group decision making: Research paradigms and challenges. *Knowledge-Based Systems*, 162, 3-13.



- Eliens, A., & ten Have, E. (2014). Interdisciplinary rounds: assessing quality of interdisciplinary rounds in the intensive care unit. *Nederlands Tijdschrift voor Evidence Based Practice*, 12(5), 7-8.
- Hipel, K. W., Fang, L., & Kilgour, D. M. (1993). Game theoretic models in engineering decision making. *Doboku Gakkai Ronbunshu*, 1993(470), 1-16.
- Kaplan, R. M., & Frosch, D. L. (2005). Decision making in medicine and health care. *Annual Review of Clinical Psychology*(2005), 1(1), 525-556.
- Kickert, W. J., Klijn, E.-H., & Koppenjan, J. F. (1997). *Managing complex networks: Strategies for the public sector*. Sage.
- Klijn, E.-H. (2001). Rules as institutional context for decision making in networks: The approach to postwar housing districts in two cities. *Administration & Society*, 33(2), 133-164.
- Lake, D. A., & Wong, W. (2007). The politics of networks: interests, power, and human rights norms. *Power, and Human Rights Norms* (May 12, 2007).
- Ledgerd, R., Hoe, J., Hoare, Z., Devine, M., Toot, S., Challis, D., & Orrell, M. (2016). Identifying the causes, prevention and management of crises in dementia. An online survey of stakeholders. *International journal of geriatric psychiatry*, 31(6), 638-647.
- Leggett, A. N., Polenick, C. A., Maust, D. T., & Kales, H. C. (2018). Falls and hospitalizations among persons with dementia and associated caregiver emotional difficulties. *The Gerontologist*, 58(2), e78-e86.
- Litjens, M. J., Perry, M., Hendriks, S., & Olde Rikkert, M. (2021). Crisisopname bij dementie dient zich vaak al eerder aan. *Medisch Contact*. <https://www.medischcontact.nl/nieuws/laatste-nieuws/artikel/crisisopname-bijdementie-dient-zich-vaak-al-eerder-aan.htm>
- Monareng, L. V. (2013). An exploration of how spiritual nursing care is applied in clinical nursing practice. *Health SA Gesondheid*, 18(1).
- Nieuwboer, M. S., Richters, A., & van der Marck, M. A. (2017). Triple aim improvement for individuals, services and society in dementia care. *Zeitschrift für Gerontologie und Geriatrie*, 50(2), 78-83.
- Nieuwboer, M. (2019). *Interprofessional communication and clinical leadership in the development of network-based primary care* [Sl: sn].
- Oostra, D. L., Harmsen, A., Nieuwboer, M. S., Rikkert, M. G. O., & Perry, M. (2021). Care Integration in Primary Dementia Care Networks: A Longitudinal Mixed-Methods Study. *International Journal of Integrated Care*, 21(4).

- Rasmusen, E. (2007). Games and information. An introduction to game theory. *Theory and Decision*, 29(2).
- Richters, A., Nieuwboer, M. S., Perry, M., Rikkert, M. G. O., Melis, R. J., & van der Marck, M. A. (2017). Evaluation of DementiaNet, a network-based primary care innovation for community-dwelling patients with dementia: protocol for a longitudinal mixed methods multiple case study. *BMJ open*, 7(8), e016433.
- Richters, A., Nieuwboer, M. S., Olde Rikkert, M. G., Melis, R. J., Perry, M., & van der Marck, M. A. (2018). Longitudinal multiple case study on effectiveness of network-based dementia care towards more integration, quality of care, and collaboration in primary care. *PloS one*, 13(6), e0198811.
- Roungas, B., Bekius, F., & Meijer, S. (2019). The game between game theory and gaming simulations: design choices. *Simulation & Gaming*, 50(2), 180-201.
- Starfield, B. (2011). Is patient-centered care the same as person-focused care? *The Permanente Journal*, 15(2), 63.
- Strandberg, J. M., & Vigsø, O. (2016). Internal crisis communication: An employee perspective on narrative, culture, and sensemaking. *Corporate Communications: An International Journal*.
- Streater, A., Coleston-Shields, D. M., Yates, J., Stanyon, M., & Orrell, M. (2017). A scoping review of crisis teams managing dementia in older people. *Clinical interventions in aging*, 12, 1589.
- Tserkovny, A. (2022). Some Considerations about Fuzzy Logic Based Decision Making by Autonomous Intelligent Actor. *Journal of Software Engineering and Applications*, 15(2), 19-58.
- Urena, R., Chiclana, F., Melancon, G., & Herrera-Viedma, E. (2019). A social network based approach for consensus achievement in multiperson decision making. *Information Fusion*, 47, 72-87.
- Valentijn, P. P., Schepman, S. M., Opheij, W., & Bruijnzeels, M. A. (2013). Understanding integrated care: a comprehensive conceptual framework based on the integrative functions of primary care. *International Journal of Integrated Care*, 13.
- Van den Bergh, J., De Blij, J., Nieuwboer, M., Oostra, D., Perry, M., Remers, T., Olde Rikkert, M., & Wolters, F. (2021). Eerstelijns zorgnetwerken voor ouderen: feiten en verhalen. *DementieNet*.

