Nurses in Space

Marcel Boonen

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A qualitative empirical and conceptual study into the use of a drug safety system by nurses in an orthopaedic ward of a general hospital

Verpleegkundigen in de ruimte

Een kwalitatief empirische en conceptuele studie naar het gebruik door verpleegkundigen van een medicatieveiligheidssysteem op een orthopedische afdeling in een algemeen ziekenhuis

(met een samenvatting in het Nederlands)

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“Logic is the beginning of the confusion”

Sogyal Rinpoche

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Introduction

1.0. Travel through Time

My professional background is in nursing, and in this chapter I want to explain how that has brought me to this PhD research. Before I had got to the stage of identifying an issue that would later translate to a research question capable of scientific scrutiny, I had to travel back in time. Why was it so important to travel back in time? The past helps me to interpret my present and my future, and to make sense of both. That understanding adds value to my work, and without it, there is neither perspective nor meaning.

"The first is the way in which individuals within political institutions come to attribute meaning and value to their past and their future. Second is the way in which the process of comprehension of the world becomes, under some conditions, an enactment of that world. Third is the way in which interpretation is not only an instrument of other processes, such as decision making, but a central concern on its own right." (Weick, 2001, p. 39).

To Weick, people are continuously in a process of trying to understand the world. The act of making sense of a situation is influenced by the context (past, present experiences, and future expectations) that structures our (my) world. As Weick looked at the situation of professionals in complex organizations, and at the pressing issue of how they could navigate the organization, he pointed up the need to become reflective practitioners. That implies looking back in a critical way to one's professional experiences and digging into their meaning. Having disturbing experiences and reflecting on them is the key to successful navigation. So before writing about my research problem, I found it useful to explore my past as a health-care professional, to look for the source of my research project and to bring it forward into my present and future research. I start with a description of the political and technocratic context I was operating in. Within this context I will describe a number of illuminating experiences as a reflective practitioner and elaborate on different 'problematic' experiences. Later, I address the individual experiences and bring them together to formally state the problem. I will highlight critical methodological insights derived from these experiences which, per component, will be expanded further into concrete concepts that will help to identify the research strategy most appropriate to the problem. I start with the description of the broader context of contemporary healthcare.

1.1. Broader context

Healthcare organizations are embedded in an increasingly complex environment, directly influenced by the social and political processes of liberalization, individualization, economization, and globalization (Schnabel, 2004, Klaveren, 2016). Besides the

fact that individual Dutch and European citizens are more demanding with regard to their 'consumption' of healthcare, there are also national and international conventions (European Union) defining qualitative and quantitative standards for cure and care. I will focus here on economization and nursing, eventually narrowing that focus to nursing on an orthopaedic ward.

1.1.1. Economization

"Economization is the growing dominance of financial and economic thinking in healthcare." (Hout & Putters, 2004, p. 130).

The economization of care has infiltrated the political and private domain. In the Netherlands, from a political point of view, healthcare is a common good and has to be accessible to all people; at the same time the restricted national budget demands a more equitable or economically efficient distribution of resources (Berden, Houwen, & Stevens, 2015).

Nationwide, the quantitative and qualitative demand for healthcare keeps growing. The reasons for this growth in demand are diverse and include:

- Greater possibilities for cure and care under the influence of scientific, medical, and technological developments;
- The explosive population growth after World War II. This large group of people belonging to the post-war baby boomer generation is ageing and increasingly dependent on care.

From both quantitative and qualitative perspectives, it is the combination of politics, individualization, and the increase in patient interest groups that makes people claim the best affordable care (Putter, Breejen, & Frissen, 2009).

Hospitals have been subject to intensive reorganization in the past few decades, as the public health care system absorbs and adapts to a neo-liberal government agenda that promotes more 'efficient and effective' use of public funds and increased involvement on the part of the private sector (Rankin & Campbell, 2009, on Canadian hospitals, highly comparable with the Dutch situation).

Higher demand and increasing costs means that healthcare is not available under all circumstances. The main goal of the health-care system, to keep cure and care accessible to all its citizens, is threatened by growing demand and increase in costs.

From the late 90's, hospitals in the Netherlands were focused on a new way of financing healthcare and on introducing a market orientation. The government had initiated a new way of funding healthcare by gradually introducing the concept of combining diagnosis and treatment ('diagnose – behandel – combinatie': DBC). Treatment was linked to a specific illness, and the costs of diagnostics and therapies were the subject of negotiation with health insurance companies who had to buy this care for their customers. Within the hospital budget, 70% of care is funded in the historical way and 30 % negotiable through DBC. At the same time, some kinds of cure and care are no longer automatically paid for. People have to pay for them out of their own income or look for extra insurance for those particular types of treatment. Healthcare becomes a trade-product with all the economic consequences that entails. In 2010, this on-going economization of care was limited by government to its current level of 70/30%. In 2012 a new system was adopted with an even stronger market-orientation.

1.1.2. Nursing controlled

Not entirely coincidentally, the government has applied a scientific approach to the outcome of cure and care, in order to increase accountability in the form of quality indicators. Firstly these indicators had to support the government in its responsibility for the overall quality of care in the Netherlands. Secondly they had to support insurance companies in their decisions on where to buy the best care for the best price, and thirdly they had to offer patients the opportunity to make comparisons and then make a deliberate choice about which hospital to attend. In order to contain the effects of the economization of the health-care system the government initiated all kinds of control mechanisms of: accountability, transparency, and safety. Rankin and Campbell state that the work of nurses is responsive to the increasing availability of therapeutic evidence, as well as to new accountability practices and outcomes measures that are believed to make best possible use of hospital facilities (Rankin & Campbell, 2009). On a personal level, nurses want to provide good care. On a more abstract level, they are asked to feel responsible and follow organizational stimuli that require them to use hospital facilities as economically, safely, and efficiently as possible. They are personally motivated to become involved with an organizational issue, but the patient disappears into the background as the nurse becomes pre-occupied with institutional dilemmas (Tonkens, Bröer, Sambeek, & Hassel, 2013).

In recent years nurses have been encouraged to focus on technical professionalism, which means they have been driven towards purposive rational action dominated by cost and by objective data obtained from research (Jacobs, Meij, Tenwolde, & Zomer, 2005).

All these developments have stimulated the use of technology. Where modern health care systems originate in the care provided for others in convents, and where hospitals once had no other focus than patient care, in the modern era they are expected to be outward looking and located within wider society. Formerly closed organizations now have to make all kinds of systemic connections with the outside world. As medicine and care become more complex, they trigger a need for overview and insight, and technology is indispensable in meeting this requirement. Technology is the only way to connect all the systemic parts, literally in software design which links the different system components, and figuratively in bringing all the information into data than can be interpreted. Nurses are trying to reposition themselves in a changing environment where they have to look for opportunities for emancipation. At the same time, a nurse's work is becoming more complex and this creates new divisions and a new workplace hierarchy. Hospital staff now provide care at different levels: second level staff (support basic care), level 4 nurses (give nursing care), level 5 nurses (provide care and coordination of care), and specialized nurses, such as the nurse practitioner (NP) and physician assistant (PA). Nurses who specialize and develop technical skills move toward the domain of the medical specialist which leads to promotion and a higher salary. The professionalism of nurses now tends towards the scientific, with rational and targeted thinking predominating in their approach. Does this technical rationalization and professional specialism make for better nurses? Or could it draw nurses away from their original vocation which was embedded in generic knowledge that made nursing special and enabled nurses to meet a wide range of caring needs and a wide range of responsibilities?

1.1.3. Systems

These developments are certainly not to be rejected, but it can be acknowledged that systems in action have the tendency to take over. Policymakers, hospital administrators, doctors, nurses, and other healthcare workers are doing their best to meet their goals, but every now and then they become mere operatives within the system. And if the system does not meet expectations, it should be reviewed. Government and hospital budgets are still exceeded, patients still choose their hospital based on travel time, while doctors and nurses try to bring conflicting interests into line. It is clear that the market-orientation in healthcare is relatively young and hospitals in the broader context are struggling with thoughts of rationalization and the emergence of new technological possibilities. The next step is to connect this historical perspective and the broader context to some of my own experiences within my hospital.

1.2. Technology in action

Understanding the role of technology in my professional life will mean going back to my first experiences with technology. This approach aims to establish a basic understanding of contemporary technology and to offer a possible glimpse into the future of technology in nursing. After obtaining my nursing degree, I started work in an Intensive Care Unit. Admissions to this unit were mainly trauma patients whose vital functions had to be maintained artificially and/or monitored. At first I was very impressed with the type of high-tech equipment that was used to support patient's vital functions. But after a while the awareness of technology[1] diminished, only to come to the fore if an alarm sounded, indicating something was wrong. When that happened, a patient's vital signs were monitored and supported by all available technology. In many cases, in the first few hours the combination of technology and human action was live-saving. Later, this combination would support the recovery of the patient. There was a legitimate trust in technology because it proved itself over and over again.

1.2.1. Reliability taken for granted

During one of my shifts a patient was admitted after a car crash and was connected to an artificial respirator while his blood pressure and heart-rate were monitored. Drugs were administered to prevent the patient from moving and resisting the respirator: muscle relaxants were given in combination with sedatives to suppress awareness. In this particular case I was confronted with the other side of technology. Despite the medication, the patient seemed not to accept the ventilator, which resulted in us administering more medication, up to the moment that we realized there was something wrong with the device settings. I became aware, suddenly, that the same live-saving technology and human action could become a threat to the patient. It was this experience of the ambiguous nature of technology that made me wonder why these kinds of situations emerge, and why there is so little reflection on these potential dangers beforehand.

1.2.2. Trust in technology

In another case, I was taking care of a patient who had a serious brain trauma. During my round I was checking his vital signs and saw that his pupils were dilated and responding less to light stimuli, while his reflexes gradually changed from bending cramps to stretching cramps when I administered a pain stimulus. Despite his having a normal blood-pressure and heart rate I was worried, suspecting that the man was de-

1 I use the terms technolog(y)ies, which in the Intensive care case refers to equipment. In the second example it refers to actions in applying techniques. In chapter two I will explore the term technology in depth. For now, it is important not only to understand technology as equipment but also as the everyday objects and processes involved in providing care – available techniques, protocols, work instructions etc.

veloping a cistern obliteration (a deadly side effect of very high intracranial pressure). I decided to consult the registrar who reassured me that as long as his blood pressure and heart rate stayed normal there was nothing to worry about. Fifteen minutes later the obliteration was a fact, and the patient died. The question here is not which interpretation was right or wrong. Either way, at that time, this patient could not have been saved. But it puzzled me that my observations were inconsistent with the data of the monitor. I realized that once you get used to it, trust in technology can develop, as in my case, into a complete and utter trust. However, the incident taught me that technology also has a negative side. The results from technology may be at odds with observations made by a nurse. This brought me to another 'why' question. Why do we trust technological outcomes more than our own observations? And how can we prevent ourselves from blind trust?

1.2.3. Is asking 'why?', the right question?

I continued to pose these 'why?' questions when I moved to a new position as a team leader on a neurology ward. In the late '80s and early '90s, neuro developmental treatment (NDT) was introduced on a large scale in Dutch care facilities. Neuro developmental treatment is a multidisciplinary approach to the neurological patient who has suffered a stroke. Key features of this approach are:

- The patient has to relearn normal locomotion with involvement of the paralyzed side;
- The patient has to relearn normal posture that provokes reduction of muscle tension to reduce pain and improve awareness and feeling in the affected side of the body.

I really became immersed in this movement as a member of a national neuro-rehabilitation working group. In collaboration with colleagues, I introduced this approach on our ward. Introducing and working with the key features techniques of NDT was difficult but inspiring, although it created new problem areas for us. In the process of using the techniques and taking care of stroke patients, I constantly tried to understand and explain the patient's progress or lack of progress, asking myself: "Why does this happen the way it happens?"

1.2.4. From 'Why?' to 'How come?'

It was on one of those days that I was struggling with the 'why', that a nurse from the national working group told me a story about an experience he had had with a patient who had suffered a stroke and had aphasia (wasn't able to speak). Colleagues consulted the nurse from the working group because every day at the same moment

in care-giving they had trouble with the patient. After showering the man, they helped him to dress. By the time they got to the stage of putting on his socks and trousers, the man became restless and began to emit sounds, pointing with his finger towards his legs. The days following this 'event' showed an increasingly intense reaction from the man when nurses attempted to put on his socks and trousers. Nurses could not explain 'why', and started to report that the man was becoming aggressive and depressed. The consultant nurse took over from his colleagues and was confronted with the same problem. After a few days he decided to talk with the man's relatives about what was going on. They couldn't explain his behavior either. Then he told me*: "It came to me in a flash, and I asked his wife if she could describe in detail how her husband used to dress himself in the thirty years she was married to him."* The solution was very simple, and the next day all the nurses were surprised to see the patient smiling as he came out of the bathroom. The nurse had found out that for thirty years the man first put on his socks and then his trousers, not the other way round as the nurses had been doing up till then. In reflecting on this story, the working group member and I tried to understand, in a deeper sense, what had happened and came to the conclusion that at the moment he had switched from the 'why' question to the 'how come this is happening in the way it's happening', he was open both to the relatives' story and to the untold story of the patient. But more importantly, the world of the man opened up before him, and as a nurse he was no longer questioning the man's behavior by asking 'why?' Instead he was interpreting the behavior, from the perspective of the man's daily routine. He was literally trying to see things through the eyes of the man: he was taking the patient's point of view.

The principal conclusion I have drawn from this example is that there are many different perspectives from which you can observe or try to understand a situation, and changing perspective is vital for nurses trying to support patients. My personal insight was that the 'why' question was preventing me from stepping out of my own perspective and routine: I would have continued to look at the problem in the same way. Adopting the perspective of the *other*, the individual person of *this* specific patient, opens up the possibility of a different answer to the problem.

1.2.5. Emerging Technology

Contemporary technology continues to develop and we will always become familiar with new technologies. We will also have the tendency to create new routines while working with that technology. Questioning technology from the point of view of the patient, or the experienced reflective practitioner, is not common.

As technology emerges and extinguishes, it is replaced by new technology. What impact does that have on nursing?

During my career, new technologies emerged and evolved. One of those technologies was the introduction of a computerized patient file (EPD).

This began with a doctor and a nurse (internal medicine) sharing the idea of building software to save patient data in a computer in order to reduce the amount of paper that had to be archived and stored for many years. Initially, they built templates based on the paper versions of medical and nursing files. After a few years they had achieved a full digital system that met their entire needs in terms of patient information. Internal medical staff no longer needed to report on paper and could access all the relevant data needed for good care. Concepts such as availability of information, doctors giving orders, doctors and staff performing rounds on the ward and searching for relevant patient information were given a whole new meaning. Soon, other doctors and nurses, in fact the whole hospital, wanted access to this new form of file management. The two innovators were asked to set up and join a project management group to help others build their own digital reporting systems. Their main concern when building their original system was how to write software that would connect components to each other and communicate properly. For example, how does information that Doctor X enters in his medical file automatically generate an order in the nursing file? At this point they were up against a different type of challenge: colleagues demanding a customized copy of their system as soon as possible. In short, at this moment (2017) almost all patient data for the entire hospital are digitally connected. Because it was built by and for doctors and nurses (of course, with the help of the IT staff), satisfaction with the product is very high.

On the other hand, new issues are emerging and I will mention just a few of the most salient. With custom-made files problems arise with regard to connecting and exchanging information between the different files and newly purchased programs and software. Because of the wide range of possible ways to store information, the 'search and find' issue that was encountered previously with paper patient files is reintroduced in the digital version. Enforced by government rulings and privacy legislation, lots of checklists had to be built into the EPD.

With the small scale technology introduced by the two innovators, they seemed to have resolved any issues. There were only two people involved in reaching agreement. Introduction on a wider scale complicated the process of building the technology and increased the impact on the practices of the care professionals. In sum, under

the influence of changing needs and regulations, the technology is adjusted. Linking systems becomes increasingly complex. At the same time as emerging technology solves problems it introduces new ones, while older problems return in new guises.

Alongside the phenomenon of emerging technology there is also the phenomenon of expiring technology. What consequences does that have on care practices?

1.2.6. Expiring Technology

To complete the picture, when there is emerging technology there has to be expiring technology. In the late '80s and early' 90's, from a perspective of quality thinking in relation to standardization, accessibility, survey, manageability and communicability, hospitals at first developed written protocols and work instructions and later transferred these written materials into a computerized system.

Because staff and nurses were afraid of system failure causing loss of documents, as a back-up, paper documents were archived. Document management and search functions where time consuming and user-unfriendly.

But as soon as one electronic system was set up, a new 'better' software system would be installed, with every document needing to be put into the new system. IT systems are continually replaced by new ones, requiring new skills and requiring staff to adapt to the new system. In the near future, everything will be accessible in the Cloud.

Learning from history, and influenced by the increasing complexity of IT systems and tighter external and internal control in the form of audits, switching to new systems will be led by project teams. The project team follows the design or blueprint method (Wierdsma, 2002, p. 79) characterized by splitting the thinking process from the acting process. The thinking process involves talking about new strategy, structure, culture and, last but not least, about the matching of systems (reorganization process). The thinking process is followed by the acting phase in which the project team focuses on influencing and stimulating the desired organizational behavior of its members so it will match the new structure (influencing human behavior). This process indicates that technology emerges, is present, is used, and expires as it makes way for an new emerging technology. As described, the required human action has changed from simply physically typing a document and has become the obligation to acquire knowledge of the new technology before being able to use it. In sum, the idea that there is a simple progression in technology that practitioners can deploy as a straightforward device does not apply: the patterns in developing technology imply that the work of practitioners itself is affected.

