



**Adverse events related to coordination between primary and secondary health care  
services in Norway**

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## Abstract

At present, nearly 25 percent of all patients experience some variety of adverse event during the life cycle of their patient experience in a hospital admission (Kable, et al. 2008). It is critical to effectively gain a comprehensive understanding of the types, frequencies, causes and consequences of adverse events related to coordination of care between primary and specialized health care services in Norway, in order to effectively prevent future adverse events. This research seeks to determine the primary characterizations of adverse events, as they relate to patient transfers between care providers, as well as to identify details and additional areas for research associated with these characterizations. The research was accomplished through review of adverse event reports using a developed taxonomy to appropriately sort and present event occurrences. Within the findings were a number of significant results, including a higher propensity for errors associated with improper or inadequate communication, caused by multiple causal factors. In utilizing a number of existing taxonomic structures to sort, evaluate and classify adverse events, it became apparent that there is no existing taxonomy that is fully suited to apply to patient handovers occurring between primary and specialized health care providers in Norway, resulting in the need to develop one. Additionally, resulting data supported a need for further research and development of best-practice defensive barriers to mitigate hazards within patient handovers and care transfers, to better protect against multi-factorial risks associated with typical adverse events.

## Table of Contents

1	Introduction .....	1
1.1	Background.....	1
1.2	Aim/Objective .....	2
1.3	Research questions.....	3
1.4	Collaborations.....	3
1.5	Limitations.....	4
2	Theoretical framework .....	5
2.1	Definitions of important terms .....	5
2.2	Previous Research.....	6
2.3	Learning from mistakes/Why report? .....	8
2.4	Models of adverse events.....	8
2.5	Use of a taxonomy to classify errors .....	12
3	Context .....	20
3.1	Relevant laws and judicial considerations .....	20
3.2	Norwegian Healthcare System .....	20
3.3	Coordination reform .....	21
3.4	Synergi.....	22
3.5	Case description.....	23
4	Methods .....	24
4.1	Design.....	24
4.2	Sample .....	24
4.3	Interviews with Synergi coordinator .....	25
4.3.1	Adverse event reports.....	25
4.4	Data collection.....	26
4.4.1	Key interviews.....	26
4.4.2	Adverse event reports.....	27
4.5	Analysis .....	28
4.6	Ethical considerations.....	29
5	Results .....	31
	When adverse events occur .....	31

5.1.1	Admission.....	31
5.1.2	Discharge.....	31
5.2	Types of adverse events.....	32
5.2.1	Written communication/documentation.....	32
5.2.2	Spoken communication.....	35
5.2.3	Diffuse/unclear responsibility.....	38
5.2.4	Not performing expected duties.....	38
5.2.5	Multiple errors.....	39
5.3	Causal factors.....	40
5.4	Consequences.....	41
5.5	Differences from before and after coordination reform.....	42
6	Discussion.....	43
6.1	Admissions vs. discharge.....	43
6.2	Availability of discharge reports.....	44
6.3	Written vs. spoken communication.....	44
6.4	Person approach vs. system approach.....	45
6.5	Reason's Swiss cheese model.....	46
6.6	Consequences of adverse events.....	47
6.7	Need for additional taxonomy development.....	47
7	Conclusion.....	48
8	References.....	49
9	Appendices.....	54
9.1	Appendix 1.....	54
9.2	Appendix 2.....	56
9.3	Appendix 3.....	57

# 1 Introduction

Patient safety has become an increasingly important topic of research over the last decade (Vincent 2010, Aase 2010), yet the importance of protecting patients from harm is not a new idea. As early as 370 B.C., Hippocrates addressed the importance of protecting patients from unnecessary complications, stating “*Primum non nocere*” “*First, do no harm*”. While the goal of medical care is to treat illness without unnecessary harm to the patient, the delivery of such care has proved to be inherently risky. In 1964, Schimmel documented the dangers of being hospitalized, or “the price we pay for modern diagnosis and therapy,” as he referred to it in his report on the Hazards of Hospitalization, with outcomes including drug reactions and “untoward effects” of diagnostic and therapeutic procedures. In a review of adverse events associated with discharge from intensive care settings, Elliot et al. define an adverse event as “any unintended harm or injury to a patient, including temporary or permanent disability, which is caused by the health care provided rather than the patient’s disease or illness.” (Elliott, et al. 2013). At present, nearly 25 percent of all patients experience some variety of adverse event during their hospital admission (Kable, et al. 2008), with one in five of those events resulting in death, and another 13 percent rendering the patient permanently disabled. It is estimated that at least half of these events would have been prevented with an increase in standards of care (Baker, et al 2004, DeVries, et al. 2008).

## 1.1 Background

Transitions between care settings have become an increasingly important topic in patient safety research. The World Health Organization (2009) rates lack of communication and coordination (including coordination across organizations, discontinuity and handovers) as one of the top six research priorities within the field of patient safety for developed countries, indicating a need for more research within the area of coordination of care.

Coleman and Boulton (2003) define transitional care as “*a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or*

*different levels of care within the same location*” (p. 30). Transitions between primary and secondary health care settings have proven to be a high-risk area for patients, and an increasing amount of research indicates a correlation between patient handovers and adverse events (Forster, et al. 2003, Forster, et al. 2004, Moore, et al. 2003, Kripalani, et al. 2007). In the past, it was common for people to have one doctor, with that doctor responsible for the majority of their care. The emphasis on increasing specialization within sub-fields of medicine has begun to create the need for cooperation between primary and specialized health care providers, as any patients now have (Tahan 2007). This leads to an increase in the number of handovers and an increased risk for patients (Wachter 2008).

Patients changing needs have also lead to an increase in transitions. Patients with continuous complex care needs frequently require care in multiple settings, and as such are particularly vulnerable to poorly executed transitions (Coleman and Boulton 2003). Because patient care is often fragmented, duplicative, and sometimes disorganized and improperly planned, the risk of life threatening medical errors increases as the patients’ exposure within the healthcare system increases (Tahan 2006).

In 2009 Norway launched a health care reform focused on coordination of care (called the coordination reform). The coordination reform identified three main challenges that it aims to solve:

- Patients’ needs for coordinated services are not being sufficiently met.
- There are too few initiatives aimed at limiting and preventing disease.
- The population is developing and range of illnesses among the population are changing.

Examining adverse events, related to coordination of care, can give valuable insight into types of failures and their underlying causes. This information can then be used to improve patient safety during transitions and offer better continuity of care, an important step in making sure that patients’ needs for coordinated care are met at a sufficient level.

## **1.2 Aim/Objective**

The aim of the study is to gain a better understanding of the types, frequency, causes, and consequences of adverse events seen in relation to coordination of care between primary and secondary health care services in Norway.

### **1.3 Research questions**

#### *Main research question*

What characterizes adverse events in relation to coordination of care between primary and secondary health care services?

#### *Supplementary research questions*

- What are the most common types of adverse events reported in relation to coordination of care?
- What are the possible causes of these events?
- What consequences do these events have for patients?
- How frequently do these events occur?
- Is there any notable difference in frequency/types of events reported after the coordination reform was put in to place?
- How reliable are the data on reported adverse events in relation to coordination of care?

### **1.4 Collaborations**

This study is a collaboration with a larger patient safety study, Quality and safety within elderly health and care services – The role of transitions and interactions (QSEHCS). The QSEHCS study has two main objectives:

1. To understand coordination aspects (transitions and interactions) of significance for the quality and safety of elderly health and care services in Norway (Phase 1).
2. To design and test an evidence-based intervention program to assess the impact of transitions/ interactions on quality and safety and to implement improvements within transitions/ interactions in elderly health and care services (Phase 2).

While the QSEHCS study is primarily focused on the elderly population, the anonymous nature of the adverse event reports prevents the ability to use age as a distinguishing factor.

## **1.5 Limitations**

There is a substantial amount of research that indicates an under-reporting of adverse events (Bates, et al. 2003). The aim of this study is not to determine the effectiveness of the reporting system, but to use reported material as an additional data source to try to gain better insight into why the transition between primary and secondary care is a high risk area for patients. As such, problems such as reasons for under-reporting adverse events related to coordination of care will not be addressed.

## 2 Theoretical framework

In this chapter I will first provide definitions for important terms used in the paper. After that I will present previous research that is relevant to the study, models of adverse events, and taxonomies used within patient safety.

### 2.1 Definitions of important terms

#### Handover

The definition of a handover can be very broadly interpreted. The Australian Council for Safety and Quality in Health Care (2005) define a clinical handover as the transfer of information from one health care provider to another when:

- a patient has a change of location or venue of care, and/or
- when the care of/responsibility for that patient shifts from one provider to another (p. 5)

For the purpose of this study, a handover refers to the transfer of information that occurs as the responsibility for patient care shifts between primary and secondary health care providers.