- Viplive. (2022). *Een product van Topicus en Calculus*. Viplive. Retrieved July from <https://www.viplive.nl/over-ons>
- Vroomen, J. M., Bosmans, J. E., van Hout, H. P., & de Rooij, S. E. (2013). Reviewing the definition of crisis in dementia care. *BMC geriatrics*, 13(1), 1-12.
- Wang, W. (2016). Exploring the determinants of network effectiveness: The case of neighborhood governance networks in Beijing. *Journal of Public Administration Research and Theory*, 26(2), 375-388.

## 8. Appendices

### 8.1. Appendix I: Crisis definitions from seven articles with citations

Original article	Crisis definition
Hoff, 1995 [7,8]	"The representation of a serious occasion or turning point occurring when an individual is faced with an obstacle that is important to life goals. A crisis is self-limiting because homeostatic mechanisms necessitate resolution of a crisis. A crisis results in depletion of system resources and eventually the system shuts down or ceases to function."
Caplan, 1961 [7,9]	"An obstacle that is insurmountable through customary methods of problems solving."
Liken, 2001 [7]	"A process precipitated by a stressor that occurs only in the presence of mediating factors, when normal methods of problem solving have failed, and results in an outcomes or resolution."
Caplan, 1964 [10,11]	"An imbalance between the difficulty and importance of the problem and resources immediately available to deal with it."
Butcher and Maudel, 1976 [12-14]	"The dual experience of distress and sense of immediacy associated with a defined, problematic situation."
Aguilera, 1998 [15]	"A perceived or actual imbalance between perceived difficulty of a life challenge and an available repertoire of coping skills."
Aguilera and Messick, 1986 [16], Joslin, 1980 [17]	
England, 1994 [17]	"A decision point, an opportunity for growth."
Maturana and Varela, 1987[18], Shaw and Halliday, 1992 [17]	"In crisis, experience within the niche is detached and out of sync with the rest of the domains of experiences, one or more structural domain."
Michon, 2005 [19], De Clerq and Dubois, 2001 [20], Aguilera, 1998 [15]	"Periods of disorganization experienced by the entire family that turn into opportunities of change."

Figure 7 - (Vroomen et al., 2013)

## 8.2. Appendix II: Codebook

Pattern		Open	Code number
Signals		Signals/events patient	1.1
		Signals caregiver/MZ	1.2
		Intake	1.3
DM		DM moment/action MZ	1.4
		DM moment/action healthcare professional	1.5
		Lack of DM/activity	1.6
Game theoretical models	M-I game	<b>Multiple actors with multiple issues</b>	2.1.1
		Different incentives	2.1.2
		Aim to reach a common goal	2.1.3
	P-A game	<b>Hierarchical relationship between a supervisor/leader and others</b>	2.2.1
		Different or conflicting interests	2.2.2
		<b>Asymmetric information</b>	2.2.3
	CC game	Actors act dependent on other actors	2.3.1
		Decisions are made in different parts or layers within an organization.	2.3.2
		Path-dependency	2.3.3
		<b>Sequential decisions</b>	2.3.4
		Irrational DM	2.3.5
	HS game	Multiple actors	2.4.1
		Different incentives	2.4.2
		<b>Steered by one actor (hub)</b>	2.4.3
		(Hierarchical relationship)	2.4.4

		Decision is made after negotiations	2.4.5
		Only one possible option	2.4.6
	VD	One or more actors take responsibility (shared responsibility)	2.5.1
		Prevent worst case scenario	2.5.2
		Passive attitude	2.5.3
		Waiting for another to make a decision	2.5.4
		Volunteering to prevent personal blame	2.5.5
		No decision will be made	2.5.6
		Avoiding costs of volunteering to exploit public goods which are produced by others.	2.5.7
		<b>Wait &amp; see behavior</b>	2.5.8
	DD	Symmetric	2.6.1
		Non-strictly competitive	2.6.2
		Non cooperative	2.6.3
		Value of payoff	2.6.4
		Free riding	2.6.5
		<b>An actor that violates agreement</b>	2.6.6
	BOS	Two actors	2.7.1
		Dependent on each other	2.7.2
		Common goal	2.7.3
		<b>Other motives</b>	2.7.4
		Adapt to other motive	2.7.5
		<b>Conflict emerging/appearing</b>	2.7.6
		Decision made simultaneously	2.7.7

		Not able to communicate	2.7.8
		No optimal outcome	2.7.9
		Only one possible option. No compromising.	2.7.10

### **8.3. Appendix III: Interview guide in Dutch**

*[Toestemmingsverklaring laten tekenen]*

#### **Introductie**

Ik doe mijn Master Thesis vanuit de Radboud Universiteit. Dit is een onderzoeksproject van Marieke Perry, Dorien Oostra en Femke Bekius. Ik doe onderzoek naar de besluitvorming in samenwerkingen binnen de DementiaNet netwerken, met als doel de interacties binnen de samenwerking te analyseren. Dit wordt gedaan met betrekking op besluitvorming voorafgaand aan crisissituaties.