1.3. Reflective practitioner

In a first attempt to understand what my personal experiences could add to the greater picture I had to step away from particular anecdotes or specific contexts in order to grasp a deeper insight. Within my professional experience, I have made a number of discoveries that prompted the process of reflection, a core quality that every nurse should possess.

My experience with technology has encouraged me, as a reflective practitioner[2], to examine the issue in greater depth. However, this must be based on something more than mere individual experience and first insights.

1.3.1. Relational triangle

Going through my first (somewhat naïve) struggle in the space between patient, technology, and myself as a nurse engaged in patient care, made me realize that initially we trust the technology and make the most of the input it allows us (see above). But experience has shown me that tension is created when there is a mismatch between the outcomes of technology and the nurse's findings. The premise is that in order to take care of a patient, nurses use technology as a tool. The technology is supposed to be a passive component within the caring relation between a nurse and their patient. In my experience the three (patient, nurse and technology) were interacting with each other. Anyone familiar with Actor-Network-Theory (ANT), or with practice theories, will not be surprised that materiality is seen as an actor, through its constraints, and through enabling functions that previously were impossible or simply laborious.

Whatever the starting point, there is always an active relationship between patient, nurse, and technology (figure 1.).

It is possible that the relationship primarily takes place between two actors and the third actor gets involved at a later stage. Sometimes actors are (temporarily) more active or passive in the relational triangle.

As a result of technological developments there is a point at which technology itself starts to develop into a third, technological actor. In an attempt to grasp how it acts as

2 My interpretation of a reflective practitioner is based on Jacobs, Meij, Tenwolde, and Zomer (2008). They make use of the components of reflection, combining the thinking of Baart (1990) and of Dewey (1910). After considering the nature of reflection, Jacobs et al., inspired by Baart and Dewey formulate the following definition: "…reflection is the analysis, (re)interpreting, and evaluating of personal experiences, feelings, thoughts, taking into account the diversity of context, and with a sense of responsibility." (Jacobs, Meij, Tenwolde, & Zomer, 2008, p.:55).

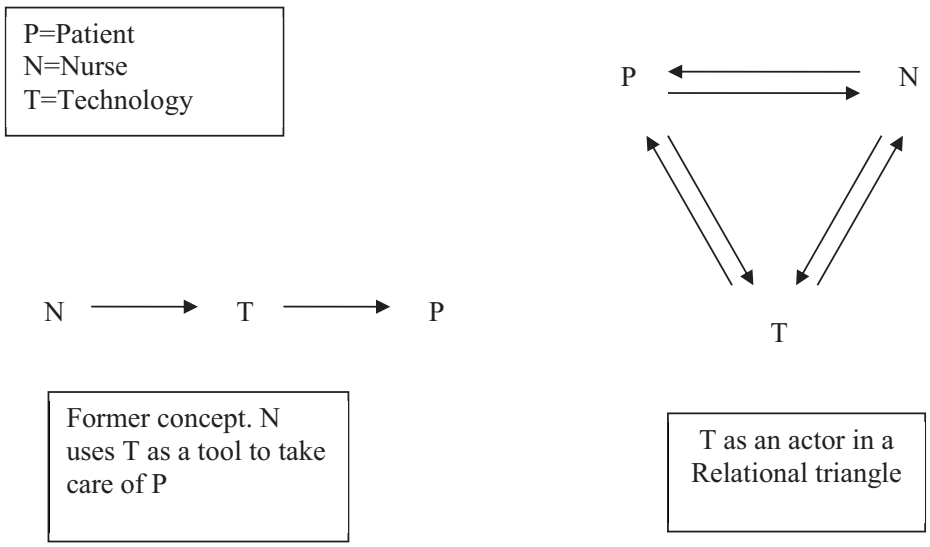

Figure 1. Relational triangle

third party, influencing the practices of nurses and patient (!), we have to change the nature of our questions from trying to explain why things happen to trying to gain a deeper understanding (how and what). Changing our questions opens opportunities to answer the most difficult question of them all: 'how' to cope with the ever changing technologies as a third party in the relational triangle, and a necessary component of nursing practice.

1.3.2. Fact–value gap

In order to study the relational triangle and all the questions it stirs up, it is essential to involve the issue of standpoint. This issue is relevant when looking at the relationship with patients: taking their perspective brings new insights. But the issue is also important when considering the relationship between nurse and technology. Surely epistemological claims purporting to reflect the nurses' experience with technology can only be made when we acknowledge the nurses' point of view in practice: in their specific positions. How are they confronted with technology and what is the value of their insights gained in its use? Their views are interesting, since, particularly for nurses, evolving technology increases the complexity of what they have to do on a daily basis. Here the work of sociologist Andrew Sayer can be of help. According to Sayer (2011) humans are '*evaluative beings*'. We don't just think and then (inter) act. Rather, we evaluate things, including the past and the future. It is a delusion to think that you can fully understand a person or situation. The 'how?' question is multi-layered and can bring different perspectives to the surface. The formulation helps to postpone

judgment and creates the opportunity for the specific patient to unfold the core of the problem to me as a nurse. The 'Why?' question is not wrong, but understanding needs more depth. From experience I realize that our actions are always initiated from a certain 'standpoint'. As a nurse and a researcher I have to be constantly aware of the fact that I look at the world from a particular standpoint and that it is possible to switch or consciously pick a different standpoint.

1.3.3. Knowledge

Nurses have knowledge from former experiences with patients and also possess theoretical knowledge of the different phenomena in care giving. In the example of the conversation with the registrar and the stroke patient, these different types of knowledge become active. It is a composition of gut feeling, protocols, procedures, information coming from the monitor, and theoretical/scientific knowledge. Decisions are made taking all these different types of knowledge into account.

In the case of technological developments, nurses constantly have to adapt to technology, gain new skills and connect them with their basic professional rules of delivering patient-centered care. Nurses develop that kind of skill and knowledge, but is that knowledge recognized and accepted as necessary for technological development?

1.4. Connecting reflection to the actual context

In the last ten years, Elisabeth Hospital (EH)[3] has modernized its health care with the introduction of diverse IT applications and technologies. Conducting research that ultimately adds something to the field of nursing asks for a research focus. My focus is on a recently implemented barcoded medication administration technology (BCMA) called Theriak©[4], resulting in a regulated technology system that is built on procedures and protocol. By scanning the medication and the patient bracelet barcode, ETZ hopes to reduce the human factor and thus the number of human errors, thereby increasing safety in drug distribution.

Exploring my professional space in relation to the subject of technology, I was stimulated in my search for possible answers, realizing that this is just the beginning of a more detailed and more elaborate scholarly inquiry.

3 In 2016 after a merger EH became Elisabeth-Tweesteden Hospital (ETZ).
4 Later on the system was renamed Therapy.

1. Past, present and future structure our world, and the world of nursing is no exception. It is wise to realize this before formulating the statement of a problem and beginning research;
2. Present changes in health care show increasing pressure on the affordability of health care, as do market orientation, and the need for efficiency. The demand for accountability pulls nurses into a technical professionalism. This rationalization of care in turn increases the application of technology;
3. Nurses become part of a system and their position in relation to technology needs reviewing and rethinking from the nurse's perspective;
4. There is trust in technology, up to the point of taking it for granted and no longer questioning its possible dangers;
5. Rephrasing the question into 'How come?' helps me to get closer to the nurse's standpoint. As a researcher, this helps me to remain in the descriptive position and also offers nurses a platform to explain how technology influences their work;
6. Technology emerges and keeps changing the nurse's context within the relational triangle of patient, technology, and nurse. And while nurses adapt to the new situation, their skill mix has to change and they are pressured to understand the new application of care driven by: institutional targets, regulations, procedures and manuals – all supported by technology.

In the final part of this chapter I will place my personal biography and deliberations in a broader context. I will also explain how the broader context has given direction to the local context of the hospital and the department where the research is conducted. Biography and context will be the basis for formulating my research problem and my research question.

1.5. Local context

In this paragraph I describe the way the ETZ in Tilburg interpreted these developments within their strategic plan and the organizational design of the cure and care process.

"The times that we deliver cure and care in splendid isolation are over." (van de Meeren, a former member of the board of directors of the St. Elisabeth Hospital. May 2003).

Over the years the ETZ implemented several projects to accomplish more efficient, patient-centered, accountable, and profitable care. It began with the introduction of a patient classification system to support management in classifying care needs into definite and recognizable levels of care. This was followed by a project to speed up the care process by reducing access time and waiting time for care within ETZ (Sneller

Beter- project sponsored by the Ministry of Health). The main goals were: reducing costs, increasing efficiency, and inviting patients to choose the ETZ in preference to other hospitals. About 2008, management of the ETZ urged front-line nurse leaders to introduce clinical pathways to combine the benefits of the two former projects, simultaneously introducing a third project, the 'LEAN' principles: a systematic way of approaching problem solving in order to add more value to the care process of patients.

In addition to values of efficiency and accountability in these three projects, board members and management embraced a human care program.

Because of the emphasis on technique and efficiency, some members of management, inspired by the theory of Presence (Presentie theorie. Baart, 2001) and the book 'Professional Loving Care' (Van Heijst, 2011, Dutch original 2005), realized that patients and their relatives are increasingly experiencing a lack of recognition and human attention, with a resultant feeling of misunderstanding and abandonment. ETZ decided to start a program on humanizing care in cooperation with Tilburg University which offered to support the program by researching its development. The model was action research. The ETZ wanted to become a 'caring hospital', where all employees are in contact with the patient, through attention and personal presence. ETZ on one hand follows the dominant system, dictated by government, health insurance companies, and cultural pressure, but on the other hand tries to reconnect with the historical roots of care and of nursing. Supportive management techniques and procedures are developed, implemented, and used in order to attain the institutional objectives.

Finally, I will connect these developments to my research area and formulate the problem. What are the consequences of these changes in nurses' daily work, and how do they deal with them?

1.6. Research problem in general

The historical component of nursing, the actual caring relationship, economic, managerial and technical developments within healthcare create a tension. This tension illustrates the increasing complexity of the nursing practice and how this is connected to nurses' knowledge. Multiple agents are active in a dynamic relationship with one another. In reaction to change, in this exploration of the use of new technology, new behavior and patterns emerge. The patterns are not changed by a person but by means of a material object, in this case a technology. Another important issue that I regularly encountered was knowledge. Sturmberg and Miles write about the complex nature of knowledge. They conceptualize knowledge, drawing on great thinkers on this subject.

Sturmberg and Miles have created a format that is useful for our research. There is: (1) '*knowing how'*, that is about explaining procedures, (2) '*knowing what*, that is about facts and relations, (3) *'explicit knowledge*, that is easily codified and communicated, (4) *'tacit knowledge*', that you can divide into two dimensions. The first dimension is a technical one of know-how arising from a wealth of experiences. The second dimension is a cognitive dimension of beliefs, perceptions, ideas, values, emotional and mental models (Sturmberg & Martin, 2013).

The technologization of care practices results in a collision between different kinds/levels of knowledge, at the point where they intersect in daily activity. The dominance of economic values in relation to the care process creates a tension between personal knowledge/values and institutional knowledge/values; the latter seems to overrule the former. Annelies van Heijst (Iemand zien staan, 2008) analyzed how care lost its humanity and how decision making in nursing became increasingly influenced by economic and management values.

As Van Heijst paraphrases Toulmin: people on the work floor (in my case nurses) have sensible knowledge, but they can hardly claim it as valid and appropriate knowledge to the senior "experts" among whom they work. The knowledge of doctors is more valued then the knowledge of nurses. Their knowledge is bound to time and space and is subordinate to abstract and explicit knowledge and hard numbers (Van Heijst, 2011). The (commercial) developments of healthcare led to an instrumental and technical rationality (Van Heijst, 2011) that contradicts nurses' actions, using explicit knowledge in combination with practical knowledge. Hospital management, in the end, prefers abstract knowledge, substantiated with hard numbers, over the personal knowledge that nurses apply to give good care. This suggests that this is a deliberate choice. It is not. There are different forces in action and nurses get stuck in between. On one hand they have to live up to the expectations of economic demands like efficiency, and cost reduction, while on the other they have to deliver value-driven and patient-centered care. This problem needs to be explored, not merely for the sake of finding a solution, but also as a contribution to the understanding of how this problem affects hospital staff and is self-inflicted daily in their discursive and narrative activity.

It is about discretionary space, where nurses are ordered to make use of explicit evidence-based knowledge (protocol and procedures) and are simultaneously praised when they exhibit practical/sensible knowledge – while performing CPR, for example. Because of the dominance of explicit knowledge, this paradox creates a restraint on the use of practical knowledge and can encourage nurses to stick to their institutionalized routine. Knowledge is an important supportive concept in the framework of my

research. It forms the background to my problem statement that focuses on the influence of technology on contemporary nursing practices.

1.6.1. Research problem in focus

What have we seen so far?

Over time, the nursing profession has changed, from being primarily care giving, to being more focused on cure.

The profession has also become more technological, to the extent that that the nurses who are good with technology (cure) are better paid and ranked more highly in the hospital's hierarchy. I place my personal experiences in the broader context of care and cure development, both its technological development and its evolving political context.

There are three risks that I foresee and want to address:

1. Technology is no longer seen from a triadic point of view (patient, nurse, technology) but as a stand-alone entity that cannot be avoided (paragraph 1.3. and 2.2.).
2. Technology is taken for granted and never questioned (blind faith instead of trust), as shown in the example in paragraph 1.2.1.
3. The continuous development and change of technological 'help' is in itself problematic (paragraph 2.2. and 2.2.1.).

For research purposes, personal reflections have to be presented in a way that permits scientific scrutiny. My own experience heightened my awareness of the constant mutual influence of technology and human action. These influences operate on a subconscious level and only surface after (deep) reflection, prompted by the 'How come?' question. Knowledge and decisions, combined with information from technology, (written) procedures and/or protocol, most of the time lead to action. In reaction to this dominance of the system, nurses are stimulated to objectify (rationalization of care) their knowledge to meet the systemic institutionalized expectations. In its turn, ETZ elaborates on the systems' demands and implements technologies and procedures. In my research, I want to adopt the standpoint of the nurse, in order to fully explore and better understand the use of technologies which by habituation and familiarity with its institutional context are taken for granted by nurses.

1.6.2. Research object: BCMA in nursing

The introduction of Barcoded Medication Administration Technology (BCMA) is based on the assumption that when human action is eliminated as much as possible, drug

distribution becomes safer. It starts from the assumption that people make mistakes and that applying technology solves this problem. You provide nurses with a scanning device so they no longer have to look closely at what they are doing, because the medication, for example paracetamol, is changed into a barcode that is checked by the computer. The dominant instruction is: follow the computer, scan medication, and trust the explicit technology because that improves safety. But on the other hand, nurses are instructed not to totally trust the same technology and to keep looking out for flaws in the system, which is an appeal to their practical knowledge. As Greenhalgh and Stones stated, "such a programme, built on a vision of a 'modernized' health service that is fully networked, integrated, largely paperless and uses standardized decision protocols, is seen by policymakers as key to improving the quality, efficiency and safety of healthcare." (Greenhalgh & Stones, 2010, p. 1286). Technology changes roles, identities and mutual expectations in a subtle though far-reaching manner. Greenhalgh and Stones state that

"technology can on the one hand create possibilities of new and efficient ways of communication and interacting between staff and patients. On the other hand it is sometimes associated with newly produced forms of disorder and inefficiency, and the need for stressful workarounds." (Greenhalgh & Stones, 2010, p. 1286).

I will look into the use of BCMA technology by nurses, paying particular attention to the textual and organizational (systemic) influences they exert on each other. If nurses are so caught up in institutional ruling that they tend to look for solutions within the rules of the system, the chances are that if these are not present they will look for loopholes or else become inactive.

In chapter 2, I will introduce the theoretical backgrounds against which I will examine my research topic. These theories facilitate a deeper examination of the problem.

1.6.3. Research focus

My research is ultimately about the question of how nurses act within that triangle of patient, technique and their own professionalism, in the rapidly changing world of care and cure. To answer that question I focus on BCMA, a leading technology that is already in place, chosen because as a project it is representative of many similar technology projects/systems, and its various actors/stakeholders (cure, care, policy makers, technicians) are known and accessible. After all, the relational triangle does not take place in a vacuum.

1.6.4. Research question

How, from the standpoint of nurses, does the use of BCMA (Theriak©) institutionally and textually mediate their work?

- What are nurses' deliberations while they are using BCMA? (Chapter 5).
- What influences nurses' deliberations in the process of using BCMA? (Chapter 4, 5, 6, and 7).
- Are there signs that they are aware of these influences in their practices and do they, or can they, change their decision if they do not agree with a particular influence that BCMA has on their daily work? (Chapter 6).
- Do nurses make knowledge-based decisions that are not congruent with organizational decisions that are based on knowledge that is explicitly related to BCMA? (Chapter 4, 5, 6, and 7).
- What are the stimulating and inhibitory factors in the nurses' process of deliberation in using BCMA? (Chapter 5-7).

1.7. Outline of this thesis

Chapter 2 is a mapping of the literature used to frame the methodology of my research. The subject of this research is an everyday recurring problem in nursing practice. The use of BCMA is a layered problem which requires in-depth study of the areas of technology, institutional regulations, and practice in order to understand what is happening in the use of BCMA.

Chapter 3 explains my ethnographic approach and describes the design of this research and the development of a model of data analysis that stays close to practice and to the literature.