#### Coordination of care

From *Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies*, Care coordination can be defined as, “*the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care.*” (McDonald, et al. 2007)

#### Transitional care

For the purpose of this study, transitional care is defined as, “*A set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or different levels of care within the same location. Representative locations include*

*(but are not limited to) hospitals, sub-acute and post-acute nursing facilities, the patient's home, primary and specialty care offices, and long-term care facilities. Transitional care is based on a comprehensive plan of care and the availability of health care practitioners who are well-trained in chronic care and have current information about the patient's goals, preferences, and clinical status. It includes logistical arrangements, education of the patient and family, and coordination among the health professionals involved in the transition. Transitional care, which encompasses both the sending and the receiving aspects of the transfer, is essential for persons with complex care needs". (Coleman & Boulton 2003)*

#### Adverse event

WHO guidelines for adverse event reporting and learning systems (2005) define an adverse event as, *"An injury related to medical management, in contrast to complications of disease. Medical management includes all aspects of care, including diagnosis and treatment, failure to diagnose or treat, and the systems and equipment used to deliver care. Adverse events may be preventable or non-preventable."* (p. 8)

## **2.2 Previous Research**

The majority of research is focused on handovers within specialized health care services, and there is more focus on handovers relating to hospital discharge than hospital admissions, indicating that more research is necessary.

A review study by Laugaland, Aase and Barach (2011) identified risk factors associated with transitions between care settings, which included deficits in communication, poor or lacking documentation, adverse drug events, and procedure and test follow-up errors. In addition they found that the seriousness of consequences varied and included incorrect treatment, patient dissatisfaction, inappropriate use of resources, re-hospitalization, and death. Additionally, the study pointed out a lack of studies that measure the actual extent and frequency of adverse outcomes effecting patients that are transferred between different care settings.

A study by Moore, et al. (2003) examined the prevalence of rehospitalizations within three months after the initial post-discharge outpatient primary care visit. They found that 49% of the patients in the study experienced at least one adverse event related to discontinuity of care

from the inpatient to outpatient setting. They concluded that the prevalence of medical errors due to discontinuity of care is high and may be associated with an increased risk of rehospitalization.

Walraven, et al. (2002) conducted a study of the effects of discharge summary availability on hospital readmission. They found that only a small number of follow-up physicians had received the patient's discharge summary at the time of the follow-up visit. Additionally they found that rehospitalization was more likely when the follow-up physician had not received the discharge summary.

A study by Forster, et al. (2004) found that one quarter of the patients involved in the study experienced an adverse event after hospital discharge, and that half of these events were preventable. Further they found that it is necessary to follow patients more closely after discharge in order to prevent adverse events. They suggest that interventions could include enhanced communication with community care providers, better integration of home-care services with hospital care, hospital-based follow-up clinics, and early telephone contact.

A case study by Gandhi (2005) found that system problems including poor continuity (with multiple-provider involvement), lack of communication, and multiple handoffs led to a substantial delay in the patient's diagnosis of tuberculosis. The handoffs in the case were particularly notable as they highlighted the issue of diffused responsibility that allowed important test results to go unnoticed, ultimately resulting in the patient's death. Further, Gandhi suggests that clear lines of responsibility must be established in order to prevent misunderstandings or lapses in patient care when there are multiple care-providers are involved.

A study by Coleman, et al. (2004) found that post hospital transitions were common in Medicare (aged 65 and older) beneficiaries, and that a significant number of these care transitions were considered complicated in nature. They highlight the importance of identifying patients who are at risk for complicated care patterns with information available at the time of discharge.

A review study by Greewald, Denham and Jack (2007) found that routines for hospital discharge varied greatly from hospital to hospital and patient to patient, increasing patient risk and the number of post discharge adverse events. They suggest that a standardized discharge process could decrease the number of adverse events and unnecessary re-hospitalizations.

### **2.3 Learning from mistakes/Why report?**

Learning from previous experiences provides the basis for the necessity of reporting adverse events. In order to improve quality of care and reduce potential errors, one must be able to learn from adverse events undertaken. The primary goal of reporting and recording adverse events is to learn from them, and the first step in being able to learn from previous incidents/mistakes is by recording the events. The World Health Organization's guidelines for adverse event reporting and learning systems (2005) describe the fundamental role of a patient safety reporting system as the ability to "enhance patient safety by learning from failures of the health care system (p. 3)". In an influential report out of the United Kingdom, titled *An organisation with a memory* (Department of Health, 2000), UK public health researchers highlight the proposed improvement of the National Health Service (NHS) through implementation of more effective reporting and information systems, with particular emphasis on better documentation of adverse events. Though recording adverse events is an important first step in reducing future errors, the act of collecting these events in itself has little to no influence on patient safety. It is only through the analysis of these recorded events that one can begin to address the causes and therein gains the potential to improve patient safety. The mere reporting of adverse events is thus of little value without an analysis (WHO, 2005).

### **2.4 Models of adverse events**

#### *Person approach*

The tradition of the person approach to error focuses on error seen from the individual perspective. It views errors as stemming from an individual's wayward mental processes such as forgetfulness, inattention, poor motivation, carelessness, negligence, recklessness etc.

(Reason 2000, Vincent 2010). Since the individual is in control of their mental processes, and it is these processes that lead to the error, the individual is held completely at fault for the error committed. Methods to reduce error are targeted at individuals and often appeal to person's sense of fear, such as shame, the fear of blame, and the threat of disciplinary action. This approach isolates errors from their system context, causing important features of human error to be overlooked. Error tends to follow patterns, and as such similar circumstances and contexts often lead to the same errors regardless of the people involved. Focusing on the individuals that cause errors and ignoring the circumstances and situation surrounding the error can impede the pursuit of greater safety (Reason 2000, Vincent 2010).

### *System approach*

While the person approach focuses on individuals' actions being the cause of error, the system approach focuses on fallibility as a part of the human condition. Errors can be seen as consequences of underlying problems in the working environment. Methods to reduce error focus on the idea of context in which errors occur and employing system defenses of barriers and safeguards. When an error occurs, the focus is not on blaming the individual that triggered the error, but on which defenses failed and why in the hopes of creating more efficient barriers that will successfully prevent such errors in the future (Reason 2000, Vincent 2010).

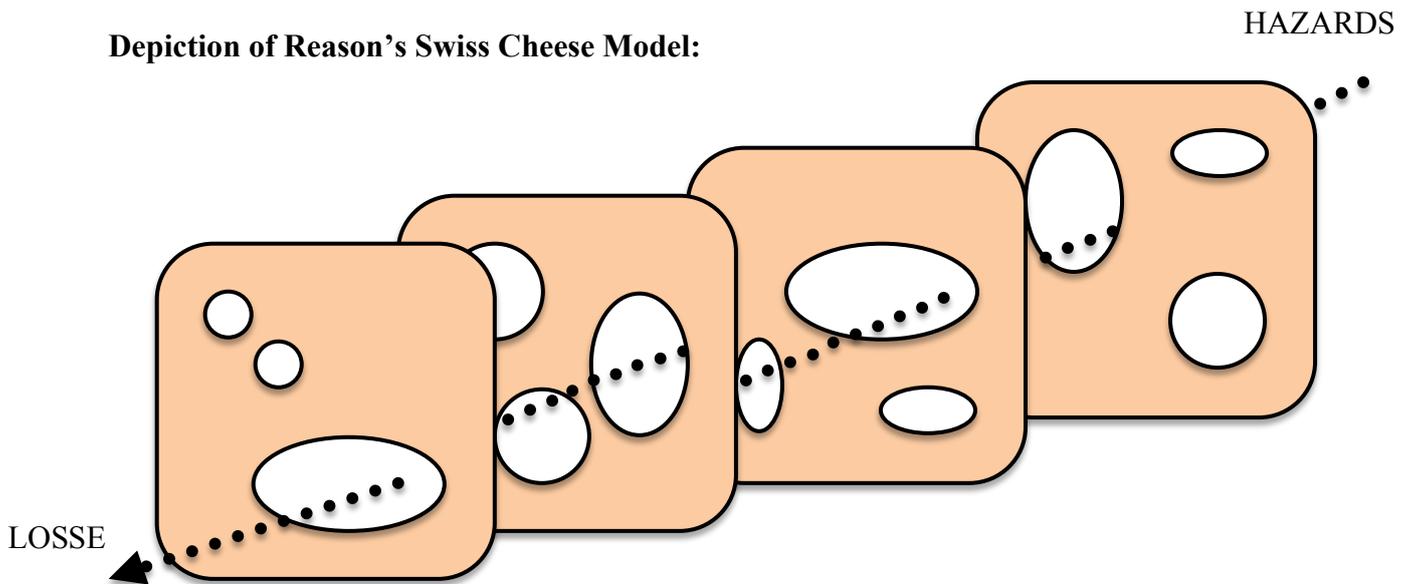
### *Reason's Swiss cheese model*

Reason (2000) applies an organizational accident model to the medical context in order to better illustrate how human errors can explain adverse events. In the system approach, barriers and safeguards are put in to place as defensive layers to prevent error. Ideally these defensive layers would be fail proof, but in reality they are filled with holes (resembling a slice of Swiss cheese). The "holes" in any one barrier do not necessarily lead to errors, as the next barrier usually blocks or prevents the error from happening. However, when the holes in all of the barriers momentarily line up it can result error.

These holes in the barriers and defenses can occur be attributed to two different causes: active failures, and latent conditions. Active failures constitute failures in which the negative outcomes occur almost immediately. In contrast, latent conditions can take significantly longer periods of time, even years, before the consequences of human actions or decisions are

fully disclosed. In the context of health care, active failures are generally committed by those in direct contact with the patient, while latent conditions are connected to organizational and managerial issues. There is emphasis on the fact that safety errors can occur at all levels of the system, and that errors arising from human factors are often a result of a chain of causes (Reason, 2000).