Dit is de beginstap voor verder onderzoek en verdere verbeteringen binnen de samenwerkingen van DementiaNet. Dit zal specifiek gaan over de samenwerking tussen de zorgprofessionals binnen het netwerk waar u onderdeel van bent. Allereerst wil ik u bedanken voor uw tijd. Het interview zal ongeveer een half uurtje gaan duren.

Heeft u nog vragen of zijn er nog onduidelijkheden na aanleiding van de informatiebrief?

Graag benadrukken wij nog even dat er geen goede of foute antwoorden zijn. Wij gaan respectvol met de informatie om en wij gaan de informatie ook alleen gebruiken voor ons onderzoek.

#### **Algemene vragen:**

1. Kunt u iets vertellen over uw functie?
2. Kunt u iets vertellen over uw rol binnen het Dementienet?
3. Hoe lang bent u al onderdeel van dit netwerk?

#### **Deel 1: Besluitvorming voorafgaand aan crisissituaties**

Introductie: Nu gaan we in over het besluitvormingsproces in de aanleiding naar een crisissituatie. In mijn onderzoek definieer ik een crisissituatie als een proces waarin er factoren zijn waardoor de balans wordt verstoord en er een onmiddellijke beslissing moet worden genomen, zodat er een gewenste uitkomst ontstaat voor patiënt en betrokkenen.

1. **Taak verdeling wie wat doet op welk moment.** Welke besluitvormingsmomenten vinden plaats voorafgaand aan een crisissituatie?
  - a. Is er daarbij vaste werkwijze/protocol? Zo ja, hoe ziet die er uit?
2. Is er een opeenvolgendheid van besluitvormingsmomenten?
  - a. Kunt u dit dan ook toewijzen aan de besluitvorming/belangen van verschillende lagen of plekken in het netwerk?
  - b. Heeft dat dan te maken met problemen/issues rondom de patiënt die dan tijdens de samenwerking spelen er tegelijkertijd? → tekenen van het proces

#### **Deel 2: Algemeen vragen over samenwerking**

3. Hoe verloopt de samenwerking met de zorgprofessionals binnen het netwerk?
  - a. Hoe wordt er binnen het netwerk gereageerd op onverwachte gebeurtenissen?
4. Hoe verloopt de samenwerking met de netwerktrekker?



- a. Merkt u een verschil in samenwerking met de netwerktrekker en andere zorgprofessionals binnen het netwerk?
  - b. Heeft u het idee dat interacties tussen de zorgprofessionals buiten de netwerktrekker om de algemene samenwerking beïnvloeden? Waarom wel/niet?
- 5. Heeft iedereen binnen de samenwerking toegang tot dezelfde informatie op hetzelfde moment? (Toegang tot dezelfde systemen, verslagen over patiënten enz.)
  - a. Zo nee, wat is de reden dat niet iedereen toegang heeft tot dezelfde informatie, hoe ontstaan eventuele vertragingen?
  - b.

## **Deel 2: Doelen/ besluiten/ conflicten binnen het Netwerk**

- 6. Wat is uw belang binnen het netwerk?
- 7. En heeft u het idee dat deze overeenkomen met de belangen van de andere zorgprofessionals binnen het netwerk?
- 8. Houden de zorgprofessionals binnen het netwerk zich aan de afspraken?
  - a. Kunt u voorbeelden geven wanneer men zich niet aan de afspraken hield?
- 9. Kunt u een voorbeeld geven wanneer er onduidelijkheden waren over de verantwoordelijkheid van taken binnen een bepaalde casus?
  - a. Waarom ging dit mis?
- 10. Merkt u verschil in hiërarchie tussen zorgprofessionals binnen het netwerk?
  - a. Zo ja op welke manier merkt u dit? Waarom denkt u dat dit zo is?
  - b. Merkt u bijvoorbeeld dat zorgprofessionals veel waarde hechten aan hun functie? Zo ja, Op welke manier?
- 11. Stel er ontstaat een probleem binnen de communicatie of een meningsverschil in de aanloop naar een crisissituatie, hoe gaat u daar zelf mee om?
  - a. Tussen wie en waarom is er een meningsverschil?
  - b. Die meningsverschillen zelf in de aanleiding naar een crisissituatie, leggen de actoren dan wel eens verschillende issues tegelijkertijd op tafel, zodat de besluitvorming wordt gecompliceerd? [voorbeeld vragen]
- 12. Op welke manier heeft u het gevoel dat het proces in aanleiding naar de crisissituatie op een dusdanige manier gebeurt door de zorgprofessionals, zodat alle actoren zich gehoord voelen?
- 13. Wat zou u zelf nog willen verbeteren aan de samenwerking en/of besluitvorming