The subsequent four chapters of this thesis (4-7) are based on articles that have been published, accepted, or at the stage of resubmission with a response on reviewers score.

Chapter 4, based on an article, shows how the use of different heuristic lenses helps to map the change in nursing practice brought about by medication technology and how nurses' knowledge is important for guiding the technology.

Chapter 5, based on an article, shows the use of a mixed method to explore the practice of nurses working with medication technology and the impact it has on their work. It sheds a new light on the notion of 'tinkering with the technology'.

Chapter 6 based on an article, is about the technological institutional organization that rules the daily activity of nurses, using a derivative application of a model to explicate different forms of logic.

Chapter 7 based on an article, describing the institutional ruling of the nurse- patient relationship. The institutional rulings based on the technology BCMA.

Chapter 8, the general discussion of this thesis, reflects on the previous chapters and formulates key elements which provides nurses with arguments to talk back to the organization, along with recommendations for practice and future research.

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2.

Putting Practice into Theory

2.0. Introduction

In this chapter, I will move from primary critical insights, based on my own nursing experience, to the theoretical context of the nursing practices surrounding a system of technology that has been designed and implemented to increase drug safety in a general hospital. The theories under examination are chosen to provide clarity about what happens in nursing practice and the subject will be viewed through three different theoretical lenses, positioned in such a way as to allow principal actors to be seen against their professional theoretical background. The idea of using lenses in this way is drawn from the practice theorist Davide Nicolini. Three theoretical lenses are needed – positioned in such a way as to provide a critical perspective on the research data: they are technological, institutional, and knowledge based.

The technology lens allows us to see what technology is about in practice and is concerned here with the theory of P.P. Verbeek. This is deployed alongside a theory of institutions and organizations connected to actual practice. The institutional perspective or lens is based on Baart and Vosman, who draw on Dubet's theory of the decay of the institutionality of organizations. Sociologist Dubet researched educators and nurses and the institutions they work in, and Vosman and Baart translated this to the healthcare system. For connecting and explaining the practice perspective, Nicolini and Robert Schmidt are the most important sources, and the knowledge lens comes into operation in relation to Nicolini's and Schmidt's approach to practice theory. Although the theories have been examined in depth, their use here is for discernment and they are deployed for the pragmatic purpose of examining what comes into focus: nursing practice will be the central theme throughout.

2.1. Shifting lenses

The use of different lenses in order to discern the problematic entwinement of technology, nurses' practice, and nurses' knowledge in the hospital is explained more fully in this paragraph. But first, it is important to explain some crucial triggers that led to me choosing this approach. As explained in chapter 1, it was my experience as a nurse that formed my early thoughts and questions in relation to technology and its impact on the daily activities of nurses. As Weick explains, 'peoples' reality is constructed backwards (Weick, 1995). My first reflections taught me that technology rises, expires, and proceeds in new rising technology. It is *we* who implement, use, write off, and replace technology we believe to be more useable than the old one. Later I came to the understanding that the problem of technology in nursing practice has multiple layers that influence the representation of the problem in different times and contexts. Technology presents us with possibilities and with potential problems. There are vendors of

technology, users of technology and situations to which the technology is applied, and these are not always unproblematic (see examples in chapter 1). Increasing demands on nursing practice lead to continuous adjustment of those supporting technologies.

To explore this research into practice I use Nicolini's concept of lenses (Nicolini, 2012). According to Nicolini, when studying practice empirically it is helpful to switch between different theoretical lenses. In the use of those different lenses I adopt Nicolini's two basic movements of zooming in and zooming out (Nicolini, 2012): zooming in on the actual action of the nurse and zooming out to see the overarching connection with organizational policies.

My own experience nourished the idea that when staff at a hospital are not aware of the different perspective that nurses have when working with BCMA, they are taking their environment for granted and gaining no insight into the problems associated with developing and implementing technology – nor the cause of the problems. Therefore, three theoretical lenses – technology, practice, and knowledge - are used to help select the correct strategy for this research on the use of BCMA in nursing practice, and to give that choice some foundation. The type of nurses' knowledge involved underpins and connects the other two lenses. It is not only the technical knowledge of how to use BCMA that is involved, but also knowledge of the organizational rules and procedures involved, a knowledge which allows the carving out of discretionary space.

2.2. The first lens: Technology

Within the hospital context, technology can be invasive and it can support the imposition of a merely average standard, as became clear in the examples described in chapter 1. As we saw from the relational triangle described earlier in paragraph 1.3.1., technology becomes an actor in the nurse-patient relationship and changes that relationship. It does not mean, however, that the nurse is subordinate to the technology. Because of the research focus on BCMA, a concept of technology must be established which helps to define the research problem in the everyday world of nursing. What kind of approach to technology suits this interest in everyday nursing care? We are in need of an approach that focuses firmly on the problematic aspects of nursing practice. Peter-Paul Verbeek in 'What things do' (2005), his dissertation on technology, philosophy and design, provides an inspiring view on the interaction between technology and people (here: nurses).

In the following outline of Verbeek's perspective, I will confine myself to making the connections between his position and my research problem with respect to technology.

Verbeek, at the end of his analysis, concludes that human beings are not sovereign in relation to technology. The technology itself shapes the way people relate to it, but on the other hand the technology is also shaped by the way people use it. It is a reciprocal relationship. In our case, the use of BCMA shapes the behaviour of the nurses towards patients, but the practice of the nurses in turn alters BCMA. To Verbeek, this mutual interweaving of people and technology must become the point of departure for an "existential" analysis of technology (Verbeek, 2005, p. 46).

This supports my thoughts that in order to understand the reciprocal influence of BCMA and nursing, I have to focus on the 'actuality' of the BCMA technology that nurses use to administer medication to their patients. I have to look at BCMA and nursing practice in their connected relationship, because there is an implicit users' manual with BCMA that dictates certain ways of acting, and it is questionable whether nurses always follow that implicit manual. Like in the examples of nurse navigating a heavy medication trolley through narrow automatic doors (section 5.3.) and patients holding up their hand as soon as the nurse enters the room with the scanning device (section 5.4.1.1.).

According to Verbeek, one should avoid an isolated look at either technology or the human actors. Verbeek's idea that technology plays an active role can be seen in practice when medication is being distributed. BCMA enters the network of other hospital technologies, but also enters nurses' caring relations with their patients and other nursing practices. At a certain stage, after using it often enough, the technology is mastered and recedes into the background where it becomes invisible. It is taken for granted and will no longer be questioned. Nurses no longer focus on the technology as such, but on the actual role technology plays, or on what one can do with the technology.

Verbeek conceptualizes 'technological intentionality'.

"When human beings use an object there arises a "technologically mediated intentionality", a relation between human beings and world mediated by a technological artefact." (Verbeek, 2005, p. 116).

He gives an example of how the mayor of a city proposed to shorten the shafts of the rakes used by employees of the public gardens. In his view this would eliminate an undesirable practice of leaning on them excessively. By shortening them, laziness was discouraged and working hard encouraged (Verbeek, 2005, p. 115). This example shows that tools – a device or technology – are not neutral and can change practices. This example has a parallel with the introduction of BCMA. Policymakers reported damage to patient safety due to medication errors in hospitals. They compelled hospitals to take

proper action to improve patient safety by decreasing the number of errors made. 'The hospital' assumes that human failure is the root cause and starts the development and implementation of medication technology. The practice of the medication round is altered in a far reaching way, on the assumption that the number of adverse events will decrease due to the implementation of BCMA.

In order to really understand objects and technology in the presence of the subjects, you have to connect them with the subjects, because the presence of that technology precedes people's ability to take it into account and to really know and understand the technology. This is Verbeek's critique of dichotomy thinking, separating the object and subject, in scientific scrutiny too, as if one thing leads to another. The two cannot be separated and have to be seen in their connectedness. The use of BCMA alters the caring routine as a whole, and in particular the practice of medication rounds.

Verbeek comes to the conclusion that technology and human action are not only intertwined with one another but also shape one another (Verbeek, 2005) and can only be examined scientifically in their interrelationship.

2.2.1. Fading into the background

Verbeek points at something else important to practice. When people are working with technology, they generally do not focus on the tools (BCMA) they are using but on what they are using them for. Yet, meanwhile, despite this, the tools shape the relationship between the person and what (or who) they are working with (Verbeek, 2005).

In order to understand Verbeek's arguments in the context of nursing practice and in relation to BCMA, I cite the practical research on technology proposed by practice theorist Robert Schmidt. Schmidt will be quoted later in this chapter in relation to another aspect of this research: what practice is about.

2.2.2. A diagnosis of AGILE

In his book 'Soziologie der Praktiken' (Schmidt, 2012), Schmidt develops thoughts occasioned by his research on the implementation of software. With his research Schmidt proves that software development brings up new kinds of labor and organizational forms.

According to Schmidt, the so called 'agile' method of software implementation is upcoming in response to the conventional method. The conventional method is based on a philosophy of project management in engineering that puts detailed roadmaps and a tight schedule of assessment periods at the centre of software development.

Agile encourages the production processes to deliver the project in small parts, and restructures those parts in an efficient way. In reaction to the hierarchical approach which delivers the product in the final stages, the agile method calls for a committed and diversely composed team that feels highly responsible during the entire process. Programming is no longer a lonely 'intellectual' activity but becomes a communicative process between co-creating participants who develop software that can be altered at any moment a situation requires (Schmidt, 2012, p. 157).

Schmidt shows how what seems to be a matter of cerebral labor is, in fact, physical work. In the usual separation of mind, brain and thinking, and of physical acting, laboring and producing, the former is regarded as dominating the latter. This proves to be neither legitimate nor relevant.

The agile method prefers to keep everything connected. Schmidt's research on software implementation is about planning software for a hospital. He emphasizes four paradoxical aspects that are on the one hand connected, and on the other hand make things complicated. The paradoxes of these practices are characterized as *'Gegensatzpaare*' (Schmidt, 2012, p. 184), 'pairs in contrast', namely: individual versus collective, mental versus physical, explicit versus implicit, and privately versus openly. The first aspect mentioned in each case is the dominant one. In the process of development there is a collective concept, and eventually assignments to an individual (author), the programmer, who then does virtually everything on his own, with the remit to return to the collective when they are finished. By that time, at that stage, there is no longer much opportunity for change. There is a sort of informal co-operation with the authors who have to explain retrospectively to the collective what they have done. The implementation of BCMA followed the linear/engineering model (the left side of figure 2., a visualization of Schmidt's paradoxes in practice). The development and the phase before implementation were very hierarchical and technical. Nurses were involved at the implementation phase only, by which time the technology was susceptible to only minor adjustments.

It was a strict linear process of development and implementation. This yields the insight that, in order to understand the effects of BCMA on nurses' practices, research can only be done in its operational status close to those practices. If we build on Verbeek's and Schmidt's theoretical insights then we have to get right down to the level of practice as it is to be observed in the organization, the general hospital. Therefore, in the following paragraph the institutional and practice lens is developed.

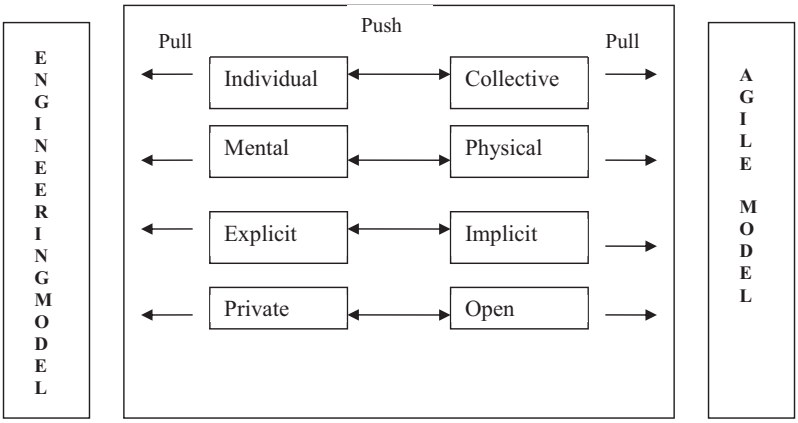

Figure 2. Push and Pull of the Paradoxical Poles (Schmidt, 2012, p. 183–184)

2.3. The second lens: Institution and practice

In order to zoom in on practice in the hospital it is helpful, first, to briefly explore hospitals as organizations, and the developments at organizational level that are relevant to the research objective.

Most of our institutions are confronted, in addition to the demands of their core business, with an increasing desire to get good ratings or rankings when audited. In Sayers' opinion this tendency to rank institutions is driven by good intentions of accountability, fairness, and equality, and the aspiration to treat people and institutions all in the same way. In order to keep track, the use of technology is inevitable (Sayer, 2011).

According to Vosman (drawing on François Dubet's theory on the decay of institutions), institutions such as hospitals, nursing-homes, health-insurance providers and political care agencies have adapted aspects of free market logic which change their original character. Let us focus on hospitals, and follow Vosman's ideas about institutions. An institution is a political and ethical entity which serves one purpose, unlike a system, which is a sociological entity, the purpose/result of which can be altered (Vosman & Baart, 2008, p. 41). Because of that new logic, hospitals become something other than organizations: they are systems, legitimized by society, in which sick people find cure and relief for their illness and pain. Now the hospital also looks at profit, at industry oriented efficiency, and adapts to talk about products and productivity (Vosman & Baart, 2008, p. 37). Hospitals are no longer one single, politically legitimized institution, but become multiple institutions. It is its structure and specific purpose that defines it as an institution. Broadening the purpose is to abandon the institution and transfer to a system. In the case of the hospital, its purpose and effectiveness are no

longer derived from being efficacious in restoring health. Instead, its purpose is seen from a manufacturing perspective. Increasing its complexity weakens the institutional character of an organization and the actors, workers – nurses – become a "bundle of desired features" (as Vosman and Baart cite Dubet). Hospitals become systems whose institutional character, caring for the sick, gets crushed.

Two of the four problems mentioned that are associated with the decay of the institutional character of modern hospitals are relevant to this research.

- It is difficult to have good relationships between caregivers and care receivers because the institution, as such, no longer mediates between nurse and patient. Systems have rules that regulate traffic. Care professional and patient are no longer seen as meaningful participants, as would have been the case in an institution. They become links in a system.
- Care professionals are subject to universal values ('everyone is equal and worthwhile' – whatever that means) and they entertain their own private values connected to the basis of care. In the previous political terminology that characterized institutions (in this case, of a hospital being a guest house, and a more political term is hardly conceivable) a hospital was a elementary political entity, through which living together was performed. But the political character of the hospital got lost, it became an efficiency oriented organization that provides 'products'. The institutional character got diluted. That puts people who perform *travail sur l'autrui,* people whose work it is to help other people, in an awkward position (Vosman & Baart, 2008, p. 41-42): they have become producers, obeying to the logic of production, yet at the same time bound by political ethical values.

What does the organizational lens tell us about BCMA and nursing practice, while involving the insights of Verbeek and Schmidt? We see nurses working with BCMA as one of the many systems in use in hospital nowadays. The relationships between nurses and their patients are connected, in this case, to a medication system. Nurses have to incorporate all kinds of safety and quality regulations in their caring practices.

Andrew Sayer calls this 'the systemic rationality' that changes the base of institutions.

"Many of us are all too familiar with the rise of audits and the imposition of standardized procedures on activities which seem to defy standardization. Supposedly, these provide rational systems for organizing and assessing the performance of individuals and institutions." (Sayer, 2011, p. 59).

In this paragraph we have connected the implementation and use of BCMA to the overarching institutional context. In the next section we look closely at the theoretical implication this has for my view on practice.

2.3.1. The practice

With ideas about technology and what it does in action set out, and the transformation of the organization in which nursing is taking place (from a politically legitimized institution to an organization characterized by systems) described, it is necessary, finally, to get a clear view of what practice is about, as the focus of this research is the practitioners performing in these practices. What is a practice? I follow Nicolini, who describes a practice, but does not define it in the strict sense. Firstly it is about a relationship between human action and 'the system':

"…the system has an impact on practices ***and*** practices have an impact on the system." (Nicolini, 2012, p. 42).

Secondly, what people actually do:

"Our attention is drawn towards understanding how, and under what conditions, action is actually carried out. The object of inquiry becomes the capacity of humans to perform actions in a competent way, the temporal organization of such an action, and the resources that make this possible." (Nicolini, 2012, p. 42).

It is about practical reasoning and performing a practical task in a current context such as a hospital building.

Thirdly, the role of human actors alongside systems that become actors in the context.

"Practice Theory therefore tended to dissolve the distinction between micro and macro, and to institute continuities that help explain both how the 'system' can be reproduced in practice and, at the same time, how practice can become the locus of variation, innovation, and change." (Nicolini, 2012, p. 42)."

Translated to nurses' work, the question is: is it possible to divide their work into little pieces and thus single out one practice? Is it possible to isolate parts of the care process from one another? Or are they intertwined and in that intertwinement constitute a practice? Schmidt offers a more detailed interpretation of the concept of practice. He connects social practices and the concept of performativity, which brings him to a definition of social practices:

"They are a continuous iterative production of social reality that alters on a similar and regular base, influenced by speech, material, physical, and symbolic events." (Schmidt, 2012, p. 14).

According to Schmidt – and we side with him on this – practice theories are only interested in the 'full event', including participant(s) active in, or connected to the event (Schmidt, 2012, p. 24).