## Depiction of Reason's Swiss Cheese Model:



### *Blunt end/Sharp end model*

Cook and Woods (1994) offer an additional model to explain accident causation/error. In this model, the sharp end refers to health care workers who provide direct patient care, while the blunt end refers to those in positions of management and administration. It focuses on how interactions between the sharp-end and blunt-end can lead to or prevent errors and accidents. The sharp-end is affected by decisions, policies, and regulations, which are made at the blunt-end. The blunt-end dictates both the resources and constraints that shape the working environment for the sharp-end, and can contribute to errors and accidents by producing latent conditions that can increase the probability of sharp-end failure. Further it describes how overlapping cognitive factors affect human performance at the sharp end. These factors are:

- Knowledge factors- factors related to the knowledge that can be drawn on when solving problems in context.
- Attentional dynamics- factors that govern the control of attention and the management of mental workload as situations evolve and change over time.
- Strategic factors- the trade-offs between goals that conflict, especially when the practitioners must act under uncertainty, risk, and the pressure of limited resources (e.g., time pressure; opportunity costs). (p. 258)

The demands of the problem at hand shape the cognitive activities of those confronting the incident at the sharp end, and interact with each other to determine if they are flexible enough in their thinking to activate relevant knowledge (Cook and Woods, 1994; Morath and Turnbull, 2005).

## 2.5 Use of a taxonomy to classify errors

Classifying errors is pivotal to any process of change. A taxonomy is a system of classification into ordered categories. Use of a taxonomy in the field of patient safety to classify accidents offers the benefit of allowing one to learn from previous experiences; information gathered from previous experiences can then be used to improve safety in future situations. Through use of a taxonomic structure and conceptual framework, it becomes possible to systematically code and index adverse events in such a fashion as to enable the recognition of patterns and relationships between events (Wallace and Ross 2006). This also allows researchers to access adverse events for further analysis, based on a set of similarities. The use of a taxonomy to classify incidents and accidents within coordination of care events can serve the overall goal of improving safety by supporting learning from experience. WHO (2005) identifies three key factors should be considered in the design of a classification system:

- The purpose of the reporting system. What is the expected product? How will the classification scheme facilitate analysis that will produce the desired outcome?
- The types of data that are available. Are reporters expected to have carried out an investigation and analysis of the event? If not, it is unlikely that they will be able to provide useful information concerning underlying systems causes, and events will not be able to be classified at that level.
- Resources. The more detailed and elaborate the classification system is, the more expertise will be required, and the costlier the system will be to maintain.

Taxonomies used within patient safety

*World Health Organizations Conceptual Framework for the International Classification of Patient Safety (ICPS)*

WHO (2009) has developed a conceptual framework for the international classification of patient safety. The conceptual framework aims to provide a comprehensive understanding of the domain of patient safety, and to represent a continuous learning and improvement cycle emphasizing identification of risk, prevention, detection, reduction of risk, incident recovery

and system resilience. The classification identifies 10 high level classes: incident type, patient outcomes, patient characteristics, incident characteristics, contributing factors/hazards, organizational outcomes, detection, mitigating factors, ameliorating actions, actions taken to reduce risk. Each class has hierarchically arranged subdivisions, and each subdivision is further divided into subcategories allowing for classification.

This classification framework is designed for general use within patient safety, the categories regarding incident type, patient outcome, and contributing factors/hazards could offer useful information within the analysis of events relating to coordination of care.

**ICPS: Tables 1-3**

<b>Table 1: ICPS Incident Types</b>	
1. Clinical process/ procedure	2. Clinical administration
3. Documentation	4. Healthcare associated infection
5. Medication/ IV fluid	6. Blood/ blood products
7. Nutrition	8. Oxygen/ gas/ vapor
9. Medical device/ equipment	10. Behavior
11. Patient accidents	12. Infrastructure/ buildings/ fixtures
13. Resources/ organizational management	

<b>Table 2: ICPS Patient Outcomes</b>
1. Type of harm
2. Degree of harm
3. Social and/or economic impact

<b>Table 3: ICPS Contributing Factors/ Hazards</b>	
1. Staff factors	2. Patient factors
3. Work/ environment factors	4. Organizational/ service factors
5. External Factors	6. Other

### *Event Taxonomy (PSET)*

The aim of the JCAHO (Chang, et al. 2005) patient safety event taxonomy was to develop a common terminology and classification schema (taxonomy) for collecting and organizing patient safety data. Through the development of the taxonomy they sought to, “identify similarities and gaps in the terminology and classification to create a multidimensional taxonomy that encompasses diverse health care settings and incident reporting systems”(Chang, et al. 2005, p. 2).

The taxonomy identifies 5 primary classifications:

- Impact- the outcome or effects of medical error and systems failure commonly referred to as harm to the patient.
- Type- the implied or visible processes that were faulty or failed.
- Domain- the characteristics of the setting in which an incident occurred and the type of individuals involved.
- Cause- the factors and agents that led to an incident.
- Prevention and mitigation- the measures taken or proposed to reduce incidence and effects of adverse occurrences.

Each of the primary classifications are further sorted into 21 sub-classifications (see table 2), which were in turn subdivided into more than 200 coded categories and an indefinite number of non-coded text fields to capture narrative information about specific incidents.

### **PSET: Tables 4-8**

<b>Table 4: PSET Impacts</b>	
Medical	Psychological
Physical	Non-medical
Legal	Social
Economic	

<b>Table 5: PSET Types</b>
Communication

Patient management
Clinical performance

**Table 6: PSET Domains**

Setting	Staff
Patient	Target

**Table 7: PSET Causes**

Systems (structure and process)	Organizational
Technical	Human

**Table 8: PSET Preventions**

Universal
Selected
Indicated

*Siemens's Taxonomy of Adverse Handover Events (TAHE)*

Siemens (2011) developed a taxonomy of adverse handover events to capture types of handover failures and their underlying factors. The taxonomy was used to categorize and analyze adverse handover events within a hospital setting in Denmark. The taxonomy distinguishes among both the types of handover failures that occur and the main causal factors behind these failures (see table 3)

**TAHE: Tables 9-10**

**Table 9: TAHE Types of Handover Failures**

Failures of clinical communication
Failures of communication related to tests (laboratory results, x-ray etc.)
Refusal of responsibility, diffuse allocation or acknowledgement of responsibility
Responsibility accepted but actual response delayed
Handover attempted, receiver unavailable

<b>Table 10: TAHE Causal Factors</b>	
Deviation from procedure or guideline (both individual and organizational)	Inadequate professional competence or knowledge of tasks (both individual and organizational)
Omission – memory lapse or action slip	Inadequate procedures or guideline
Problems with physical or functional infrastructure	Busy ward or interruptions
Crowded ward	

*Comparison of the taxonomies*

Types of failure or error was addressed in all three of the taxonomies (see table 4).

Furthermore all of the taxonomies identified communication failures as one of the major types of errors. However, both the WHO (2009) classification and the JCAHO (Chang et al. 2005) are designed as general patient safety taxonomies, and as such are designed to identify many types of failures, while Siemsen’s taxonomy focuses specifically on errors that occur during handover events.

**Comparison of Type: Table 11**

<b>WHO ICPS Types</b>	<b>JCAHO PSET Types</b>	<b>Siemsen TAHE Types</b>
Clinical administration	Communication	Failures of clinical communication
Clinical process/procedure	Patient management	Failures of communication related to tests (laboratory results, x-ray etc.)
Documentation	Clinical performance	Refusal of responsibility, diffuse allocation or acknowledgement of responsibility
Healthcare associated infection		Responsibility accepted but actual response delayed
Medication/IV fluid		Handover attempted, receiver unavailable
Blood/blood products		
Nutrition		
Oxygen/gas/vapor		
Medical device/equipment		
Behavior		
Patient accidents		
Infrastructure/building/fixtures		
Resources/organizational management		

Causal factors were also addressed in all three of the taxonomies (see table 5). All three of the taxonomies addressed both individual and organizational/system factors. Siemsen’s (2011) taxonomy focuses solely on causal factors of handover errors, while the other two taxonomies address a wider range of factors.



**Comparison of Causal Factors: Table 12**

<b>WHO ICPS</b>	<b>JCAHO PSET</b>	<b>Siemens TAHE</b>
Staff factors	Systems (structure and process)	Deviation from procedure or guideline (both individual and organizational)
Patient factors	Technical	Inadequate professional competence or knowledge of tasks (both individual and organizational)
Work/environment factors	Organizational	Omission – memory lapse or action slip
Organizational/service factors	Human	Inadequate procedures or guideline
External factors		Problems with physical or functional infrastructure
Other		Busy ward or interruptions
		Crowded ward

### **3 Context**

In this chapter I will define the context in which the study takes place by giving an explanation of relevant laws and judicial considerations, a brief overview of the Norwegian healthcare system, an overview of the coordination reform, an explanation of the adverse event reporting system used, and case descriptions of the case in the study.

#### **3.1 Relevant laws and judicial considerations**

##### Obligation to report/notify

Under Norwegian law (Lov om helsepersonell § 38, and Lov om spesialisthelsetjenesten § 3-3), all health personnel are obligated to report any events in which a patient sustains significant personal injury from the health care they are provided, or situations in which one patient causes injury to another. In addition, events that could have potentially lead to personal injury also fall under the obligation to report. The goal of the reporting of these events is to improve patient safety, and the reports are to be used to clarify the causes of the event and to prevent similar events from taking place in the future (lovdata.no).

##### Obligation to facilitate coordination

Norwegian law (Lov om kommunale helse- og omsorgstjenester § 3-4, and Lov om spesialisthelsetjenesten § 2-1e) also states that under both specialized health care providers and primary health care providers are obligated to facilitate coordination of care, both within levels of care and between levels of care, such that all health and care services provided in the country can best function as a single unit (lovdata.no).

Additionally, it is stated that all health care personnel providing care under these acts shall ensure that the organization is working systematically to improve quality and patient safety (Lov om spesialisthelsetjenesten § 3-4a, and Lov om kommunale helse- og omsorgstjenester § 4-2, available from lovdata.no).

#### **3.2 Norwegian Healthcare System**

The Norwegian healthcare system is based on universal coverage, and built on the principle that all residents should have equal access to necessary health care and services regardless of social status, income, and geography. Health care services in Norway are divided into primary and specialized services. Primary health care services are run by the municipalities. Primary health care services that each municipality is responsible for include: general medical services including a general practitioner scheme, preventative care such as checkups and immunizations, emergency first aid, physiotherapy, nursing homes, and home health nursing services.

Secondary or specialized health care services are owned and run by the state. There are four regional health authorities and 30 local hospital trusts (owned by regional health authorities). The four regional health authorities are responsible for ensuring that specialized health care services (such as outpatient specialist care and hospitals) are provided within their region, and the trusts are responsible for delivering these services (Ministry of Health and Care Services, 2007, 2009).

### **3.3 Coordination reform**

In 2009, Norway launched a coordination reform with a focus on delivering the proper treatment at the right place and right time. This reform was implemented January 1, 2012. The goal of the coordination reform was an increased focus on prevention, earlier treatment, and better coordination between services (Ministry of Health and Care Services, 2009). The coordination reform addressed three major challenges, and then recommended five primary steps to face them. The three main challenges identified are:

- Patients' needs for coordinated services are not being sufficiently met.
- Too little initiative aimed at limiting and preventing disease.
- Population development and the changing range of illnesses among the population.

The recommended five key steps for dealing with the three major challenges are:

- A clearer role for the patient.
- A new municipal role emphasizing prevention, early intervention efforts, low-threshold initiatives and interdisciplinary measures.

- Changing the funding system so that municipal co-funding of the specialist health care services is a vital element.
- Developing the specialist health care services to enable them to apply their specialized competence to a greater extent.
- Facilitating better-defined priorities.

The main changes of the coordination reform resulted in a shift in the responsibility of health care providers, giving the primary health care providers a larger role and putting more emphasis on preventative care. This way patients could receive the majority of their care from primary health care providers, and hospital discharge could take place earlier. The reform dictates that agreements between primary and secondary health care providers should be drawn up in order to formalize how responsibilities were to be divided and how the two care providers were to improve their cooperative patterns in order to ensure more coordinated health care services patients (Ministry of Health and Care Services, 2009).

### **3.4 Synergi**

Synergi is an electronic reporting system used by the healthcare trust and municipal primary care providers to report adverse events. The goal of using this reporting system is to:

- Prevent unwanted/adverse events
- Correct problems
- Learn from previous experiences/mistakes

Once an adverse event or near miss occurs, the healthcare worker witnessed or experienced the event is responsible for recording the event in the Synergi system. Both healthcare workers working in a specialized health care or hospital setting and those working in the primary care setting can use Synergi to report adverse events. The person reporting the adverse event fills out details such as date and time of the event, and then writes a description of what happened and any immediate actions that were taken to prevent or limit injury or damage. The report is then sent on to the manager in charge of the unit where the event occurred. The manager is then responsible for handling the adverse event report by trying to find the cause of the error and suggesting measures to be put in place to prevent such events from taking place again in the future.

### **3.5 Case description**

The chosen case consists of a healthcare trust in more rural setting and the primary health care providers within the region that cooperate with the healthcare trust. The healthcare trust has approximately 2200 employees and consists of one central hospital and three regional hospitals in addition to two district psychiatric centers. The trust is also provides ambulance service and has ambulance stations throughout the region. There are 26 municipalities within the region responsible for providing primary health care services. There are approximately 108,210 people living in the region. The region covers an area of approximately 18,623 km<sup>2</sup>.

## 4 Methods

In this chapter I will describe the methods used in this study. I will address the research design that was chosen, the sample included in the study, data collection, analysis, and ethical considerations.

### 4.1 Design

An exploratory case study approach has been chosen as research design using a mixed methods approach (key informant interviews and document analysis). Exploratory design can be used when there is lack of previous knowledge about the area being studied (Jacobsen, 2005). There is little knowledge about the types of adverse events that are reported in relation to coordination of care between primary and specialized health care services (Laugaland, Aase and Barach 2011), therefore an exploratory design has been chosen. Yin (2009) states that, *“a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and with in its real-life context, especially when the boundaries between phenomenon and context is not clearly evident”* (p. 18). The boundaries between adverse events and the contexts in which they occur are not always clearly evident, and as such a case study design was utilized.

The case in this study consisted of a rural setting with a healthcare trust comprised of four relatively small hospitals and the 26 municipalities responsible for providing primary care services within the region.

The aim of the case study design was to:

- To explore the types, frequency, causes, and consequences of adverse events seen in relation to coordination of care between primary and secondary health care services.

### 4.2 Sample

The study was composed of two major data sources:

Source 1- key interviews with Synergi coordinator

Source 2- adverse event reports

### **4.3 Interviews with Synergi coordinator**

In order to analyze the collected adverse event reports, more details and information about the reporting system used were necessary. To gain this information, key interviews were conducted. The coordinator responsible for the Synergi reporting system were the natural choice in order to gain more insight into the operation of the reporting system as they work with the system on a daily basis and have a good working knowledge of how it functions. The Synergi coordinator was sent an invitation to be a part of the study along with an informational letter explaining the study (Attachment 1). The coordinators responded positively to participating. In addition to providing interviews, the coordinators also provided access to the adverse event reports.

#### *4.3.1 Adverse event reports*

The prime focus of the study was the analysis of adverse events related to coordination of care, and therefore only adverse event reports directly related to coordination of care were of interest. When events are initially reported (this can be done by healthcare personal working in the hospital or in primary care services), it is possible for the type of event to be categorized as coordination with municipal primary health care services. If the initial reporter overlooks this category, it is also possible for the manager in charge of dealing with the case to add this afterwards. In Case A, the total number of reported adverse events is manageable so that the Synergi coordinator is able to read through all reported events and flag the event as relating to coordination with municipal primary care services in the event that both the initial reporter and the manager handling the adverse event report have not included this detail. In order to narrow the results of the adverse event reports, only the events that were flagged in the system as relating to coordination of care were included in this study.

While patients' age was an inclusion criteria in the QSEHCS study, the anonymous nature of the event reports made it difficult to include or exclude reports based on age. In some of the reports it was possible to determine the certain details about the patient involved in the incident (for example, some reports mentioned that the patient was elderly, or that the patient suffered from dementia). Since only a fraction of the reports included details that allowed the reports to be narrowed by factors such as age or type of illness, such inclusion/exclusion criteria were not included in the study.

All of the reports that were marked as relating to coordination of care were then read through to guarantee that the content was related to the type of coordination being examined in the study (i.e. coordination between primary and specialized health care providers). After reading through the event description in each of the reports, all reports with descriptions accurately depicting events that related to coordination of care between primary and specialized health care services were included. Reports that described events that did not have a direct connection coordination of care were excluded. Reports that lacked a significant description of the event were also not included in the analysis.

In order to get a clear perspective of whether or not the coordination reform has had an effect on the types, frequency, causes, and consequences of reported adverse events seen in relation to coordination of care, it was important to have an adequate amount of reports both from before the reform was put into place (January 1, 2012) and after. There was a total of 144 reports before the coordination reform and 122 reports after it was put into place. There was no date constraint used to limit the number of reports, and all reports that filled the inclusion criteria were used.

#### **4.4 Data collection**

##### *4.4.1 Key interviews*

Semi-structured interviews were conducted with the Synergi coordinator in order to gain a better understanding of how the reporting system worked. An interview guide was used in order to make sure that key points were covered and the interviews were recorded (after approval was gained from each of the informants) in order to guarantee that no data is misunderstood or overlooked (Appendix 2). The main themes covered in the interviews included how adverse events are reported (both in the hospital and primary care setting), how they are handled after they are reported, problems that arise during the reporting process, and how the reporting system is designed. The informant chose the location for the interview, the interview took place in the office of the coordinators. The coordinator was not provided with the interview guide prior to the interview. The interview in lasted approximately 30 minutes. The informant covered most of the topics outlined in the interview guide without being

prompted. Follow up questions and examples were asked for in cases where the explanation was unclear.