2.3.2. Rules as understood in routines

To understand the position of rules in routines it is helpful to scrutinize Schmidt's first example of practice – in the Metro. The same logic can then be applied to describe nurses' routines. The metro example is about observation of travellers on the metro embarking, disembarking, and waiting, where things seem to simply flow as a consequence of the movement of the passengers. After the departure of a train everything comes to rest, to swell at the arrival of the next train. These movements contain several ground rules or conventions: people wait in a prescribed way, sometimes literally because there is guidance about queuing, but most of the time through some sort of natural tradition. There is a principle about not bumping into people, and a certain level of physical contact with strangers is tolerated on a congested platform or a crowded train that would be unacceptable in a different context.

Travellers move forward in relation to one another, using their eyes to observe what is going on, and trusting that everyone respects and follows the rules imposed by the movement of walking and waiting. Even a certain amount of pushing and shoving is involved and permitted. Certain spatial artefacts and technical constellations are involved in the organization of this collective movement: the architecture of the train station, colourful markings, stairs, escalator and elevator, information boards with arrival and departure times, and visual and acoustic warning signals. In this way, the movement is choreographed. Its regulation is based on explicit and implicit rules and the normative requirements placed on relationships. This includes communicating the shared assumption that some rules can be violated with confidence, despite warning signs, for example, stopping the door from closing to help a latecomer get onto the train. The latecomer takes a risk built on trust that the passengers already on the train will assist by blocking the door, thereby joining the intervention against the technical provision (automated closing of the doors) and spreading the responsibility over the participants. This social ordering of practices, thus Schmidt, is public, visible, yet taking place in a way that is 'taken for granted' (Schmidt, 2012, p. 9).

2.3.3. Nursing routines

Looking in this way at the practice of nurses working with BCMA might be helpful in unravelling what is going on in their practice in relation to medication technology. How is this medication practice connected to the rest of a nurse's work? To Schmidt (2012), psychical performances, a common and shared practical routine, and practical knowledge in combination with artefacts play an important role in the emergence of social practices. These social practices are constantly subject to change. For example, in former times nurses had a medicine cart and paper-based medication administration record (MAR). Nurses stayed in the corridor near the patient's room, looked at the MAR, took the medication out of the cart and walked into the room to hand over the medication. With the introduction of BCMA, new rules were installed from a safety perspective and nurses were mandated to take the cart into the patients' room, scan the bracelet and administer the medication to the patient. In this way there is always visual control over the situation.

2.3.4. What does this mean for this study?

In the view of Nicolini and Schmidt, firstly, researching practice is a practice itself. Secondly, that research cannot be carried out while staying outside the practice; a practice can only be studied from within. Perceiving what a practice is about involves certain theoretical presuppositions (here: on technology in use, on the functioning of the institution, on the nature of the practice) as heuristic devices: what do we actually see? Emphasizing the heuristic use of the theories implies that we do not intend to define nor make statements that claim objective truth. Our objective is much more modest: do the selected theories enable us to see more, and in a nuanced way? Being in that particular practice, as a researcher, one can get close to the subtle movements in that practice. We can start to see how the practice works, instead of what the nurse does. In a practice-oriented approach, acting agents are not seen as 'talking heads' (Schmidt, 2012, p. 13), but as skilled and active participants. In line with Verbeek, with this statement Schmidt also criticizes the subject-object dichotomy. He advocates not only the admission of abstract textual data, but also data produced by participating, silent, non-communicating agents. In our case that means, e.d., the design of the door (heavy) giving access to the patient room; the type of lighting in the night; the rule that nurses must take the medicine cart along with them into the patients' room.

Schmidt paraphrases Goffman on research on practice.

"...>> nicht um Menschen und ihre Situationen, sondern eher um Situationen und ihre Menschen<<." (Schmidt, 2012, p. 24).

Translation: It is not about people and their situation, but about situations and their people. It is all about position in the field. The object of this study is not nurses administering medication, but the administration of medication and how nurses perform this practice, cope with it at work and cope with situations arising from this practice.

That should be the starting point in research on practice. In all Schmidt's' examples he lists three characteristics which serve as a basis for identifying practice: temporality of practice, physicality of practice, and materiality of practice.

2.3.5. Temporality of practice

Practice is about concrete events that are ongoing, in the here and now, characterized by an irreversible process following a certain pace or rhythm and going in a certain direction (remember the choreography of the metro station). The actor has certain assumptions (through training, experience and so on). There is a kind of toolkit of possible actions, of which the applications are dependent upon the requirements of that one, temporary, situation.

Actions seem to be ruled by awareness and it is the course of the event that determines whether this awareness is converted into a specific action. Within the terms of this research, a nurse has knowledge and a certain assumption about the event that is distribution of medication, but it is the actual event in relation to a patient that ultimately determines which specific intervention will be made by that nurse. At the moment that a nurse is pressing medication out of the packaging into a medication cup they are in that moment and closed off from the past (fully concentrating) and unaware of their potential impact on the future. Temporality is about the order of things, being in the 'now', aware of the demands of the situations in the 'there and then.'

"Praktiken bezeichnet ein zeitliches Kontinuum, die Teilnehmerinnen befinden sich in einem Strom sich entfaltender Aktivitäten." (Schmidt, 2012, p. 52).

Translation: Practices are defined by a temporality continuum in which the participants are present and evolve in an ongoing stream of activities.

2.3.6. Physicality of practice

The physicality of practice considers the body as a memory of previous practice, from which it assigns a role as a medium or agent in 'the moment'. Practices are always meaningful, significant physical movements. Within these so-called 'skilled bodies' (Schmidt, 2012, p. 56) thinking and acting, (individual and communal) are not separate from each other. Practices are about bundling physical and mental activity and not, as

is often assumed, regarding them as separate parts of practice, with a determining role of the mental over the physical. This is the perspective from which Schmidt wants to understand and explain the observed.

Concepts and capabilities such as intentionality, awareness, and reflexivity are not eliminated but through research are reformulated. Nurses working with BCMA have to be able to handle a computer on wheels (COW), which is to be pushed with some force. They know how to manoeuvre the COW out of the medicine room with the automatic door that closes too quickly. While doing that, nurses are aware of what is going on in the ward and are constantly connected to the whole of the caring process and to their colleagues.

"Bewegungen, Haltungen und Gesten erscheinen nicht als unverständliches Gewirr, sondern als sozial verständliche Verhaltensweisen, weil sie von den Teilnehmern- immer schon- als sinnhafte körperlich- mentale Manifestationen interpretiert und weil sie ihnen als solche Manifestationen verständlich werden." (Schmidt, 2012, p. 59).

Translation: Movements and postures are not seen as incomprehensible jumble, but as understandable social behaviour. They are always just interpretations of meaningful and positive mental manifestations of the participants and are understood as such by those participants.

2.3.7. Materiality of practice

"Artefacts also play a part in the construction of the social world."
(Schmidt, 2012, p. 63).

Buildings, streets and technical devices, are seen as demonstrations and reifications, as moulds of understanding of the social, with reference to the actor–network theory (ANT). They act as a framework for everything that has happened, is happening and is about to happen. In the example described in the section above where it is connected to physicality, it can also be connected to materiality. The nurse needs a skilled body to know how to cope with the design of the ward and the materials in use. These artefacts that influence nurses' actions and movements act as the roadmap of the actual context a nurse is working in.

A certain view of technology, institutions and practice has now been presented. There is a final and vital link which connects all of the authors cited, and that is the term 'knowledge'. It is the final lens.

"Die Soziologie rechnet soziale Akte traditionellerweise einzig menschlichen > Akteuren<, Individuen und Gruppen zu und betrachtet Artefakte und Techniken allenfalls als Instrumente, Werkzeuge, neutrale Mittel oder äußere Objekte…. Die praxistheoretische Perspektive erweitert demgegenüber den Fokus." (Schmidt, 2012, p. 62).

Translation: Sociology traditionally connects actions or acting to individuals or groups of human actors. Artefacts and techniques are merely seen as instruments, tools, the neutral medium of objects…practice theory broadens this focus.

In chapter 5 these insights will be applied to look at time and materiality in the work of nurses, with reference to BCMA. It is there that the impact of the insights will become clear.

2.4. The third lens: Knowledge

In this final theoretical lens, the other lenses are brought together. Nicolini and Schmidt, in an explicit way, and Verbeek in a more implicit way, write about knowledge as being crucial in our actions. My challenge is to provide the term 'knowledge' with such a meaning that it helps in this particular research field (BCMA and nurse action) and renders the ultimate research data clear.

Knowledge is not simply about facts that we already know, but a melting pot of all kinds of theorized knowledge, book knowledge, practical experiential knowledge, knowledge of how things are done, and how it is connected to practice. Furthermore we discern social, emotional en relation knowledge. Knowledge is also about intelligence which is the capability to use knowledge to adequately react to change in environment.

In this research, we encounter different forms of knowledge which interact with each other. In this paragraph the concept of knowledge is explored in a way that helps in answering the research questions. The concept of knowledge that we are searching for here should be of use to nurses in providing a certain insight into their work with BCMA in particular, and technology in general.

As research is problem driven, an appropriate description of 'knowledge' is needed and was presented in paragraphs 1.6. and 2.1. The following sections sheds more light on this concept. All previously mentioned theories speak of the traditional dichotomy between theoretical and practical knowledge. Despite the fact that these two kinds of knowledge repel each other, their poles have an attractive force (shown in line with

figure 2. section 2.2.2.): this encompasses the idea of rational and practical knowledge having to be viewed separately versus the idea of connecting them with one another in order to broaden the view. In their writings, the authors describe theoretical knowledge in different ways as scientific knowledge, evidence-based knowledge, theorized knowledge. At the other end of the spectrum, practical knowledge is described using concepts of historical knowledge, experiential knowledge, and theoretical knowledge combined with gut feeling, '*Fingerspitzengefühl*' (Tacit knowledge).

2.4.1. Knowing in practice

As we have seen Schmidt ascribes three main characteristics to practices: temporality, physicality, and materiality. Schmidt connects them to all humans as 'knowers' in their practice. Nicolini takes it a step further when he focuses more on the phenomenon of knowledge and connects it to 'site' (Nicolini, 2011, p. 1). Nicolini states that practice, knowledge, and institutions are strongly related. A nurse is a 'knower' in her practices within an institutional context.

To Nicolini 'knowing' is a verb: we *are* and we *do* knowing. In line with the authors referred to in this dissertation, the knowledge of nurses working with BCMA is seen as *institutional knowledge in action*, "situated in the historical, social, and cultural context from which it arises." (Nicolini, 2011, p. 3). In his study in the field of telemedicine, Nicolini endorses the fact that there are different sources of knowledge that are used in a practice.

"….to scrutinise knowing in practice we need to attend to the process which allows different and dispersed ways of knowing in practice to work together."(Nicolini, 2011, p. 4).

2.4.2. Site

Nicolini, in line with Schmidt, also believes the focus of analysis should shift from people who act, to their practice and their connections. To Nicolini, practice and knowing should not be separated merely for the sake of making the distinction. If separated, it should only be for analytical purposes in order to enlarge understanding. Because knowing and practice only make sense if they are observed in their context, Nicolini introduces the concept of 'site'. This concept establishes a connection to Schmidt's 'characteristics' and Verbeek's idea of background and the world that is hidden behind, insofar as we can observe it. To Nicolini the background is permanently there, only "… in most cases, it is pre-reflective and unacknowledged." (Nicolini, 2011, p. 5).

The knowing of the nurses working with BCMA arises from the practice and can only be seen in that practice – but it cannot be *reduced* to a practice.

In his research into telemedicine Nicolini elaborates on how artefacts are involved in the process of knowing but do not carry knowledge. They are merely mediators of knowledge which is translated into the scenario of a practice. "The knowing is in the patterns of use in the alignment between them."(Nicolini, 2011, p. 7) The institutional aspects of the use of BCMA are primarily based on scientific, abstracted knowledge, while in the practice of working with BCMA, there is entwined knowledge.

2.4.3. First and third person knowledge

My problematic leads to a distinction between first and third person knowledge.[5] There is the knowledge generated within a practice from the perspective of the agent within the practice. That person is on the field, as it were. This is first person knowledge. Then there is the perspective of an outsider, the one who looks at a practice from outside,

2.4.4. First person

From an institutional perspective (a vital part of the research focus) we are supposed to act on the basis of acquired theoretical knowledge. Nurses often both act on and use practical knowledge which they get from a melting pot of different forms of knowledge. This is first person knowledge: it comes from within and is connected to practice. Theoretical knowledge is third person knowledge. It is abstract and comes to us from outside. In the practice of nurses working with BCMA these two kinds of knowledge constantly collide with each other. However, following Nicolini and Schmidt, we should connect the two, so that both retain their strength, rather than studying them separately.

This can only be done if the basic premise is accepted that the kind of knowledge nurses have is associated with, and a result of, what they do. It is about practice-bound knowledge. It is knowledge that is contained *in* practice.

2.4.5. Third person

Martin has the following to say about research and development of theory, which he calls third person knowledge:

5 Problematic is a term used by Dorothy Smith. There are many theories about knowledge but we are confined here to the use of 'first', and 'third' person knowledge, a sufficient distinction for the research in hand.

"….'sociology and its near kin have adopted an understanding of theoretical explanation that privileges "third-person" explanations and, in particular, have decided that the best explanation is a "causal" third-person explanation, in which we attribute causal power to something other than flesh-and-blood individuals…." (Martin, 2011, p. 5).

He then writes about the dismissal of what people in practice have to offer to the development of that same theory. This is related to Schmidt's idea that knowledge is inherent to practice and that there is a world of knowledge hidden behind practice.

According to Martin we have to recognize this as the dominance of a particular view. This view refuses to accept that the knowledge gained by people actually working in a particular situation is capable of helping to develop theory. The first-person explanation is labelled inadequate to form the base of scientific findings. Martin takes it a step further. The personhood and competence of the actor is pushed aside:

"Social science rejects the possibility of building on first-person explanations because, to be blunt, it distrusts persons and their cognition." (Martin, 2011, p. 23).

This third-person domination over the first-person statement offers an analytical freedom that is used to abstract theoretical data from respondents that, afterwards, is no longer recognized by the respondents, according to Martin.

As we have seen in chapter 1, we don't ask the 'why?' question but the 'how come?' question. Nurses tell of how they are acting in relation to technology using their first- and third person knowledge. They are not asked to defend or explain their motivation for doing what they are doing, but to combine their experiences institutional and theoretical knowledge to provide greater understanding of the world of nurses using BCMA. It is not about objectification but about understanding. Talking about past and future is to use a construct, and it is the beginning of a slippery slope to enter it as data. However, encouraged by the literature, it is reasonable not to ignore the past and future as influencing factors.

"….reference to analytic elements outside the experience of actors has a corrosive effect on the honesty of the investigators." (Martin, 2011, p. 105).

Only focusing on the here and now as a researcher narrows your view, with the risk of filling in the blanks without looking at these influencing factors.

The next chapter, on methodology, will deal with the relevance of first person knowledge and its impact on the method of research used in this study.

2.5. Summary

Chapter 1 provided an overview of the effects of economization on the development of technology and the nursing profession. This led me to reflect on my own experience with the use of technology over my time as a nurse. Some pivotal concepts such as technology, temporality, knowledge, point of view, and standpoint came to the surface and these thoughts helped me to formulate a research question. In chapter 2, the theoretical background of these concepts was explored in order to establish which research strategy would be best to answer my questions. If the first chapter looked at the research field from a distance, by describing my own experiences in chapter 2, I took a closer look at my research field. This zooming in and zooming out brought me the necessary insight of different point of views (theoretical lenses). Using the first lens, Verbeek's lens of technology, confirms that in this research nurses and technology are in a relationship that has to be studied in this mediating connection. The second lens (institutional theory) shows how technological developments have changed the hospital from an institution into a systemic network in which technology becomes the connecting factor. One of those technologies is BCMA which changes nurses' practice. Nicolini and Schmidt provide a definition of practice. Technology and the systemic network have a ruling influence on nurses' practice in relation to drug distribution. Schmidt's three distinctions provide a way of identifying that practice. The third lens (knowledge) confirms the constant presence of different forms of knowledge in the practice situation where nurses work with BCMA. Finally, all the authors agree that in a study such as this, seeing a dichotomy between technology and practice must be avoided. They must be considered in a single context. Furthermore, it is clear that the authors also agree that such a study must be carried out from a standpoint that admits several points of view into consideration. It is the only way to understand 'how' things are happening the way they are happening. The next chapter connects the theoretical journey with an appropriate research strategy.

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3.

Back to Practice

3.0. Introduction

In this chapter the theoretical framework of chapter 2 is connected to the overall research strategy and research method. Understanding the various theoretical approaches yields a residue of unifying concepts that lead to an appropriate strategy.

Verbeek describes how technology has to be looked at in its 'actuality'. Technology has an 'implicit' manual (institutional or textual) which is imposed on its users with the result that, at a certain stage, technology is taken for granted. The authors already quoted all react against dichotomized thinking and stipulate that, when researching practices, it is necessary to zoom in on the local context and zoom out to see the trans-local connection of things. In order to get a congruent look, a 'standpoint' has to be adopted, and from that standpoint the subject can be viewed through different 'lenses'. Verbeek on technology and Nicolini and Schmidt on practice all use the term 'mediation'. Practices are mediated by people, artefacts and (institutional) texts and are placed in a timeframe of past, present and future. From the above we concluded that Institutional Ethnography would be the most suitable approach to this study.

3.1. Point of entry

My point of entry is as close as possible to that practice under examination, nurses using BCMA. In the presentation of my results, I want to stay as close to concrete situations as possible, and that is why this chapter adopts a first person perspective, instead of a more objective third person perspective and passive voice. Figure 3. visualizes my research focus, as close as possible to nurses' practice.