In addition to the semi-structured interview, 4 days were spent with the Synergi coordinator during the collection of the adverse event reports. Additional questions were asked and conversations took place during this time that both answered practical questions and gave a better understanding of how the reporting system worked. Key words and phrases were noted during these conversations, and summary notes were written each evening to make sure that important information was documented during the data collection process.

#### 4.4.2 Adverse event reports

The Synergi coordinator helped facilitate gaining access to the adverse event reports. I am an employee at one of the hospitals in a different health trust and already had basic user access to the reporting program (that allowed me to report events, but that did not allow me to read already reported events). I was granted extended user access during the data collection period so that I was able to search for and access the event reports myself, rather than requiring one of the coordinators to do this work for me as it was a time consuming process. The adverse event reports used in the study do not include sensitive information (such as name or date of birth) about the patients involved that could be used to identify them, which allowed me to search for the event reports without having to compromising the patients right to confidentiality. I used a computer that was available at the Synergi coordinator's office to access the reports.

In order to find event reports that were related to coordination of care, I conducted searches within the Synergi system. There was a limited amount of how many reports each search could pull up, so searches were done on a year by year basis starting from 2007 when the reporting system was first adopted. In addition to limiting the searches by year, I also limited them so that only events reported within the appropriate health care trust would come up (multiple options for responsible health care trust were available). Under the advanced search options I chose to search under the field of "where and what", and further choose to limit the search by event type selecting events related to coordination of care with municipalities (one of the options in the pull down menu). All of the options during the search process were

chosen from pull down menu options, and no free-text search fields were utilized. The same search process was performed for each year from 2007 to 2013.

After the search results were displayed, I read through the event description included in each adverse event report to decide if it met the inclusion criteria. All adverse event reports that met the inclusions criteria were then entered into an excel sheet. The case number was noted to make it easier to go back and recheck the event report in case there was a need to do so at a later point in time. The date of the event and a brief summary of what happened (for example, patient sent home without discharge paperwork and prescriptions for new medications) were also recorded. The events were then analyzed and coded.

#### **4.5 Analysis**

The analysis of the reported adverse events were originally based on Siemsen's Taxonomy of Adverse Handover Events (2011). The taxonomy was developed in order to capture types of handover failures and their underlying factors in a hospital setting. The taxonomy distinguishes among five non-overlapping types of handover failures (failures of clinical communication, failures of communication related to tests, unclear or rejected responsibility, delayed response, and receiver unavailable), and seven main causal factors (inadequate competence, infrastructure problems, busy ward and interruptions, inadequate procedures, deviations from procedures, crowding, omissions and lapses). The taxonomy was developed to capture errors during handovers from unit to unit within a hospital, rather than errors that occur when a patient is transferred between hospital and primary health care services. Though it was not specifically designed to be used in handover situations between primary and specialized health care services, it is the only taxonomy that has been developed with the specific intention of capturing handover errors. Both the World Health Organizations Conceptual Framework for the International Classification of Patient Safety (2009) and the Joint Commission on Accreditation of Health Care Organizations Patient Safety Event Taxonomy are more general and do not specifically cater to adverse events relating to handovers or coordination. Because of this, Siemsen's Taxonomy of Adverse Handover Events (2011) was initially used to analyze the event reports in this study.

The first step in the analysis process was to read each of the event descriptions two or three times to make sure that I had a clear understanding of what occurred. Next, the type of failure

was categorized out from the types of handover failures presented in Siemsen's Taxonomy of Adverse Handover Events (2011). If there were multiple failures described in the event, each one was included rather than choosing a primary failure. The failure/failures were then recorded in the excel sheet under type of failure. Next the event description was examined with regard to the causal factors presented in the taxonomy. Again, if multiple causal factors were identified, all of them were included and then recorded. Even descriptions that were hard to code were flagged and set aside to be re-read after the first round of coding was finished. This allowed more time to think about each event and the ability to group difficult cases that were similar so that all of the event reports were coded consistently. There was an openness for new codes, and events were not forced to fit the taxonomy. However, after re-reading many of the event reports there were quite a few that did not fit the taxonomy. This indicated the need for modifications to be made to the existing taxonomy. The causal factors section of Siemsen's Taxonomy of Adverse Handover Events (2011) fit with all the adverse event reports, however the types of errors in Siemsen's Taxonomy did fit with many of the adverse events. Through a process of re-reading all the handover events and identify common themes within types of errors, an new model for analyzing the types of errors was created. This model identified 4 main types of adverse events: failures in written communication/documentation, failures in spoken communication, diffuse/unclear responsibility, and not performing expected duties. Adverse events relating to written communication/documentation and spoken communication were further broken down into three categories: miss communication, delayed communication, and inaccurate/incorrect communication. All adverse event reports were able to be coded using this model.

#### **4.6 Ethical considerations**

The study has been approved by the Regional Committees for Medical and Health Research Ethics (REC, ref. num. 2011/1978) as a part of the larger QSEHCS study. The interviews conducted during the study were based on informed written consent (Appendix 3), and informants were able withdraw from the study at any point in time with no negative consequences.

The adverse event reports used in the study do not include sensitive information (such as name or date of birth of patients) about the patients involved that could be used to identify

them. Therefore having access to these reports never put patients at risk for violation of their right to privacy.

## **5 Results**

This chapter presents results found in the analysis of adverse event reports. Results will be discussed by first presenting at what point adverse events occurred during handover process, the types of adverse events that occurred, the causal factors behind them, the consequences of these events, and noticeable differences between before and after the coordination form was implemented.

### **When adverse events occur**

Adverse events were reported relating to both hospital admissions and discharges.

#### *5.1.1 Admission*

Adverse events reported relating to hospital admission were less common than those reported in connection with the discharge process. The main types of adverse events reported in connection with hospital admission were: missing or inaccurate referrals, missing or delayed nursing reports from in-home health care providers and nursing homes, and lack of notification to in-home health care providers about patients hospital admission. Less commonly reported adverse events that occurred in connection with the admission process included disagreements between referring doctor and specialist on whether or not the patient should be admitted, and electronic referrals that were never received.

#### *5.1.2 Discharge*

The majority of adverse events reported occurred in connection with the discharge process. The main types of errors reported in connection with discharge were: lack of information given regarding time of discharge, lack of information or incorrect information regarding patient's condition, delayed and/or incorrect discharge reports, missing prescriptions for new medications, and necessary medications not sent with the patient upon discharge, and patients discharged with unclear follow up. Less commonly reported adverse events occurring during the discharge process included: patients discharged with incorrect medications, medical equipment not removed at time of discharge (for example: iv port, stitches, urinary catheters), and discharge information sent to the wrong person and/or wrong location.

## **5.2 Types of adverse events**

There were multiple types of adverse events identified in the adverse event reports.

### *5.2.1 Written communication/documentation*

Adverse events relating written communication/documentation errors were the most common among the adverse events reported. Types of documents included referrals, nursing care reports, medication lists, discharge reports, and prescriptions for new medications.

#### *Missing*

Missing written communication/documentation was one of the most common types of adverse events relating to communication/documentation reported. Missing documents included referrals, nursing care reports and medication lists during hospital admissions; and prescriptions for new medications and discharge reports during the discharge process.

One of the most common adverse events reported in connection with hospital admission was missing referrals. Referrals provide important information about the patient's condition and health concerns in addition to the reason(s) the patient is in need of specialized health care treatment. In one adverse event report, the referring doctor had not physically examined the patient, and therefore felt that he did not have the necessary information to write an adequate referral. In another case, a referral was written by the referring doctor and sent electronically, but was never received by the intended specialist. This resulted in a delay in delivery of care to the affected patient. There were also multiple cases where patients were sent directly to the radiology department by the referring doctor but did not have referrals with them. This also led to delayed care as the radiology department could not carry out their job without a referral. Additionally patients and their next of kin often became frustrated as they felt they were receiving conflicting messages from the referring doctor and those working in the radiology department.

Missing nursing care reports were also a problem during the admission process. There were multiple event reports in which patients suffering from dementia were sent to the hospital without an accompanying nursing care report explain their daily care needs and they were not able to make these needs known themselves.

Missing medication lists also posed a problem during hospital admission. There were multiple reported adverse events where the primary care provider was not able to be reached in order to obtain an up-to-date medication list. The admitting doctor is then forced to rely on the patients on knowledge of their current medications and medication lists from previous hospital stays. All of the reported events regarding missing medication lists during admission resulted in the patients not receiving the proper medication. In the majority of the reported events the medication errors were detected and rectified during the patients hospitalizations; however, in two cases the medication errors were not discovered until after the patients were discharged.

The most common item missing during the discharge process were prescriptions for new medications or medications with new doses. This most often resulted in the patient not receiving necessary medication in the right doses, and caused municipal health care workers to use extra time and resources in order to resolve the problem. In one case cancer patient was sent home without prescriptions for newly started pain medications. Additionally, the nearest pharmacy did not stock these medications and had to wait until they received the prescriptions before the medications could be ordered. As a result, the patient suffered multiple days without the necessary pain medication.

While discharge reports were most often delayed, there were a couple of situations in which the discharge report was missing altogether. In one case the missing discharge report resulted in a patient taking a medication that was no longer prescribed for three months. The patient's primary care provider never received the discharge report and the error was not discovered until the patient was rehospitalized three months later.

### *Delayed*

Though less common than missing and inaccurate/incorrect documentation, delayed written communication/documentation also posed a threat to patient safety. Delayed documents included nursing care reports and medication lists during hospital admission, and discharge reports during the discharge process.

The majority of reported events relating to problems with nursing care reports during hospital admission were the result of missing care reports; however, there were a few cases in which

the nursing care reports were not missing, but delayed. However, this made little difference for patient outcomes. In one adverse event report the patients next of kin had provided necessary care information after receiving a phone call from a confused nurse working in the admitting unit. In another adverse event report the nursing care report was received two days after the patient was admitted. At this point a new care plan had already been written for the patient and the delayed care plan was never fully read.

The most commonly delayed form of written communication/documentation was the discharge report. They were many adverse event reports in which the patient was discharged before the discharge report was finished. The delays in the discharge report being sent varied between hours and months. In one adverse event report, a primary care doctor received a discharge report for a patient who had died nearly a year earlier. Most often the delay in receiving the discharge report resulted in delays in care and delays in receiving necessary medication. In one case a patient received the wrong medication dose for six days until the delayed discharge report was received. In another case the delayed discharge report resulted in a four week delay in starting with important anti-thrombosis treatment. Another patient did not receive necessary wound dressing changes for multiple days due to a delay in home health care providers receiving the discharge report.

#### *Inaccurate/incorrect*

Inaccurate/incorrect written communication/documentation was also a commonly reported adverse event. Documents that were inaccurate/incorrect included medication lists during hospital admissions, and discharge reports during the discharge process. One adverse event report included a prescription for new medication that was incorrect.

There were multiple adverse event reports that included incorrect medication lists during hospital admission. In one adverse event report, the referral included an out dated medication list which did not include important blood thinning medication that the patient had recently started taking. The patient did not receive this medication during the entire two week hospital stay, and the error was not discovered until after the patient was discharged.

There were also quite a large number of adverse event reports that included inaccurate/incorrect discharge reports. Most often it was medication updates in the discharge

report that were incorrect. In one reported adverse event, a patient's insulin dosage was supposed to be reduced from 8 I.U. to 6 I.U. The doctor writing the discharge report accidentally wrote 60 I.U. of insulin on the discharge report instead of 6 I.U. Luckily the home health care nurse responsible for administering the patients insulin shots knew the patient quite well and recognized the large increase in dosage as a possible mistake and double checked with hospital personnel before giving the insulin shot.

One adverse event report included a prescription for a new medication that was written incorrectly. The prescription was written on a normal A4 size blank piece of paper and did not include that doctor's stamp. As a result, the pharmacy did not fill the prescription as the prescription did not appear to be legitimate. It was a Friday evening and the pharmacy was closed for the weekend, so the patient was not able to receive the prescribed medication until the following Monday.

### *5.2.2 Spoken communication*

Adverse events relating to missing, delayed, and/or inaccurate/contradictive spoken communication were the second most commonly reported type of adverse event.

#### *Missing*

Missing spoken communication was the most common type of adverse event related to spoken communication. Missing spoken communication included lack of notification from referring doctor about patients being sent by ambulance to the hospital, and lack of report and information about the time of discharge.

There were multiple adverse event reports in which there was no spoken communication between the referring doctor and the admitting doctor. In some cases the admitting doctor received notice from ambulance personnel that they were on their way with a new patient. In other cases, the admitting doctor did not receive any information about the referred patient until the ambulance arrived at the hospital. Not having adequate notification of the incoming patient gave one admitting doctor some problems as there were no available beds when the patient arrived. In the majority of these cases it was unclear whether or not an adequate referral was sent along with the patient in the ambulance.

Lack of report and information about the time of discharge was a commonly reported adverse event. There were many adverse event reports in which patients were discharged to home health care or nursing home facilities without any notification. In a few cases, notification was given about the discharge, but no report was given on the patients condition. An example of this was one adverse event report in which a cancer patient was to be discharged to a home health care provider. The home health care provided was informed about the planned time of discharge, but did not receive any information about the patients need for pain medication administered via a medication pump. The necessary equipment was not in place when the patient returned home, and there was a significant delay before the patient received the necessary pain medication. In another case information about the patients condition and post discharge needs were clearly explained to the nursing home responsible for post discharge care; however, the nursing home never received notice when the patient was actually supposed to be discharged and were caught off guard when the patient showed up without warning. In the majority of cases no information was given what so ever.

#### *Delayed*

Delayed spoken communication was a less commonly reported adverse event, but still posed problems. There were a few situations in which spoken communication about the patients condition and time of discharge were given to the post discharge care providers, but were given on such short notice that the post discharge care providers still did not have adequate time to prepare for the incoming patient.

#### *Inaccurate/contradictive*

Inaccurate/contradictive spoken communication was the second most commonly reported adverse event. During the admission process, contradicting messages from the referring doctor and the admitting doctor caused confusion for ambulance personnel responsible for transporting the patient to the hospital. Inaccurate/contradictive information also cause problems during the discharge process.

There were multiple adverse event reports that described situations where ambulance personnel transporting patients to the hospital received contradictive spoken communication from referring doctor and the admitting doctor. For example, in one adverse event report

ambulance personnel are initially told to transport the patient to the hospital to be admitted. En route to the hospital, they receive contradicting information from the admitting doctor at the hospital saying that the patient is not to be admitted, and that the patient should be driven back to the referring doctor for further follow up. A while later, the admitting doctor calls the ambulance personnel back and says that the patient needs to be admitted after all. The contradicting messages from the referring doctor and the admitting doctor lead to delay in care, and increased discomfort for the patient. Additionally, the ambulance crew was not available for other missions for a longer period of time, as they had to drive back and forth unnecessarily.

Adverse events related to inaccurate/contradictive spoken communication were also common during the discharge process. There were quite a few adverse event reports in which nurses in the hospital made spoken agreements and plans with home health care providers and nursing home care providers that were not held. For example, there were multiple adverse event reports in which the hospital nurse makes an agreement that the discharge report and necessary medications will be sent with the patient upon discharge, only for the patients to turn up at the post discharge care facility with neither a discharge report or necessary medications. In one adverse event report the patient did not receive necessary medication for multiple days as the nursing home the patient was discharged to had no information about the patient's new medications without the discharge report. In another report the patient was sent home without medication even though this was agreed upon, and had to go without medication for the first weekend as the pharmacy was closed.

There were also a number of adverse event reports in which plans regarding time and date of discharge were agreed upon and then not followed through with. There were reports of patients who were discharged earlier than agreed upon without further notification, which in one situation resulted in necessary medical equipment not being in place at the patient's home at time of discharge. There were also a few reports where a patient was discharged later than planned without giving adequate notice to the post discharge care providers.

### *5.2.3 Diffuse/unclear responsibility*

Another type of adverse event reported in connection with coordination of care was diffuse and/or unclear delineation of responsibility. There were multiple examples of how diffuse/unclear responsibility threatened patients' safety.

In multiple adverse event reports there was no clear delineation of who was expected to provide the patient with follow up care after discharge. For example, in one adverse event report a patient was discharge with low hemoglobin. The discharging doctor assumed that it was the patient's primary care provider to follow up and treatment, while the primary care provider assumed that the discharging doctor had reason for not addressing the problem in the first place.

In another adverse event report a patient's blood pressure medication was removed without any follow up care in place. The discharging doctor assumed that the patient's primary care doctor would set up blood pressures checks with the patient, and the patients primary care doctor assumed that the blood pressure was no longer a problem. The patient was later readmitted to the hospital due to high blood pressure.

### *5.2.4 Not performing expected duties*

There were also some adverse event reports where the health care personnel responsible did not perform expected duties, something that can compromise the patient's safety.

There were multiple adverse event reports where patients were discharged with medical equipment that should have been removed (iv port, stiches, urinary catheters). In one case a patient was discharged without removing an iv port that was no longer needed. The problem was not discovered until a week after the patient had been discharged, putting the patient at increased risk of infection.

In another adverse event report a patient was discharged with test results indicating a urinary tract infection, however no antibiotics had been prescribed.

There were also multiple adverse event reports where a patient was discharged without necessary medication being sent with them. In the majority of cases the patient did not receive necessary medications for a 1-3 day period due the nurses at the hospital not carrying out required actions. In a two adverse event report, home health care nurses were able to borrow necessary medications from a nearby nursing home so that patients could receive necessary medication that was neglected to be sent home with them. However, doing so went against the guidelines set in place and also required use of extra time and resources.

#### *5.2.5 Multiple errors*

There were often multiple errors in each adverse event report. In some reports one error lead to the next error, setting off a chain reaction of error, while in other reports the errors occurred independently of each other.

##### *Chain reaction errors*

There were multiple adverse event reports where an initial error set into motion a chain reaction of errors. The most common chain reaction error set were patients who were admitted with inaccurate/incorrect medication lists. The initial incorrect medication list led to the patient's medication list during their hospital stay also being incorrect. The incorrect medication list is then used to in the discharge report. In some adverse event reports this problem was identified somewhat quickly after discharge, while in other reports it took considerably longer.