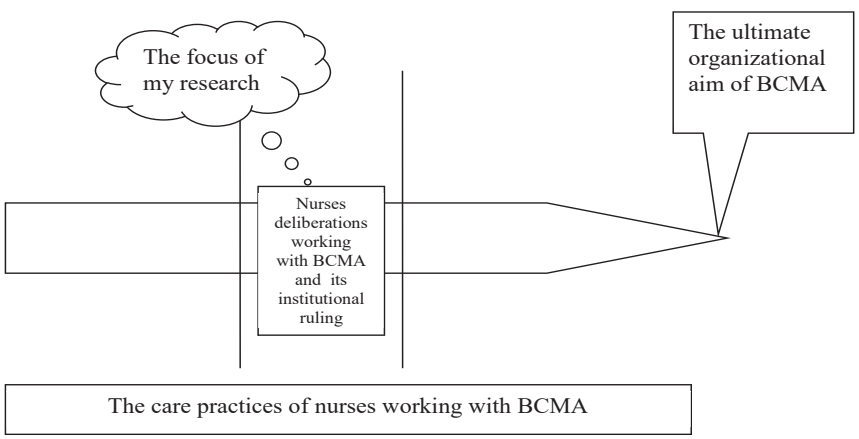


Figure 3. Visualization of the focus of my research

3.2. Institutional Ethnography

My research focus is a problem within practice and my aspiration is to apply the findings of the research to that practice. Institutional Ethnography (IE) offers the best point of entry, because it is specifically about people and their experiences with organizational policies.

IE has its roots in the feminist movement of the 1970s and 1980s and is founded on the ideas of Dorothy E. Smith (2005). She proposed a new way of looking at the accepted and dominant methods of knowing, aiming at the empowerment and emancipation of the research subject in feminist and policy research. The aim of IE is to add to theoretical knowledge, but also there is a very strong notion of empowerment and emancipation.

Within IE the researcher is considered knowledgeable, located in the actuality and trying to find meaning:

"IE is a theorised way of seeing and knowing that re-orientates people in their everyday world." (Campbell and Gregor, 2004, p. 12).

Campbell and Gregor claim that knowledge is contemporary and socially organized. Like organizations, people (in my case, nurses) structure their knowledge by translating it into discursive and textual forms for administrative purposes. This 'organisational literacy', a concept that Campbell en Gregor have taken from Darville (Campbell and Gregor, 2004, p. 12) creates the so called *institutional ruling relations*. 'Ruling' is also the concept that Smith uses to describe the socially-organized exercise of power that shapes people's actions (Campbell and Gregor, 2004, p. 32). From the perspective of IE, real power can be found in what has become written down. There are always texts, and they are a part of our lives and work. Texts are the sediment of organizational knowledge. IE therefore uses concepts of text-work-text or work-text-work sequences in orientation on ethnographic practice. From IE's perspective, power is situated in the textual coordination of institutional work i.e. in a non-Weberian sense.

"Hence the frames, concepts, and categories (and technologies) that structure the selection and assembly of the actual as institutionally actionable are central in subordinating individual subjectivities to institutionally generated realities." (Smith, 2005, p. 187).

Institutional settings, such as procedures, subordinate people's experience to the institutional; in that transformation, local actualities become institutionally actionable.

An example of this exercise of power is that when something goes wrong with technology, the nurse's first reaction is to blame herself: 'I have done something wrong', 'I am to blame', 'I am not smart enough'. I came across this phenomenon in my research time after time.

"If people handle and process the same texts, they find their actions coordinated by the requirements of working with the text. That is how a text has the power to coordinate and concert, to hold people to acting in particular ways. On the other hand, people who do meet face-to-face and think they are relating to each other as individuals may not recognise how, without their knowing it, their actions are also being shaped by texts." (Campbell and Gregor, 2004, p. 32).

Ethnography has to do with participative observation bringing the researcher very close to the actuality. According to IE, the best way to study the ethnography of institutions is to link people's particular behaviour to institutional texts, protocols, manuals, policies, and so on.

Analytically, there are two sites of interest, the local setting where life is lived and experienced by actual people and the extra- or trans-local setting that is outside the boundaries of one's everyday experience. For example, in the local setting nurses use the BCMA in order to scan the patient bracelet and its barcode, after which they scan the barcode on the medication sticker in order to connect the right medication to the right patient. Translocally this is connected to safety directives from policymakers on the basis of scientific evidence showing that every year patients die because of the administration of the wrong medication in hospitals. In my research the local setting is the orthopaedic ward. I go from there to the extra- or translocal settings with the aim of finding and connecting the institutional ruling relations within these settings.

IE does not study individual people. It does research on daily life and how this is organized and often reproduced and redefined in texts. IE is a suitable method for carrying out research on nurses' daily activities in the course of which they use practical and explicit knowledge in combination with technological knowledge, and respond to managerial attempts, articulated in text, protocol and institutionalized structure, and regulating their actions.

3.2.1. A closer look into Institutional Ethnography

In the ethnographic approach, I use an IE-informed methodology combined with practice theory as a research strategy for the following reasons: (1) IE provides us with a clear entry point to stay as close as possible to nursing practice so we can observe

institutional ruling. But a problem for my own research is that nurses' deliberations are not part of IE design and access to those is necessary to establish the connection between nurses' professional deliberation and institutional ruling. I agree with Smith when she stresses the power issues of texts, on the other hand it is my experience that professionals are also autonomous and professionally competent actors. (2) Given these limitations of IE, the Practice Theory is invaluable to my research because it offers an insight into the deliberations of a nurse while they are working within that ruling relation.

There is one problem here. To carve out space for the nurse's discourse, I also need a more practice based approach, that will help me to find out what is going on inside the heads of nurses working with BCMA (figure 7.). For this practice based approach I will rely on the work of Schatzki (2002), Schmidt (2012) and Nicolini (2011). For a more detailed description of my use of practice theory see chapter four, page 53.

3.2.2. Visualizing the difference

The following two diagrams visualize the difference between research where, according to Smith, people become objects (figure 4.) and IE were the research starts in people's everyday lives, the 'small heroes', as Smith calls them (figure 5.) (Smith, 2005). These will be followed by the model that has been designed for use in this study.

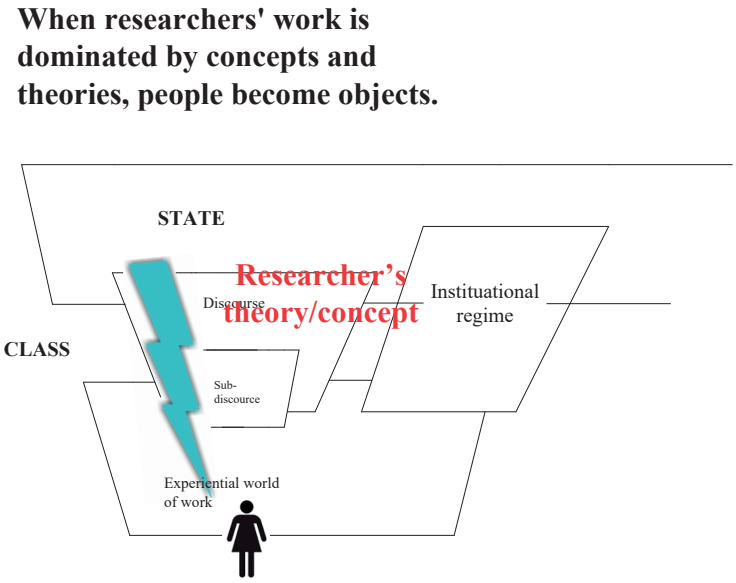


Figure 4. Research starting from theory and concepts

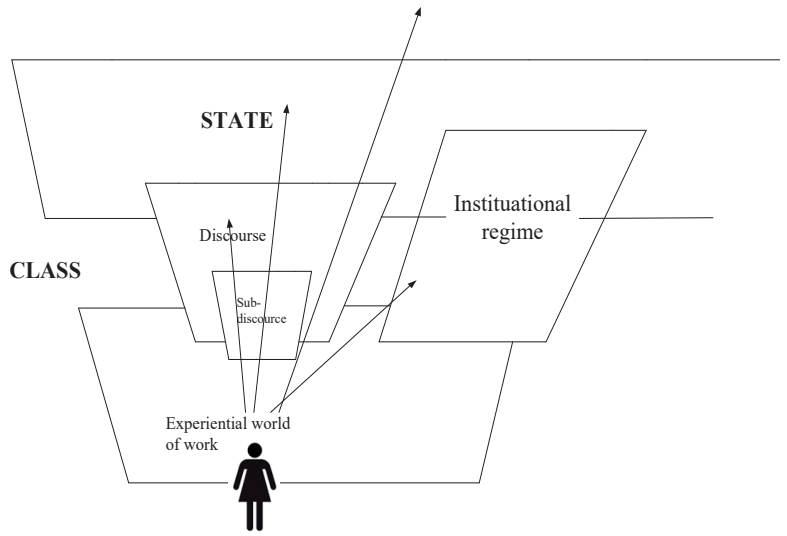


Figure 5. Research starting from the small hero

Having linked my research strategy to my theoretical framework, I will elaborate on my approach to the research field and how I collected and analysed the data

3.3. Research period

From September 2011 until May 2012 I collected the data. Analysis took place in the period from May 2012 to spring 2013. In June 2013, institutional texts like: policies, manuals, working instructions, reports of project-meetings, procedures, and protocols regarding BCMA, that had been amassed were reviewed and analyzed. The time left was devoted to writing the papers presented as part of this thesis.

3.4. Type of research

The study provided me with three data sources: data obtained anecdotally from nurses, data obtained through direct observation, and data obtained by studying written documents. I performed participative observations during shifts while nurses were distributing medication to patients. It is a practice-driven study which aims to contribute to nurses' knowledge and give them a voice to talk back to the organization.

"To capture participants 'in their own terms' one must learn *their* categories for rendering explicable and coherent the flux of raw reality." Patton paraphrasing Lofland (Patton, 2002, p. 21).

3.5. Research relations

I have carried out my research among the staff of the Orthopaedics Department of which I was the head nurse. I realized there was a heavy responsibility on my shoulders, because one can easily become biased in such situations. On the other hand, it is unlikely that an outsider could carry out this kind of research. I concluded that, with care, the advantages would outweigh the disadvantages. BCMA is not only a nurse problem. In practice it is also an organizational problem. Nurses are used to the idea that I sometimes work a shift together with them. In order to understand the problems nurses tell me about, I work their shifts with them to get first-hand experience and a better understanding of those problems. My research is not about explaining or solving a problem but about understanding the problem. It will enable me to transfer that understanding to nurses and to the organization, in the hope of informing future decisions about the implementation and use of technology in care. I have a clear entry point and standpoint from which I perform my research, the IE perspective is about giving nurses a voice and letting them talk about their experience with BCMA.

".. there is a real world with verifiable patterns that can be observed and predicted – that reality exists and truth is worth striving for. Reality can be elusive and truth can be difficult to determine, but describing reality and determining truth are the appropriate goals of scientific inquiry. Working from this perspective, researchers and evaluators seek methods that yield correspondence with the "real world," thus this is sometimes called a *correspondence* perspective." (Patton, 2002, p. 91).

Following Patton, I adopt a reality/actuality stance and I realize myself that completely value-free inquiry is impossible and I am well aware of the fact that values and preconceptions may affect my research data and analysis. It is my responsibility to explicate bias, mitigate influences through field procedure and give account for these influences in my report of my findings.

My research is not commercially sponsored. The University of Humanistic Studies in Utrecht and ETZ offered me the opportunity to carry out the research, and facilitated me by meeting the expenses related to my research (some of my time and materials). A substantial part of the research was carried out in my spare time. During the data

collection phase I worked double shifts and most of my reading, writing and analysis took place in the evenings, on Fridays (my day off), and at weekends.

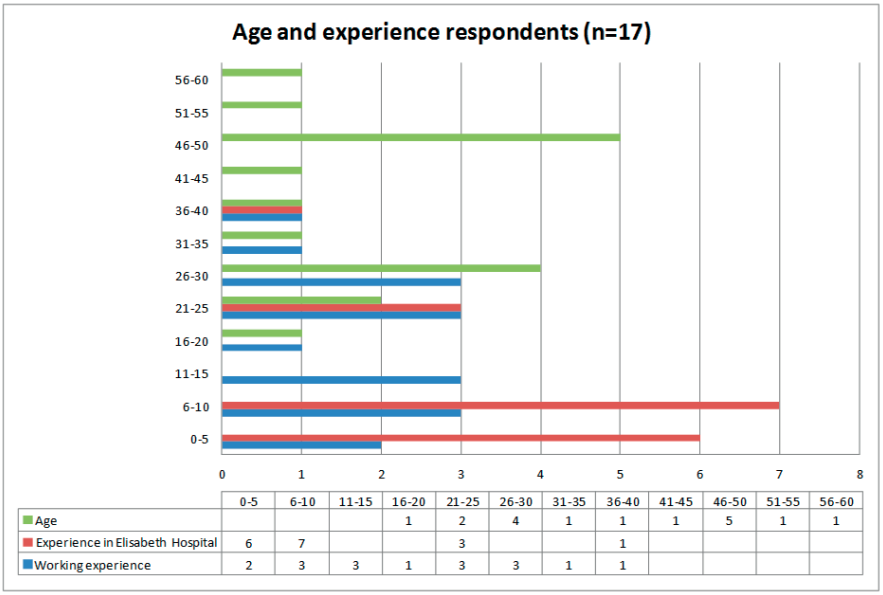
3.6. Research units

The orthopaedic ward is a ward with a capacity of 30 beds and a staffing budget of 21 full time nurses. Some of the nurses work part-time, so the team exists of 26 level-4 or -5 nurses and two level-3 caregivers. All of my respondents are nurses (figure 6.).

All respondents were female nurses, simply because, other than myself, there is just one male nurse working in the team.

Work schedule:

- Shift D1 7.30 - 16.00
- Shift D2 7.30 - 12.30
- Shift D3 9.30 - 18.00
- Shift A1 15.30 - 23.15
- Shift A2 18.30 - 23.15
- Shift N1 23.00 - 7.45



	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
Age				1	2	4	1	1	1	5	1	1
Experience in Elisabeth Hospital	6	7			3			1				
Working experience	2	3	3	1	3	3	1	1				

Figure 6. Age and experience of respondents

3.7. Planning data collection

I started in September 2011, and in the following months I carried out seven observations during seven different shifts. I selected dates randomly, picked a shift and approached nurses with a request to observe them during their shifts when they were working with BCMA. If I randomly selected the same nurse twice, I restarted the procedure of selection, with the aim of getting the greatest possible diversity. I selected three D1 shifts, two A1 shifts, and two N1 shifts to get the best possible overview of medication distribution throughout the 24 hours of the care process. With the exception of the night shift, all the shifts had two medication rounds and all types of medication intervention spread over the duration of the shift could be observed. During the night, shift nurses prepare medication for the next 24 hours by putting medication in trays (with a patient's name on it) in a medicine cart. This was a process I wanted to observe. I also collected all the documents concerning BCMA that were circulating within the organization.

3.8. Research techniques

I carried out seven participatory observations, five of which were fully tape recorded. Accordingly, during observations nurses were asked to think aloud and to reflect on their actions and use (and appropriation) of the technology. This is also referred to as "spect-acting", a method entailing both observation and reflexivity on the part of the informants, thereby opening up emancipatory possibilities in the field (Gill, 2011).

3.9. Model of analysis

I have tailored Smith's model to fit my research on technology. The data collected could be cut up into what I propose to call 'scenes'. The idea of a scene as a group or cluster of activities is put forward by Woo, Rennie, & Poyntz (2015). Instead of viewing a scene as a linear scenario in a film, they suggest that a 'scene' analyses how action is enabled, mediated, and constrained (Woo, Rennie, & Poyntz, 2015). By using scenes certain trails could be followed regarding BCMA and also rendered the data discussable and prepared it for further rounds of analysis. In adopting this terminology to examine my data, I am in fact approaching it as scene analysis. This division into scenes increased the readability of my data and provided me with trails I could follow. This rendered the data discussable and in that way I prepared it for further rounds of analysis. I numbered the parts of the scenes[6] and gave them a reference code. The result was 249 unique scenes connected to the codes of my model.

6 In ascending order for traceability reasons.

To provide a broad overview of the findings, I developed figure 7. (below) to show how each nurse is positioned within discursive practices that are variously activated in relation to the problems that arise in administering medications. The dashed line around the item BCMA/ Technology (T) identifies the BCMA as our focus and represents the 'traffic' between the ruling relations of 'the state'[7] and safety practices and the design of the BCMA system. Although there is a top-down hierarchical safety discourse in place, this is not my entry point. The schematic positioning of the nurse inside the authoritative system becomes relevant as soon as nurses activate their work within the conceptual, discursive, technological frame that does not line up with what *they* know about administering medication. This mismatch was seen over and over again during the observations.