##### *Independent errors*

There were multiple adverse event reports in which there were three independent errors occurring during the discharge process in one single report. These three errors included lack of information about planned time of discharge, delayed discharge report, and inaccurate/incorrect discharge report. While these errors are all related, they occurred independently of each other. All adverse event reports with this combination of errors resulted in the patients not receiving necessary medication and/or care at the appropriate time.

### 5.3 Causal factors

Multiple different causal factors were identified in the adverse event reports analyzed. While some reports showed very clear causal factors, other reports were not as clear. In some cases, causal factors could not be definitively identified. The reports with easily identifiable causal factors often contained causal factors in each report. Common causal factors included deviation from guidelines, inadequate professional knowledge or skills, memory lapses, inadequate procedures or guidelines, problems with infrastructure, and busy ward or interruptions.

#### *Deviation from guidelines*

Deviations from guidelines were the most common causal factors. Deviations from guidelines occurred both during hospital admission and the discharge process. During hospital admission, deviations from guidelines cause problems such as missing referrals and missing nursing care report. During the discharge process deviations from guidelines led to patients being discharged without adequate notice to post discharge care providers, patients being discharged with delayed and incorrect discharge reports, and patients being discharged without necessary medications.

#### *Inadequate professional competence or knowledge of skills*

Inadequate professional competence or knowledge of skills was also a causal factor of adverse events. There were two examples where a discharge report containing errors was written by a junior doctor being overseen by an attending doctor. The junior doctor lacked the competence or knowledge to recognize the errors in the report. The attending doctor was responsible for double checking the junior doctors discharge reports, however this was not done (deviation from guidelines) and the errors went unnoticed.

#### *Memory lapse*

Memory lapses were also a common factor. Memory lapses were identified as causal factors for missing nursing care report during hospital admission, and patients being discharged without adequate notice to post discharge care providers, patients being discharged with delayed and incorrect discharge reports, and patients being discharged without necessary medications.

### *Inadequate procedure or guidelines*

Inadequate procedure or guidelines were not directly identified as a causal factor in any of the adverse event reports.

### *Problems with infrastructure*

A few adverse event reports identified problems with infrastructure (specifically computer related problems) as causal factors. In all the involved reports, infrastructure problems led to not being able to access necessary documents (referrals, nursing care reports and discharge reports) in a timely fashion.

### *Busy ward or interruptions*

While many adverse event reports could potentially be interpreted as being due to busy wards and interruptions, only a handful clearly identified this as a causal factor. One report stated clearly that illness in the hospital unit had led to both delayed discharge reports, and inaccurate discharge reports due to the doctor writing the report not having a good knowledge of the patient's condition and progression during hospitalization. Another report acknowledged lack of staff due to summer vacation as a cause for memory lapses and guidelines not being followed (other causal factors).

## **5.4 Consequences**

Consequences and patient outcomes were not always easily identifiable in the adverse event reports. The most commonly identified consequence was medication errors. The medication errors ranged from being relatively minor (a patient receiving a lower dosage of paracetamol than prescribed) to having the potential to cause serious injury or death (an insulin dose six times higher than actually intended). In the majority of cases the medication errors had no lasting effects on the patients, or were caught by health care personnel in time to avoid major injury.

There were also quite a few episodes of patient information being treated in such a way that it risked the patient's right to confidentiality. There were multiple discharge reports that were faxed to city hall instead of the appropriate post discharge care facility. Additionally there were multiple faxes sent with patient's full name and ID number connected to the patient's sensitive medical information. In one case a discharge report- containing patient's name, ID

number, and all information pertaining to the most recent hospitalization- was sent to the patient's primary care provider without being placed in an envelope.

### **5.5 Differences from before and after coordination reform**

One notable difference from before and after the coordination reform was put into place was the most common type of error. Before the coordination reform was put into place the most common type of error was inaccurate/incorrect discharge papers, while after the reform, lack of information about time of discharge to post discharge caregivers was the most common type of error. Additionally errors short notice of patient discharge (less than 24 hours) were only reported after the coordination form went into place.

## **6 Discussion**

### **6.1 Admissions vs. discharge**

The majority of research available within the field of patient safety is focused on handovers relating to hospital discharge rather than hospital admission. Interestingly, the majority of the adverse event reports reviewed in this paper also were also events occurring during the discharge process. A potential conclusion could be drawn that there are more adverse events occurring during hospital discharge than during hospital admission. A finding that could also explain the reason for the increased amount of research focusing on handovers relating to the discharge process rather than the handover event of hospital admission. However, there are many other possible explanations for this correlation and for the reason that there are more discharge events reported than admission events.

One possible explanation could be potential differences in reporting cultures between primary and specialized health care fields. The majority of discharge related events are reported by primary health care workers, while the majority of admission related events are reported by specialized health care workers. If, for example, primary health care field in general had a culture more oriented towards reporting, this could account for the difference in number of reported events during the admission and discharge process. More research into possible differences in reporting culture between primary and specialized health care fields would be necessary in order to determine if this could be a valid explanation.

Additionally, there are many studies showing that under reporting of adverse events is a common problem. Due to this, the fact that there are more reported adverse events during the discharge process rather than the admission process does not necessarily mean that there are more actual adverse events occurring during the discharge process than during hospital admission.

## **6.2 Availability of discharge reports**

It was found Walraven, et al. (2002) study on the effects of discharge report availability on hospital readmission that only a small amount of follow up doctors had received the discharge reports by the time of the follow up visit. Additionally, hospitalizations were more likely in situations where the follow up doctor did not have the discharge report available. Missing or delayed discharge reports also proved to be one of the more common types of adverse events identified in this study.

Walraven, et al.'s research on the importance of availability of discharge reports was published over 10 years ago, so the problem of missing or delayed discharge reports is hardly new. Before the coordination form was launched, delayed discharge reports were the most common type of adverse event reported relating to coordination of care. However, while delayed reports were still a problem they were no longer the most common type of reported adverse event after the coordination reform was put in place. This could possibly indicate the coordination reform successfully reducing the number of delayed discharge reports. However, more research is needed in order to support or disprove this theory.

## **6.3 Written vs. spoken communication**

While results may seem to indicate the increased presence of errors based in written communication, versus spoken communication, this would require additional exploration to determine its validity. There is substantial evidence to indicate that the majority of communication in a healthcare setting (connected to medical indications, discharges and care instructions) is carried out in writing, versus in speech (direct contact, and telephonic contact occurs seldom). As such, the primary method of communication is written, which is also identified as more traceable for caregivers who are handling multiple patients, with a high level of distraction. Other research has previously indicated that early telephone contact could be an intervention that could stop adverse event in patient transfers (Foster, et al. 2004). In addition to telephone contact being important, it is also important to acknowledge that while written communication errors seem to be more frequent, this does not necessarily identify them as more vulnerable, simply as a significantly more prevalent form of communication.

#### **6.4 Person approach vs. system approach**

The person approach model of error focuses on individuals' actions being the cause of error, while the system approach focuses on errors as consequences of underlying problems in the working environment (Reason 2000, Vincent 2010). While the taxonomy used highlighted both individual factors and organizational factors, individual factors were much easier to identify in the adverse event reports that were analyzed. Though many adverse event reports could potentially be interpreted as being due organizational causal factors, none could be concretely identified. As such, all of the causal factors identified in analysis of the adverse event reports were individual factors, playing into the person approach.

This is interesting because the system approach has long been favored over the person approach of “shaming and blaming”, yet individual factors are still the most commonly identified causal factors in this paper such as memory lapse and failing to following guidelines and protocols. This could be an indication that individual factors are in fact the most common causal factors, and that error reduction need to focus at the individual level rather than system level. However, there are also other explanations for this finding.

One explanation is a reporting system (Synergi) that is not designed to adequately capture organizational level causal factors. A reporting system designed with a stronger focus on capturing system levels casual factors could give a better indication if indeed the individual factors are the primary causes of adverse events, or if a faulty reporting system is to blame.

Additionally, actual quality of the description of the adverse event reported could be liable. An increased focus on reporting all aspects of all adverse events all the time could lead to more organizational causal factors being identified, where they are maybe otherwise overlooked and forgotten in favor of spending time on other seemingly more important tasks.

## **6.5 Reason's Swiss cheese model**

The data indicates that a number of factors typically contribute to an environment that leads to adverse events and failures in patient safety. Typically, these multi-factorial failures occur when one factor compounds another, leading to a third. In example, a nurse may be working in a busy ward, with multiple interruptions, such as additional patients requiring their attention, or a ringing phone, while she is trying to complete a patient's discharge paperwork. At this same time, the computer that the nurse is attempting to complete the discharge planning documentation on may experience a malfunction and freeze, not allowing the nurse to complete the paperwork fully. In the midst of waiting for the computer to resume appropriate function, and attending to the other environmental interruptions, it is not uncommon for a staff member to experience lapses in memory upon returning to the report, or to potentially be so distracted upon final completion of the report, that they may submit it to the incorrect terminal location.

This multi-factorial potential for error in patient-safety related process clearly demonstrates a depiction of the "Swiss Cheese" theory proposed by James Reason. Following Reason's line of reasoning, it becomes evident that as an institution, there is significant need to implement as many defensive barriers as possible, in order to account for the reality of failures (holes) in some form within each barrier. Ideally, with enough barriers in place, there is a significant decrease in the likelihood that these holes/weaknesses will all line up to allow an adverse event.

In seeking out appropriate mechanisms to develop said defensive barriers, it is important that these barriers are developed and focused on a system level, versus with individuals. While patient care occurs on individual levels, analysis of the data shows that most breakdowns also occur on individual levels, as caregivers are frequently prone to intense levels of variation, and are inherently fallible. Potential areas of systemic defensive barrier implementation include installing additional checks and required sign offs within the electronic medical record system, requirement of multiple individuals to sign off on a single discharge, or even something as simple as regularly scheduled and recurring telephonic contact, post-discharge, between caregivers. Further exploration and additional stakeholder interviews are necessary to

better determine best-practices around appropriate defensive barriers, to determine effective implementation strategies.

## **6.6 Consequences of adverse events**

The majority of consequences identified throughout his study were medication related, due either to administration of an incorrect medication, or an incorrect dosage. An interesting point is that while this could seem to simply be the most prevalent type of error associated with adverse events, and therefore necessitate significant reform surround medication management in patients, it is possible that this is a skewed representation of actual occurrence, based on ease of identification and reporting. The ill effects of an incorrect type or dosage of a medication, are typically something that becomes apparent within a very short time from the occurrence of the error. This makes it easier for the involved caregivers to document and to connect to its origination point. Other complications (e.g. post-operative infections) are typically more difficult to identify, as well as to connect with their source, making their reporting significantly more difficult to identify as an adverse event, versus the occurrence of an unrelated medical event. An additional consequence no frequently taken into account is the significant number of patient privacy violations occurring with rushed caregivers mistakenly sending discharge papers to incorrect addresses or faxes, fostering an environment in which patient privacy is not being prioritized above a hectic work environment.

## **6.7 Need for additional taxonomy development**

There is important work to be done related to the creation of a taxonomy more specific to patient handover events between primary and specialized healthcare services. While there are a number of current taxonomies related to patient safety and adverse event occurrence, in testing them against data specific to handover events, they proved unable to fully classify and identify the full breadth of causal elements associated with failures in patient safety. With the creation of a more specific and accurate taxonomy structure to better sort data related to patient handovers, it will be significantly easier to classify, sort and identify areas of opportunity for process improvement, and to learn from mistakes and prevent problems in the future.

## 7 Conclusion

Of the results compiled through this research, most significantly it should be noted that through all types of adverse occurrence, the most overwhelming element identified as a commonality in patient safety miscarriages were those connected to improper or insufficient communication. This weak point in the transfer process could stand for substantial improvement, and with written communication identified as far more prevalent than spoken in medical settings, the finding of a higher incidence level of written communication-based errors does not necessarily indicate a higher level of fallibility within the communication mechanism itself, simply a bias based on frequency.

In terms of consequences inherent to errors associated with patient transfer, the outcomes are severe and multi-faceted. In everything from medical errors, such as improper or incorrect quantities of medication being administered, to post-surgical infections being improperly identified, it is essential to better identify defensive barriers to develop at a system level, in order to better protect against oversight and mistakes. In addition to immediate physical impacts of discharge and transfer-based errors, there is also evidence to indicate that patient privacy is also an area of concern in transfers, with potential private health information being transmitted to incorrect locations, or not provided to the correct recipients. Further research is needed to gain more insight into additional measures that can serve to mitigate these adverse consequences.

This research and resulting paper have served to help identify a taxonomic structure that can be used to identify future adverse events in handover situations, while also attempting to answer questions of type of event, frequency, causal elements, and consequences in a specific case in Norway.

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## 9 Appendices

### 9.1 Appendix 1

Stavanger februar 2013

#### **Forespørsel om deltakelse i masterprosjektet**

#### **«Uønskede hendelser knyttet til samhandling og overganger»**

En studie av samarbeid og koordinering av tjenester mellom sykehus og kommune. Mitt navn er Andrea Nicole Orley, og jeg er masterstudent ved Universitet i Stavanger (UiS) ved institutt for helsefag. Jeg arbeider med en masteroppgave i helsevitenskap, «Uønskede hendelser knyttet til samhandling og overganger», under veiledning av professor Karina Aase ved UiS.

Masteroppgaven er tilknyttet forskningsprosjektet ”Kvalitet og sikkerhet knyttet til overføring av eldre pasienter” ledet av professor Karina Aase. Prosjektet er finansiert av Norges forskningsråd (NFR), Helse Vest og UiS. Prosjektet har fått tilslutning fra Regionale komiteer for medisinsk og helsefaglig forskningsetikk (REK) den 19.10.11 – referansenummer 1978. I forskningsprosjektet inngår to PH. D kandidater og flere master studenter.

#### **Studiens hensikt**

Masteroppgaven har til hensikt å få en bedre forståelse over type, frekvens, årsak og konsekvenser av uønskede hendelser relatert til samhandling mellom primær- og spesialisthelsetjenester. Oppgaven har to formål. Det ene er å analysere Synergimeldinger som er tilknyttet samhandling. Det andre formålet er ved hjelp av nøkkelintervju å belyse hvor pålitelig data fra disse rapporterte hendelser er.

Studien vil foregå i en stor kommune med tilknytning til et universitetssykehus, og ved et mindre sykehus med tilknytning til flere små kommuner.

#### **Hvorfor blir du forespurt om å delta?**

Du inviteres til å delta som informant i masterprosjektet mitt da ditt sykehus eller kommune har takket ja til å delta i forskningsprosjektet «Kvalitet og sikkerhet knyttet til overføring av eldre pasienter». Jeg ønsker å intervju følgende ansatte:

1. Synergi koordinatører eller andre med direkte oppgaver knyttet til Synergi.

2. Helsepersonell som har ansvar for rapportering av uønskede hendelser knyttet til samhandling mellom primær- og spesialisthelsetjenester.

I tillegg har jeg også behov for å få tilgang til de aktuelle synergimeldingene som er knyttet til samhandling. Jeg håper at du vil bidra med dine erfaringer knyttet til samarbeid mellom sykehus og kommune, og de uønskede hendelser som oppstår i dette samarbeidet. Intervjuer av Synergikoordinatorer og uttak/analyse av Synergimeldinger planlegges gjennomført i løpet av mars og eventuelle intervjuer med ansatte som rapporterer samhandlingshendelser i april 2013. Det vil være hensiktsmessig å gjennomføre intervjuene på din arbeidsplass dersom det er mulig.

### **Hva innebærer det for deg å delta?**

Dersom du takker ja til å delta som informant i denne studien innebærer det et individuelt intervju med varighet fra ca. 30-60 min. Intervjuet vil bli tatt opp på lydfil. Alle opplysninger som samles inn vil bli behandlet konfidensielt, det vil si uten navn eller andre direkte gjenkjennende opplysninger og i samsvar med regler for dataoppbevaring fra Norsk samfunnsvitenskapelig datatjeneste (NSD). Alle data som registreres blir slettet når prosjektet "Kvalitet og sikkerhet knyttet til overføring av eldre pasienter" er sluttført innen utgangen av 2015. Deltakerne vil bli anonymiserte og vil ikke identifiseres i oppgaven.

### **Frivillig deltakelse**

Det er frivillig å delta i studien og du kan når som helst og uten å oppgi grunn trekke ditt samtykke til å delta. Dersom du takker ja vil jeg be om at du signerer den vedlagte samtykkeerklæringen før vi starter intervjuet.

Dersom noe er uklart eller du ønsker mer informasjon om dette masterprosjektet kan du ringe eller sende e-post til: Andrea Orley, mobil 45803932, epost:

[akorley@hotmail.com](mailto:akorley@hotmail.com)

Karina Aase professor og veileder for oppgaven ved UIS. Tlf: 51831534, epost:

[karina.aase@uis.no](mailto:karina.aase@uis.no)

Med hilsen

Andrea Orley

## 9.2 Appendix 2

Can you briefly explain the process a synergis report goes through once it has been recorded in the system.

Who all can report adverse events?

What areas of the report are filled out by the person reporting the event?

- Consequences?
- System for sorting incident type?

How adverse events handled that are directly related to coordination of care/handover issues?

- Check box for coordination?
  - How long has it been an option?
  - In your experience do people use correctly? (too often, not often enough?)
- Are primary health care providers (general practitioner, home-health nurses, etc.) also able to report adverse events related to coordination issues using synergis?
  - If so, how is the process work?

What is the purpose of the reporting system.

- What is the expected product?
- How will the classification scheme facilitate analysis that will produce the desired outcome?

What types of data are available?

- Are reporters expected to have carried out an investigation and analysis of the event?
- How detailed is the classification system?

### 9.3 Appendix 3

# SAMTYKKEERKLÆRING

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## INTERVJU MED ANSATTE

Navn på student fra Universitetet i Stavanger som kan utføre intervju: Andrea Orley

Jeg bekrefter at jeg har mottatt, lest og forstått skriftlig informasjon om masterprosjektet «Uønskede hendelser knyttet til samhandling og overganger mellom primær- og spesialisthelsetjeneste» og jeg takker ja til å delta i prosjektet.

**JA**

Jeg aksepterer å bli intervjuet:

Navn på deltaker: .....

Dato:.....

Sign:.....

Navn på forsker: .....

Dato:.....

Sign:.....