The institutional discourse related to medication is dominated by the safety concept (SC) – a belief that administering medication is inherently risky and nurses' professional adherence to protocol is crucial in ensuring safe practice and preventing catastrophic events. These beliefs about safety are built into the BCMA technologies

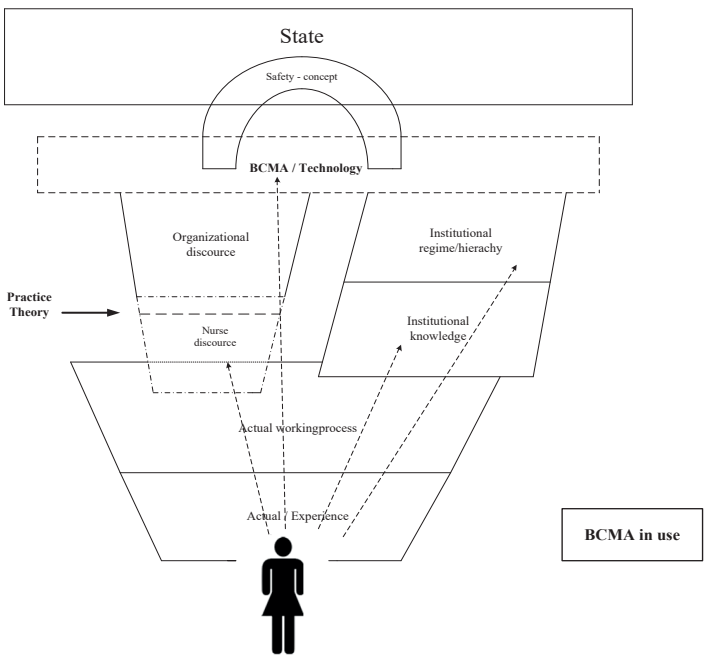


Figure 7. Model of nurse discourse

7 Smith's idea of 'the state is here defined as the pressure from society and culture towards a rigorous safety discourse, allowing no room for any risk taking.

design (T) which is buttressed by the organizational discourse (OD) which inserts specific rules and policies that are reciprocally embedded into the BCMA technology and are also supported by nurses' education and training. It is at the juncture of the organizational discourse that nurses were noted compromising the ruling guidelines by activating the "nurse discourse" (ND) and aligning this with "actual work processes" – such as the work processes described in the example later on in chapter 6 – that were implemented to ensure an adequate nursing response to the specific needs of the patient with Parkinson's disease. The 'nurse discourse' (ND) is based on immediate practical knowledge. We depict this with the dashed line because it is *always* what the nurse must *mediate* with the OD (the protocol-based knowledge) that directs a certain standard way of acting. The space between the two dashed lines (between the ND and the OD) alerts us to how the ND (what is known from 'being there in that particular situation') coordinates a workaround (or rule breaking). The blurred line between organizational and nursing discourse represents whether or not a nurse's activity *is seen* as rule breaking. Figure 7. represents the discursive practices that organize how nurses make decisions about what to do in their work with medication. It provides a bigger picture of the various different sources of knowledge that nurses must avail themselves of when trying to decide how to proceed.

3.10. Summary

This chapter connects my theoretical perspective to the choice of IE as my research methodology. I have explained my choice of respondents and research relationships. In line with the chosen methodology I have developed a research model that I used to analyze the data. In the next chapter I present the first of four articles.

Three heuristic lenses are used to understand the nursing practice of BCMA. With the heuristic lens of knowledge (as described in Chapter 2), I focus on the different types of knowledge that nurses employ when working with BCMA.

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4.

Is technology the best medicine?

Three practice theoretical perspectives on medication administration technologies in nursing.

Boonen, M., Vosman, F., Niemeijer, A. 2015 Nursing Inquiry 23(2):121-7.

Abstract

Even though it is often presumed that the use of technology such as medication administration technology is both safer and more effective, the importance of nurses' know-how is not to be underestimated. In this article, we accordingly try to argue that nurses' labor, including their different forms of knowledge, must play a crucial role in the development, implementation and use of medication administration technology. Using three different theoretical perspectives ('heuristic lenses') and integrating this with our own ethnographic research, we will explore how nursing practices change through the use of medication technology. Ultimately, we will argue that ignoring (institutional) complexity and the various types of important knowledge that nurses have, will seriously complicate the implementation of medication administration technology.

Keywords: Barcoded Medication Administration technology, nursing, knowledge, logic, theoretical lenses, technology.

"Theorizing practice thus requires a double movement of zooming in on and zooming out of the practices obtained by switching theoretical lenses and following, or trailing, the connections between practices." (Nicolini, 2009, p. 1393)

According to O'Malley bar-code medication administration is "…A unique identifier or bar code placed on each medication which is read by an optical scanner... In addition, the patient is provided a bar-code identifier attached to the wristband to ensure correct patient identification." (O'Malley, 2008, p. 269). In the extant empirical literature on bar-code medication administration (BCMA), the focus tends to be primarily on safety and/or on how use of these technologies by nurses might affect safety. Accordingly, the direct aim of Medication Administration technology (MAT; BCMA is a form of MAT) appears to be to eliminate errors and reduce any human influence. Although most articles on MAT do not explicitly state this, they do point toward an underlying safety discourse. In other words, if a nurse is provided with MAT, to which he or she will simply adhere, the procedure of drug administration is assumed to be less prone to any (human) error occurring (Phillips & Berner, 2004, Cescon & Etchells, 2008, Koppel, Wetterneck, Tells, & Karsh, 2008, Young, Slebodnik, & Sands, 2010, Holden, Rivera-Rodriquez, Faye, Scanlon, & Karsh, 2013).

This study, however, aims to demonstrate that this is too narrow a view. Rather, everything from the procurement stage of MAT to the complexities surrounding the technology's implementation should be considered. In a recent article on the implementation and use of MAT, Wulff et al. (2011) stated that there is a need for more theoretically driven research: "Researchers need to design intervention studies in light of explicit relevant theory and hypotheses to provide stronger evidence-based recommendations for management decisions to guide MAT use." (Wulff, Cummings, Marck, & Yurtseven, 2011, p. 2093). We want to pick up where these authors have left off in their article, by highlighting one extremely problematic assumption that surrounds the use of MAT, namely that the elimination of any human (inter)action (most often that of nurses) will automatically make drug distribution safer.

Medication Administration Technology meets an institutional goal in reducing medication errors. This fits well with visions of a 'modernized health service' as being 'fully networked, integrated, largely paperless and uses standardized decision protocols', because this is seen by policymakers as: "key to improving quality, efficiency and safety of healthcare." (Greenhalgh & Stones, 2010, p. 1286). In contrast, the reality of MAT is often associated with disorder, inefficiency, and the need for stressful workarounds (Greenhalgh & Stones, 2010), as it also creates new problems in nurses daily work' (Wulff, Cummings, Marck, & Yurtseven, 2011).

This article accordingly tries to argue that nurses' labor, including their different forms of knowledge, must play a crucial role in the development, implementation, and use of medication administration technology. Using three different theoretical perspectives, so called 'heuristic lenses', and integrating this with our own empirical research, we will explore how nursing practices change through the use of medication technology. Ultimately we will argue that ignoring (institutional) complexity and the various types of important knowledge that nurses have, will seriously complicate the implementation of BCMA.

4.1. Epistemology and methodology

As stated above, we view the issue of nursing practice of BCMA in the hospital as complex and multifaceted and therefore think it both necessary and helpful to use several heuristic lenses to broaden our understanding of nursing practice of BMCA. Accordingly, these lenses involve (i); an 'institutional practice lens,' (ii) a 'technology lens' and (iii) a 'practical knowledge lens', which draw upon institutional theory, practice theory, and philosophy of technology. Each distinct theory enables us to look at one specific aspect of our research object, and at same time, the combination of these lenses allows for a more holistic and broader view on nursing practice of BCMA. Also, all of the theories are practice oriented and have their roots in empirical research, making them specifically suitable for combining them with our own empirical research.

Our empirical findings are based on extensive qualitative and ethnographic research carried out in a Dutch hospital over a period of nine months (2011-2012) using the method of *Institutional Ethnography* (IE) (Smith, 2005), during which we shadowed seventeen nurses at a ward where BCMA (Theriak©) was being used, interviewed four nurses on their experiences with BCMA, and studied documents on the use of BCMA in the hospital.

In addition, we twice carried out a form of 'responsive evaluation' (Patton, 2002, p. 171) - first in a multidisciplinary group including nurses, pharmacists, information and communication technology staff, a vendor, a manager and a physician, and second in a group of fifteen nurses from different wards.

IE focuses on a 'problematic' (Smith, 2005), namely the everyday experiences of people working and living in an institutional environment. Crucial to IE, according to Smith, is the presence of the individual. She asserts that acting subjects, either physically or in their activities, are always connected with others. Accordingly, during observations nurses were asked to think out loud and to reflect on their actions and use (and appro-

priation) of the technology. This is also referred to as 'spect-acting', a method entailing both observation and reflexivity on the informants, thereby opening up emancipatory possibilities in the field (Gill, 2011). In a different article (Boonen, Niemeijer & Vosman, forthcoming) we will elaborate further on these empirical findings. Here they are primarily meant to deepen and fortify our heuristic approach.

4.2. Findings and perspectives

4.2.1. Institutional practice lens

According to Vosman and Baart (2008), organizations such as hospitals have partly accepted the fact that market logic can change the nature of a politically legitimated institution. The authors base their argument on Dubet's idea of the decay of the current institution: the modern day hospital's main focus is not merely on delivering healthcare anymore, in the sense of aiding people who suffer, helping them to overcome disease, lessening their pain and warding off death. All kinds of other institutional incentives, such as market-orientation, accountability, cost-reduction, and technologization play an increasing role in the hospital, and consequently have implications for the nurse-patient relationship. Care giving is thus framed by organizational interests and constraints (Vosman & Baart, 2008).

Accordingly, the first heuristic lens we will set up in order to better understand nurses' use of BCMA is an *institutional practice lens.* Our question is as follows: What does working with BCMA look like if we take the fact that drug administration is part of a larger institutional practice into consideration? By framing the question in this way, this particular heuristic lens should allow us to see how medication practices are driven by different kinds of logic and not just by a functional logic of technology, let alone by the overly simple idea that BCMA is an uncomplicated device for a complicated task. This 'hybrid logic'– something which is partly driven by the market, partly by the license to operate, and as enabled through public policy, and partly by innovation – entails that hospitals are becoming something other than simply institutions to which people who are ill go to find a cure, and/or relief from their illness (Vosman & Baart, 2008). Different 'logics' (Mol, 2008, Mol, Moser, Piras, Turrini, Pols, & Zanutto, 2011), or, more accurately, different segments of a logical trajectory, thus become intermingled like *Mikado pick-up sticks*: what used to be a politically motivated, single-logic institution, consequently becomes an organization using segments of different logics (Thornton, Ocasio, & Lounsbury, 2012).

What then constitutes a 'practice'? One of the most important theorists on practices, Theodore Schatzki, describes 'a practice' essentially as 'doings and sayings' (Schatzki, 2002). So what did the informants in our study 'do and say'? What we saw were nurses interacting with each other, we saw their deliberations with patients (e.g. about the proper moment to take a prescribed drug, other than was indicated in the protocol of the BCMA) and we saw nurses wheeling and dealing with BCMA, adjusting themselves to the procedure as well as working around the procedure (like giving a drug as a suppository, instead of orally when the patient was nauseous). Because an institutional ethnographic approach asserts that acting subjects are always connected with others (Smith, 2005), we noted that nurses working with BCMA were also perpetually connected with others - not only with the patient, but also with their colleagues on the shift before them (as they had issued the pills) and with those on the shift afterwards, as these colleagues would observe the effects of the administered drug.

Although nurses are controlled by institutional regulations, whenever there appears not to be a 'fit', they have to bend the rules in order to provide good care. Nurses are not able to communicate this with the organization. Moreover, we found that, as a reaction to these 'workarounds' in nursing care, the hospital had installed a so-called 'flying brigade' consisting of managers. The flying brigade would descend to the work floor to point out to the nurses that they had to follow the technology instead of working around it, even if the nurses had a plausible explanation for it.

We might be able to further unfold this particular example by drawing upon practice theorist Robert Schmidt. According to Schmidt, social practices can be defined as 'a continuous iterative production of social reality that alters on a similar and regular base, influenced by speech, as well as by material, physical, and symbolic events.' (Schmidt, 2012). Practices are thus about situations and their people, not about people and their situation. Schmidt uses the analogy of a soccer match where the practice is already in place with clearly defined positions, and people join in, players entering as co-players, not as lone goal-getters (Schmidt, 2012).

In a 365/24/7 enterprise, such as a hospital, nurses take over from others in shifts. They work in an environment in which there is a constant transfer of information and they belong to a network that is designed to produce certain desired results. Nurse B works with information provided by nurse A and which is ordered by nurse Z, etc. However, this is not a mechanical process, as nurses constantly have to react to new situations. For example, although nurses aim to follow the protocol of the BCMA, as soon as a patient complains of nausea after surgery, a nurse becomes unable to follow the instruction to administer the medication orally. In order to change from an oral

medication to a suppository in the BCMA, the nurse has to perform many different actions: clicking; scrolling; filling in drop down menus and contacting the physician. This not only interferes with the care-giving process, but also generates time pressure. The care-giving process has to follow the technology, even though the nurse is trained to view the care-giving process as leading. As a consequence, nurses in our study sometimes decided to scan an oral pill, whilst giving a suppository.

Although technology, and BCMA in particular, presupposes that nursing practice can simply be divided up into small little pieces, seen from the *telos* (i.e. the aim of nursing), drug administration cannot simply be isolated from the rest of the work a nurse carries out. The administration of medication has nevertheless become a part of a system. The implementation of BCMA appears to follow the logic of scientific management that was introduced in care-giving. This management is linked with one single logic: systemic rationality. As sociologist Andrew Sayer has noted, systemic rationality changes the basis of our institutions: " Many of us are all too familiar with the rise of audits and the imposition of standardized procedures on activities which seem to defy standardization. Supposedly, these provide rational systems for organizing and assessing the performance of individuals and institutions." (Sayer, 2011, p. 59). However, relying on the rationality and logic of BCMA would leave little room for another logic, namely the logic of the caring process, characterized by its relationships, dialogues, intuitions, emotions and those experiences collected within the local field. Thus, approaching problems with BCMA, such as the example above, from a single perspective or single causality angle does not take the complexity of practices fully into account. We suggest, therefore, resisting the urge to disassemble the problem into little pieces and simplify it, because otherwise we will lose sight of the 'whole': nursing as a *practice.*

4.2.2. Technology lens

Next to viewing (nursing) practices as complex and multi-causal, the actual *operation* of BCMA might also provide clues when developing a heuristic view of BCMA, against the background of our observations and interviews at the ward. We will therefore use the technology philosophy as advanced by philosopher Peter Paul Verbeek (2005) to set up our second lens: a *technology lens* (Verbeek, 2005). This particular lens will show how the technology at work in BCMA influences nurses' labor.

Verbeek states that a tool is a tool because it makes *praxis* possible. However, at the same time a tool is present (or non-present) in a remarkable way, because it disappears into the background of reality (Verbeek, 2005). For instance, in our study the nurses who use BCMA at some point become less aware of the technology. But as soon as the BCMA gives a warning in the form of a medicine allergy notification, they become

aware again. At the same time, a perpetual (faulty) warning such as 'administer on the day of surgery as premedication' that would come up during every medicine round even when the surgery date had long passed was eventually just not noticed by the nurses. As one nurse stated: 'Because you are asking me about this, I've become aware again of how these ridiculous things happen and how we follow or just simply accept them without question'.

As Verbeek (2005) points out, people generally do not focus on their tools when using them, but are focused on the work they carry out using them. Whilst tools can be said to fade into the background, they also shape the relation between person and tool; technology and human action are not only intertwined with one another, but are also *an act of shaping one another*. Thus it is too simple to think of devices as a tool in the hands of a rational agent; rather, tools condition the relationship between actor-tool-act and they are unavoidable material partakers in action. BCMA is not just a tool, it is a co-factor.

Taking this analysis one step further, Verbeek points to the philosopher Karl Jaspers, who states that technology needs more than use; it needs guidance. Instead of approaching technology as if it, in itself, is not their responsibility, Verbeek states that practitioners have to use practical reasoning (*Vernunft*) in order to *guide* the technologies they use. Practical reasoning does not entail concrete operating procedures on how to guide technology, but instead helps regain awareness and responsibility for technology (Verbeek, 2005).

The nurses in our study were instructed to follow the computer, distribute medication, and to trust the technology, because doing so would improve safety. Yet at the same time, the nurses were expected to keep a sharp eye open for any flaws in the system. This last expectation is a direct appeal to their specific knowledge regarding the care process.

'Guidance' thus entails something different altogether: it is not based on the notion of a rational agent riding on the horseback of technology, but rather on the *savoir faire* emerging from practice. The nurses in our study are the ones who are able to give guidance, based on their own practical knowledge and orientation on the goals of caring. This form of guidance has, until now, hardly been recognized by designers and vendors. Instead, the role of nurse giving guidance or feedback is only thought of as 'useful' in the implementation phase, and often only when things did not work out 'as planned'. Vendors re-frame this as *user-stories*, as nurses are only asked for their

opinion when there are flaws in the system that need technical repair. Nurses are thus not perceived as guiding the system.

4.2.3. Practical knowledge lens

With our last lens, which we will introduce as a *practical knowledge lens*, we focus on the different forms of knowledge related to medication administration that are discernible on the ward. According to the practice theorist Davide Nicolini, the amalgamated knowledge of the practitioner is connected to the 'site'. In other words, the practice is carried out on a site that is the unique place where practitioners deal with the variety of knowledge types needed to sustain that practice. (Nicolini, 2011). Nicolini draws attention to the different sorts of knowing that are vital for co-operation and carrying out care: "…in order to scrutinize knowing in practice, we need to attend to the process which allows different and dispersed ways of knowing in practice to work together." (Nicolini, 2011, p. 603). Nicolini advocates a change of focus in analysis from 'people who act' to 'practices and their connections'. Practices and knowing cannot be separated. Any knowing on the part of nurses working with a BCMA would, in this view, transpire from the practice and could only be seen in that practice.

Practices, knowledge and institutions are strongly related. In a nursing practice, a nurse is a knower within an institutional context. Nicolini shows that knowledge (such as that of nurses working with BCMA) is institutional: "… knowledge-in-action situated in the historical, social, and cultural context from which it arises." (Nicolini, 2011, p. 602). This includes knowledge drawn from natural science (e.g. on blood markers etc.), as well as knowledge drawn from a variety of social sciences, such as psychological knowledge ('this patient is suffering from depression'). But there are other sorts of knowledge at play as well. Nurses carve out their discretionary space when different systems, such as surgery planning, BCMA or shift programming overlap, interjecting this space with their practical knowledge. This type of knowledge can be referred to as 'first person knowledge' (Sayer, 2011); it is knowledge about the field, gained from eye level, instead of from an aerial view.

Technical developments within health care, driven by economic values and waves of innovation, go to the core of caring, creating tension between the concerns of both patients and nurses, and organizational values. This ultimately results in a collision between evidence-based knowledge and practical or experience-based knowledge, at the point where they intersect in daily activity. Health-care today appears to be dominated by instrumental rationality, including a preference for quantifiable data as opposed to practical experience and knowledge. Quantifiable data can be compared in a numerical way, whereas findings and reports are considered merely as 'anecdotal'; the

observations of employees caring for their patients are seen as merely 'subjective', and thus of lesser value. However, our findings show that the different sorts of knowledge which nurses possess are vital if care is to be conceived of as a goal-oriented practice.

To illustrate this, consider the following example from our study. A nurse receives a message from the BCMA that the time by which the drug should have been administered has been exceeded by one hour. The nurse knows that, according to surgery protocol, the patient should not eat or drink anything before surgery and that the message has been received because the doctor has prescribed the medication too early. To avoid misunderstandings, the nurse cancels the medication and is obliged to give a reason. The drop down menu, however, does not provide an appropriate option (fasting before surgery) and the nurse therefore chooses option 'other'. Although BCMA provides indicators, the nurse has to use her own type of knowledge. The nurse subsequently combines her knowledge of the surgery protocol with her understanding of the limited amount of time doctors have to prescribe medication (which means that they have to prescribe it the night before, in this case not knowing exactly when the medication should be given). The nurse also has historic or experiential knowledge because she knows that if the medication is not cancelled in the system there will be confusion during the next shift. Nurses know the limitations of a dropdown menu and the options presented, and give reasons for their actions, verbally or in writing, to the colleagues who take over. If the nurse did not have the surgery protocol knowledge that a patient must fast before surgery, she would not have gained it on the basis of the technology. It is this kind of knowledge which will disappear if there is a complete reliance on technology, effectively causing more unsafe situations instead of fewer, not because it affects a distinct group of actors (e.g. nurses or patients), but because it alters the substance of caring as a practice. Nurses are the ones who counter this tendency, since they stay attentive to particular patients and circumstances and deliberate with each other. It is their knowledge which keeps care practices on the right track.

4.3. Discussion

The underlying assumption in using BCMA is that human intervention should be minimized as much as possible in order to maximize safety. However, this has proven too narrow a view. Instead of focusing on medication distribution as an isolated act, thereby altering both the position of nurses and the relation with their patients, we have attempted to show that medication distribution is actually kept on track when the goals of nursing practice are respected. Using three different heuristic lenses in this article, we have tried to capture the complexity that is part of nursing practice, including the various kinds of knowledge that nurses draw on when working with

BCMA. Of course, perceived complexity can create further complexity and provoke an institutional reaction in order to reduce that complexity, such as the 'flying brigades' as described above. It is therefore our belief that any further research on MAT should take account of the hybrid logic of modern institutions, which not only changes the position of the practitioner into an worker who produces effects within a system, but also fundamentally transforms the character of nursing practice. In line with Schmidt, we suggest that the development, implementation and use of BCMA is constantly changing under the influence of institutional ruling. Using this insight allows for an analysis *from within* medication practices (Schmidt, 2012).

As systems such as BCMA become more prevalent, nurses are pushed to objectify their knowledge in order to meet systemic and institutionalized expectations. Considerations that would otherwise be made during caring activities have to be encrypted in rational jargon. When it comes to the implementation and use of new technologies, there is a tendency observable in care to think in terms of dichotomies, such as 'those who are in favor and those who are against', or 'these forms of knowledge are objective and these are subjective'. However we endorse a strategy which is quite the opposite, by identifying the connectedness of scientific and practical knowledge to get a clear sight on their reciprocal influences. In the care triangle of patient, nurse, and technology, only integrated forms of knowledge capture the 'whole' of the caring process. The nurses in our study acted upon this mixture of knowledge and did not obey one, logic.

4.4. Limitations

We realize our approach might have limitations. One such limitation could be the narrow focus on BCMA, instead of including additional healthcare technologies (such as ventilators, dialysis machines or monitoring devices such as insulin pumps), and thereby potentially overlooking other important issues. However, we believe that in order to capture multi-faceted and complex practices, the focus had to be narrowed down to a very specific form of technology. What is more, we specifically chose the example of MAT because of the underlying safety discourse which surrounds its application (i.e. MAT is supposedly inherently safer, because it reduces human error). Our findings might possibly be common in different settings, including different technologies, but this warrants further study.

4.5. Conclusion

Bar code medication administration technology should not be considered as a mere tool but as something which intervenes with and co-shapes the caring process. How-

ever, in meeting set organizational goals, nurses have to follow the partial logic of the technology they use, since the practical knowledge of nurses is not acknowledged as potential guidance for BCMA.We have framed this as an epistemological struggle.

In order for BCMA to work optimally, we therefore recommend that the technology's designers, the hospital management, and the nurses set up a joint knowledge strategy. All stakeholders should be made aware of the fact that it is *precisely for the purpose of safety* that the optimal use of BCMA relies on various types of knowledge. Rather than maintaining a partial logic, practitioners have very valuable knowledge which should therefore be used accordingly.

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Interlude

In this article I have looked at BCMA from three angles: the institutional control that emanates from BCMA towards the care process, the logic of technology that does not fit the logic of care since it cannot be divided into pieces of care and, finally, nurses getting caught up in an organizational paradox where they are ordered to follow the technology but need to use their own knowledge to adjust the distribution of medication to prevent adverse events.

Scene 60

A patient with erysipelas after an ACL reconstruction is prescribed antibiotics. The nurse on her medication round realizes that, due to this, the patient has to stay in bed for most of the day. The nurse wonders if this patient should be getting anticoagulants. The nurse combines different sorts of knowledge (experiential, historical, and her own interpretation of the actual situation of this patient). In no way does BCMA support her in this. Following BCMA in this case would endanger the patient. Doctors rely on the nurse having this kind of knowledge and trust that nurses will contact them when they discover an omission in the treatment of a patient.

The nurse scrolls through the patient file in order to find out why this patient was not prescribed anticoagulants. The nurse then consults organized text resources and tries to link them together to add something new to what she already knows. It occurs to the nurse that there might be a medical contra-indication for anticoagulants and when the search yields no further information, she decides to call the doctor. The doctor thanks the nurse for her alertness but is on his way home and cannot log in to the computer to enter the order in the BCMA in the correct way. The doctor gives an order over the phone, the way it was done before the implementation of BCMA and not formally in accordance with the new procedures. The nurse provides the patient with the anticoagulants and follows an alternative route to enter the order into the BCMA. This alternative route is an institutionally accepted and developed workaround to tackle this kind of event. Nurses are not allowed to use workarounds and yet, to keep things manageable, the organization has created institutionalized workarounds. In their daily routine, nurses keep the technology in line with the caring process.

In the next chapter we elaborate on this ‘tinkering’ by nurses in order to solve problems and increase the safety of BCMA.

5.

Tinker, tailor, deliberate

An ethnographic inquiry into the institutionalized practice of bar-coded medication administration technology by nurses.

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Abstract

The aim here is to explore the practice of nurses working with bar-coded medication administration technology in order to gain insight in the impact it has on their work.

The widespread assumption underpinning the use of Barcoded Medication Administration Technology (BCMA) is that it will effectively reduce the number of errors in the dispensing of medication to patients. However, it remains unclear whether this is the case in actual practice. For the purposes of this research, two distinct but overlapping research methodologies – of Institutional Ethnography and Praxeology – were combined as a means to uncover the highly complex practice of BCMA by nurses.

Results showed that the implementation of BCMA creates a series of problems that lead to nurses constantly 'tinkering' with the technology. At the same time, they are always deliberating the best ways of tailoring the BCMA to each of their patients.

Although working with BCMA is often misconstrued as a mindless and automatic, conformity to technology, this tinkering with BCMA always involves nurses in thorough deliberation.

Keywords: Tinkering Barcoded Medication Administration (BCMA), Nursing, Hospital.

5.1. Introduction

'There is a need to continue the examination of the relations between nursing and technology, not because technology is harmful – in fact it is often wonderful – but rather because total faith in technology to the exclusion of everything else is an idolatrous, dangerous, and misplaced faith.' (Locsin, 2005, p. 13).

This article aims to explore the practice of bar-coded medication administration technologies (BCMA) by nurses, in order to gain insight into how they might impact nursing work. BCMA is a point-of-care system which requires patient identification and electronic verification and is increasingly used in hospitals to distribute medication (Cescon & Etchells, 2008). One of the reasons it has become so popular is due to the idea that BCMA has the potential to effectively reduce medication errors without claiming (more) time from nurses (Hassink, Jansen, & Helmons, 2012).

5.2. Background

Whether BCMA actually always leads to more safety and less errors is uncertain. So far, the extant literature on the use of BCMA can be divided into three categories: i) research which shows that medication administration technologies lead to a reduction of errors (Agrawal, 2009); ii) articles which simply state that these technologies have *the potential* to reduce errors (Young, Slebodnik, & Sands, 2010); iii) articles which state that although the use of medication technologies might have a positive effect on medication errors, they can also introduce new (technical and human) problems and errors (Koppel, Wetterneck, Telles, & Karsh, 2008, Sakowski, Newman, & Dozier 2008, Miller, Fortier, & Garrison, 2011).

At the same time, the (often top down) implementation of BCMA faces nurses with a difficult task: how to integrate a highly linear system – BCMA presupposes only *one* given route for medication administration – successfully, in what are the often complex, 'messy' care practices in which nurses have to work every day. As Holden, Rivera-Rodriguez, Faye, Scanlon, & Karsh point out: "Given that problem solving is a vital aspect of nursing work, it bears investigating what happens to nurses' problem-solving behavior following an organizational change. One of the most common and perhaps most impactful changes facing nurses today is new technology." (Holden, Rivera-Rodriguez, Faye, Scanlon, & Karsh, 2013, p. 284).

This paper tries to break new ground with regard to an idea we found in literature, of new problems arising due to the use of BCMA.We wonder if the new problems that arise are highly contextual and connected with the nurse's care practice as a whole. By look-

ing meticulously at the daily complex practices of nurses, new insights may emerge. Institutional ethnographic and the praxeological approach, offers us the opportunity to closely follow nurses who worked with BCMA during their medicine rounds. Perhaps it will provide us with an insight into 'how', nurses *tinker* with the medication system in order to *tailor* the medication to each individual patient.

Mol defines work as: "tinkering, involving complex ambivalence and shifting tensions." (Mol, Moser, Ingunn, & Pols, 2010, p. 84).

We hope to contribute to a further deepening of Mols' et al.'s concept of tinkering , we advocate greater precision about this tinkering, i.e. that it includes a particular kind of *reasoning*. As Eisenhauer, Hurley, & Dolan have shown, the thinking process of nurses during the administration of medication extends beyond rules and procedures, as nurses (also) use patient data and interdisciplinary professional knowledge when providing safe and effective care (Eisenhauer, Hurley, & Dolan, 2007). Nurses' tinkering with BCMA still underpins the safety of medication, tailoring it to the patient as well as maintaining the flow of the caring process. Are there arguments that another type of reasoning in the form of deliberation also has to be actively used – 'deliberative tinkering' as we call it, which draws on all different kinds of knowledge – in order to achieve the successful administration of medication through the use of BCMA?

5.3. Methods

We carried out extensive qualitative empirical research between 2011 and 2012 and our aim was to explore practices of BCMA by nurses in a Dutch orthopaedic hospital ward.

Institutional Ethnography (IE) has its roots in the feminist movement of the 1970s and 1980s and is founded on the ideas of Dorothy E. Smith. According to Smith the subject, in this case the nurse, is a 'knower', and research must start from that 'standpoint' (Smith, 2005). Our broad endeavor of using IE is to discover how the knowledge of the nurses is socially organized. Often certain forms of (explicit) knowledge are pushed into the foreground (such as knowledge of operating rules) while other (implicit or tacit) knowledge (institutional knowledge, experiential knowledge, knowing in practice) appears to be less visible (Smith 2005, Greenhalgh & Stones 2010, Sayer 2011, Nicolini 2011, Boonen, Niemeijer, & Vosman, 2015).

As well as IE, we have also made use of insights from praxeology. Praxeology is an approach which regards all acting – in our research the acting of nurses – as part of their

practice. The practice is the comprehensive framework wherein people and groups but also technology (artefacts) and (division of) spaces 'act' (Schmidt, 2012).

In our analysis we use three distinctions, described by Schmidt as lenses, to look at our data. There is the lens of 'time' (which Schmidt calls "*temporality*"): in this case it entails nurses being educated and trained to be prepared for (future) situations they might encounter. They use this prior-gained knowledge in the present. However the present might also demand modification of this knowledge. The second lens is that of the `skilled body´ of nurses ("*physicality*"): it is so named because over time there is archived an implicit knowledge of how to do things, such as how to move without hurting the patient when inserting an IV.

The final lens is that of the material ("*materiality*"): for instance, the objects nurses have to work with, or the lay-out of the building and the ward, affect the way they work (e.g. having to navigate a heavy medication trolley through narrow automatic doors).

5.3.1. Sample and setting

Research was done on an orthopaedic ward in a general hospital, with a capacity of 30 beds. There are 33 care-giving staff – five nurses with a four year baccalaureate degree; 26 nurses with three years of applied education; and two caregivers with approximately one year of training who are not qualified to distribute medication. Seventeen nurses, in seven observations, who work with medications volunteered for the study. We therefore chose the design of 'extended case study', whereby data were collected by the first author through participant observation and the study of BCMA related documents, over a period of nine months (2011-2012) Our aim was to be as close as possible to the practice we were studying, i.e. nurses in the hospital using BCMA.

5.3.2. Procedures

During seven shifts (three day shifts, two evening shifts, and two night shifts) the researcher followed seventeen nurses on the ward, paying particular attention to their use of BCMA. Most observations were audio recorded and transcribed verbatim. Four nurses were interviewed. The interviews focused on their experiences of working with BCMA and were audio recorded. Hospital documents relating to BCMA were also studied. During the observations nurses were asked to think out loud and to reflect on their actions, mediating the BCMA into their work. This is called 'spect-acting', a method entailing both observation and reflexivity on the part of the informants, adopted with the aim of opening up emancipatory possibilities in the field (Gill, 2011).

Although the outcomes of generalized research often increase insight, with regard to nurse experiences they are not always directly applicable and most of the time these outcomes do not seem to ring true to nurses (Campbell & Gregor, 2004, Sayer, 2011). As Patton (2002) points out, you have to capture participants 'in their owns terms' and learn *their* categories for rendering explicable and coherent the flux of raw reality." (Patton 2002, p. 21).

5.3.3. Data Analysis

Fig. 1 shows the framework and process of our analytical steps. First, we start off by describing scenes. Then we try to pinpoint where 'chafing' occurs in these scenes. Chafing is a key analytical concept here: it entails taking into account which problems occur when nurses work with BCMA, but also what surprises nurses, and what runs counter to expectations (Smith 2005).

We subsequently describe how the institutional ruling manifests itself in the scenes whilst also taking the three distinctions of Schmidt (time, skilled body, and the distinction of materiality). This has ultimately resulted in several emerging themes, which are presented in the results section below.

5.3.4. Rigour

The study included two intervals for responsive evaluation (Patton 2002), where first author Boonen spoke to different people to gather their responses to the analysis being developed from the data. Both evaluations were planned for the end of the day, and prior to that meeting the group was informed about the subject, not about what the researcher expected of them. The meetings started with a presentation of the research, method, data analysis, findings, and conclusion. During these evaluations we were checking whether our data analysis and findings were questioned and/or

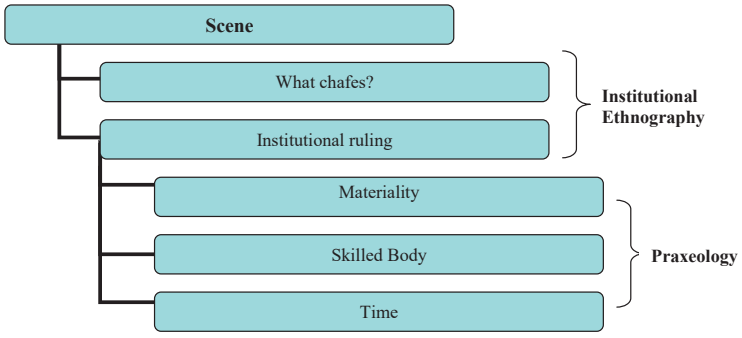

Figure 1. Framework of analysis

confirmed. The first responsive evaluation was conducted within a multi-disciplinary group that included nurses involved in the research, pharmacists, information and communication technology (ICT) staff, a vendor, a manager, and a physician. The multi-disciplinary evaluation broadly confirmed our findings. The second responsive evaluation was conducted in a group of fifteen nurses from different wards, all working with BCMA. In this evaluation results were presented to nurses who took part in the research and nurses who were not familiar with the research. During this evaluation nurses broadly confirmed our data and findings.

5.4. Results

The following paragraphs present the emerging themes that occurred from the framework (figure 1.) used in our analysis. These are supported by quotes from our observed scene. Each featured scene will be viewed from two perspectives: 'the chafing' and the 'institutional ruling'.

5.4.1. 'Technology directs'

This paragraph aims to show how medication technology can 'direct' nurses and patients actions.

Scene 25

Nurse D. grabs the scan pistol;

Nurse D. says that patients are already so used to the scanning of their bracelets that when she enters the room patients immediately hold their arms up in the direction of the nurse, even if the nurse only wants to introduce herself before doing anything else.

Nurse D. hasn't even finished recounting this when the exact phenomenon occurs in practice. Before Nurse D. has the chance to introduce herself, all the patients are already holding up their arms.

Scene 32

During the same medication round Nurse D. is about to walk into a different room whilst holding the scan pistol. One of the patients in the room says : *"I can see the scanner!"* and as Nurse D. walks in he is already holding up his arm.

Scene 78

Nurse K. walks into a room with three male patients.

Nurse K.: *"Good morning gentlemen…".*

Nurse K. walks back to her cart: *" Isn't that great that this gentleman immediately…"* (the patient in the bed nearest to us has been automatically holding out his arm to be scanned in response to the morning greeting by Nurse K.). Nurse K. then indicates that this happens all the time.

5.4.1.1. What is chafing here?

What chafes in these scenes is that once a nurse walks into the room with the scanning device, the patient immediately responds by offering his/her wristband with barcode, as if in a reflex. The procedure as induced by the system not only meets a security target, it also kneads or alters initial personal contact and patient's behavior.

5.4.1.2. Institutional ruling

BCMA appears to direct the action of both nurses' and patients' from an institutional point of view. First of all nurses are obliged to use the scanning device to gain access to BCMA and medication. Secondly, the first contact between the nurse and the patient has been reinterpreted: rather than introducing and acquainting themselves, this moment has been replaced by the immediate offering of the wristband to the nurse.

BCMA thus appears to have an implicit manual which is (also) known by patients. In the hierarchy of what has to be done this implicit manual overrules any getting to know one and other. What is more, it leaves out any personal explanation about the ins and outs of medication use. This person-centred care, which normally accompanies medication distribution, is replaced by technology which thus appears to institutionally govern both knowing and acting. Smith has also called this phenomenon 'institutional literacy' (Smith, 2005), which might also be related to the perspective of *materiality*, as the physical manifestation of this institutional literacy becomes visible through the corporeal script of the nurse walking into the room with the scanning device – a so called 'artefact in action' – and the new association (and implication) from a patient perspective.

Similarly, the time perspective conceives of BCMA as replacing a (historical) ritual such as getting to know one another with a completely new ritual, thereby altering the nature of patient care. However, not every nurse follows this newly installed institutional

routine, as there are nurses who combine old habits with new ones. This is exemplified by those nurses who first enter the room without the device and introduce themselves to the patient and only afterwards go and fetch the scanning device, or by certain nurses who, with the device in their hand, announce (sometimes very loudly) that they first want to introduce themselves before scanning the wristband.

5.4.2. Consecutive action(s) through resonation

In this paragraph we will describe several consecutive scenes, in order to argue how using BCMA should not be viewed as an isolated practice but rather as something which is always part of a much broader caring practice. Nurse working with BCMA start their rounds anticipating acute signals, postponing acting on these signals, asking for consultation or consideration, and subsequently following through either immediately or later on, which appears to be a continuous cycle.

Scene 84 t/m 87.

Scene 84

Nurse A. tells nurse B., who is on her medication round, that Ms. J. dropped a pink tablet. Nurse B. replies: *"I will look into that"*, and carries on with her work, scanning the wristband of Ms. R. whilst putting her medication in a medicine cup and handing it over to Ms. R.. Ms. R. then tells Nurse B. that she already took a pill. Nurse B.: *"You've already taken something this morning…which is?"* Ms. R.: *"Yes (ha, ha) if I only knew, but it was certainly different than what I normally take at home."*

Nurse B.: *"Did you take your own medication"? (referring to the home medication Miss. R. brought with her]*. Ms. R.: *"No."* Nurse B.:*" did you get it from a nurse here"?* Ms. R.: *" Yes two little ones."*

Nurse B. and Ms. R. go over her medication list together. Ms. R. point out: *"this is…?"* Nurse B. replies: *"that is Tildiem… the other one is Indocid. That is medication you have to take for the duration of five days."* Ms. R.: *"Okay, then it's alright."* Nurse B.: *"Okay."*

Scene 85

Nurse B. asks Mr. K.: *"Did you receive your Paracetamol..? I have Paracetamol in my cart if you want."* Mr. K.: *"Yes?"* Nurse B.: *"A whole box full."*

'Bleep' (sound of scanning device). Nurse B. explains: *"Paracetamol for this patient is not registered into the system as an order, but Mr. K. wants a Paracetamol."* Boonen Researcher (R): *"You are allowed to give this medication even though it is not registered as an order in the system?"* Nurse B replies that they are allowed to give it, but that the doctor has to enter the prescribed medication into the system and attach to the order the sublabel 'if necessary'. This means that, rather than getting continuous medication, Mister K. can, on the basis of whether he is in pain, ask nurses to give him a Paracetamol.

Because the order has not been entered into the system Nurse B. has to use a workaround offered by the system: by clicking on Paracetamol and scrolling down, a dropdown menu opens up whereby the nurse is asked to click on a name of a doctor.

As she does this, she jokes: *"He (the doctor) is to blame of course, he should be around here somewhere."* Even though the protocol requires that the doctor is immediately informed and subsequently authorizes the order, she knows the doctor is not around, but assumes the doctor will see the message sooner or later, a nurse is not willing to accept any delay in care.

However, in the dropdown menu Nurse B. also has to address the reason for giving Mr. K. this particular medication (choosing from a preset list of options) before she can connect it to a doctor's name. While she is doing this Nurse B. states that she does not know which option is the most suitable: *" I find that the options are vaguely defined."*

Scene 86

Nurse B. suddenly returns to the issue of the missing pink pill mentioned in scene 84, *"It's ever so nice, isn't it"* Nurse B. says sarcastically, referring to the rather vague description of 'a pink pill', from where she has to start her search.

Nurse B. then looks at the medication list of Ms. J. in the BCMA: *"According to this she has received both Paracetamol and Diclofenac, so we can conclude that the missing pill is Diclofenac."*

Scene 87

In the background a patient appears to be agitated and is shouting. Nurse B. suddenly becomes aware that the patient Mr. D. is actually calling for his hat. Nurse B. chuckles and repeats what Mr. D. is saying, whilst putting medication in a cup and handing it

over to another patient. Nurse B. then walks up to the next patient and asks the patient to hold up her wristband so she can scan it. But then Nurse B. suddenly exclaims: *" Oh no, I can't scan this barcode!"* She refers to a problem that occurred earlier during her round. Apparently there is something wrong with the barcodes of recently printed wristbands. However, this is a patient who is waiting to be called in for surgery anytime soon, so Nurse B. says to the patient: *"I'll go now and check on your papers, so we can see exactly what you need….."* Outside the ward, Nurse B. explains to (R):*"Yes, I have to go and check which medication is prescribed pre-operatively and whether she is allowed to take any medication before surgery."* Nurse B. then checks the anesthesia form to see what the anesthetist ordered: "*Okay she is allowed to take her Tramadol, so I will give her that when I prepare her for the OR."* Nurse B. then walks back into the room and tells her patient.

5.4.2.1. What is chafing here?

Several aspects in the above scenes appear to chafe. For instance, because the medication Ms. R. receives from the hospital differs in name, color or form to the medicine she normally receives at home, the patient does not recognize it as her medicine anymore – there appears to be no routine the patient can fall back upon.

In the case of Mr. K., according to the system no pain medication has been prescribed, even though Mr. K. sometimes does feel the need for this medication. Consequently, the nurse is allowed to give medication to Mr. K., thereby working around the system, even though the procedure dictates that the doctor puts in the order 'if necessary'. The nurse tries to deal with this omission by allocating the medication to the doctor's order, even though she hasn't actually spoken to a doctor.

With regard to the missing pill (and the fact that the nurse does not immediately deal with this, but follows through on it later), this is an everyday interruption. On the basis of the information at hand, the nurse later determines which pill it must have been. Similarly, during the medication round the nurse hears a patient shouting out loud, interprets this signal in a certain way and continues with her work. A problem then presents itself with the barcode of the patient's bracelet. It is a problem that has occurred earlier during the nurse's round. The nurse eventually solves it by looking up the paper file of the patient to see what the anesthesiologist ordered.

5.4.2.2. Institutional ruling

From the standpoint of IE, several insights come to the fore. During admission to the hospital, the home medication of Ms. R. has been changed to medication which is provided by the hospital pharmacy. The fact that this occurs is dictated by (institutional)

regulations – in fact it is an actual demand of the insurance companies. Each admission is accordingly budgeted on the basis that medication costs are also included. However, this process is also steered by a (not always explicit) safety discourse, which assumes that taking the medication administration out of the patient hands will lead to more effective or better care. Of course there are good arguments for this: a doctor is able to judge the medication on the basis of compatibility with the treatment he or she proposes. But the verification of administration and supervision is actually delegated to the nurses. The admission to hospital of Ms. R. means an institutional shift from primary home care into hospital care, where different rules apply. This change of institutional steering leads to confusion for both the patient and the nurse and necessitates a translation of the nurse – who is familiar with the institutional rules of the hospital – in order to find a solution to the problem.

In the case of Mr. K., it appears that he has become part of an implicit protocol with regard to pain medication. Even though the nurse in question initially follows the institutional regulations, she eventually makes use of an authorization which is actually meant for exceptional cases. A second, textual, steering occurs, as the protocol (and in fact the technology itself) demands that the order for the medication is allocated to a specific doctor, and that a reason is provided for the medication being given: however in doing so, the nurse is restricted to a menu with pre-set options. The nurse chooses an option (even when this option has not necessarily occurred), and any future consultation by her colleague nurses of the system will be steered by the idea that this medication was administered on the basis of doctor's orders, even when this is not the case. The BCMA has 'locked this data in' and has thereby created a new reality. If viewed from the perspective of *materiality*, making use of a drop-down menu and having to choose from a number of preset reasons often means that the nurses feel restricted: nurses find it difficult to choose a proper reason and therefore often choose the option 'other', even though this does not adequately describe what has occurred. Nevertheless the technology demands that an option is selected before she can continue. If she does not comply, she will not be able to continue to use the BCMA.

Distinguishing a physicality perspective can be helpful when discussing scene 85, as it appears that although the doctor is not actually physically present, there is still an *implied presence*, as the doctor can be linked to a drug order. Although the doctor will receive a notification of this, this occurs after medication has already been administered.

What the above scenes show is how the nurse 'skillfully' connects various actions with each other, and in so doing, may or may not immediately respond to the different

signals that are received. If viewed from a time perspective, the case of the missing pill shows how the nurse has not immediately responded but uses her historically developed knowledge in order to find a solution. She does not doubt her final interpretation, even though there is no remaining control mechanism apart from the testimony of the patient. Rather she bases her final decision on her own (clinical) experience: recognizing the specific color of the pills and applying this knowledge (deduction) where needed, is something she has learnt as a nurse. In the case of the wristband which does not work, the nurse ascertains that she needs to get the patient's papers. Even though the technology fails, she still knows how to get the required information in order to act. In this case it is historical knowledge which ultimately proves to be most useful to her.

5.5. Discussion

The implementation of BCMA in hospitals is often an answer to external pressures fueled by a broader discourse on safety that does not allow for any (medication) errors or incidents to (re)occur. Accordingly, hospitals feel pressured to take responsibility and to display what they deem as appropriate behavior in relation to the distribution of medication. Nurses and patients are consequently drawn into this discourse and the institutional ruling, to which they are not oblivious. Or, as Rankin and Campbell argue, nurses' work is highly responsive to accountability practices and outcomes measures and they are believed to make best possible use of hospital facilities (Rankin & Campbell, 2009).

Our research has shown that systems such as BCMA appear to exert a relational steering on nurses in their practice although this is obscured from the hospital management's view. As Harrison, Koppel, & Bar-Lev have pointed out: "When hospital leaders… assume that Healthcare Information Technologies will deliver the results promised by vendors, they may overlook likely interplays between new technologies and existing sociotechnical conditions." (Harrison, Koppel, & Bar-Lev, 2007, p. 543).

In addition, BCMA as a technology can also lead to alienation from certain goals of nursing, such as giving appropriate attention to each individual, despite the large number of different patients, each with their own specific needs. BCMA induces a different kind of following through of existing practices.

Although the nurse is not sovereign with regard to BCMA – they sometimes lean heavily on the institutional steering, for example by following a strict protocol in order to legitimize their actions – at the same time they are able to find ways of working through or around the system.

BCMA also appears to have a central underlying assumption, namely that there is linearity in the nursing process. In other words: each step can be compartmentalized and viewed and defined separately, step after step, not interrupted by other labor or actions. Nurses have trouble remaining in the linearity of the BCMA, because this would make it impossible for them to do their jobs. The care process is seen as an equivalent of the production process and, in the eyes of management, can be optimized in the same way. As Andrew Sayer has argued, the use of general frameworks and procedures is often driven by a managerial zeal that imagines it can root out and improve the apparently inefficient workings of the practitioners themselves (Sayer 2011). These developments are often associated with the introduction and use of technology, whereby, according to Novek: "work practices are encoded into abstract representations embedded in computer networks that are to some extent dissociated from social contexts in which work is carried out. Automation, thus, is implemented through a process in which abstract representations, mediated by information technology (IT), are substituted for direct social action or interaction." (Novek, 2002, p. 380).

5.6. Conclusion

IE has brought to the fore the institutional dimension of BCMA. In addition, praxeology has enabled us to analyze more deeply the (unity of) practice of BCMA, emphasizing its invasive character and the institutional steering of nurses and their 'skilled bodies'. BCMA as a technology (materiality) gives direction over time, during and between shifts, and by changes in the technology that they use (temporality). It shows how BCMA and the nursing practice interact (and interfere) with each other.

By combining IE and praxeology, the notion of 'tinkering' has been given a more precise fleshing out, as we have gained insight into the deliberative character of nursing work in relation to BCMA. Nurses tinker continuously with BCMA, tailoring it to suit each individual patient's needs. In order for BCMA to succeed, we conclude that this tinkering is absolutely necessary. However, this tinkering should not be seen as a thoughtless or automatic acting, but rather as something which is nurtured through a constant deliberation by nurses, even though they act under (institutional) circumstances that hardly allow for any divergence, since the (institutional view on) BCMA requires nurses to follow guidance without question.

In our view, any perceived safety of the patient actually benefits from this deliberative tinkering, as does the flow of the care process, since nurses are connecting their knowledge with the technology.

Ultimately nurses tinker, not in order to act unfaithfully towards the system, but rather so that they can administer medication to the patient in the most fitting, patient-centered way.

Changes in the structure of BCMA initiated by the organization are labelled as 'an adjustment' to guarantee the flow of the process. When a nurse does the same from a care perspective, this is called a workaround. The suggestion is that during development and implementation, nurses should be invited to attempt to hack the system, and to describe, and explain why they needed a workaround. This should then be reported to the supplier, to management and to systems builders in order to optimize the practicality of the technology in use. This would ultimately increase safety, because it would demonstrate a reflective process where all those involved could collaborate in building a technology that supports nurses instead of making them subordinate to the system.

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Interlude

The three distinctions show that the use of BCMA is not always safe. It is the nurses' deliberative tinkering that makes it safe. My point is that this tinkering is designated by the organization as a 'workaround': behavior that circumvents or temporarily 'fixes' an evident or perceived workflow block. (Debono, 2013, p. 2). Fitzpatrick and McCarthy describe the consequences of a workaround as a destabilization of the system, as error, and as evolution of the system (Fitzpatrick & McCarthy, 2016, p. 263). They approach workarounds from an external institutionalized conceptualization of what correct practice should be.

Following Verbeek, we could equally state that nurses are assuming their proper responsibility and addressing a problem with the technology.

Scene 13

BCMA was originally intended as an electronic prescribing device but resulted in a built-in hierarchy which gave doctors, alone, the authority to adjust prescriptions. Initially the doctor had to log into the system, prescribe, and then authorize medication, and only then could the nurse start distributing it. In terms of their daily practice, doctors found this unworkable and an additional administrative burden, and they were not always in a position during their shifts to authorise the changes within the system. To solve this problem, the organization asked the manufacturer to open up the system and insert new protocols. This would give the doctor the opportunity to click on a protocol that allowed the nurse to dispense a whole list of medication that was part of that specific protocol. It would save the doctor time, and they could arrange this in advance of the planned hospitalization of a patient. The manufacturer warned that the prescribing hierarchy that had been initially installed would be undermined and that the changed protocol would open a pathway to all kinds of practical problems. Without contact with a doctor, a nurse sees a protocol popping up in her screen and she translates this text into work, and in reporting to the next shift translates it back to text again (as IE states, the nurse is institutionally ruled by a text – work – text practice). The protocol is, as Smith calls it, a 'Boss-text' that rules nurses' practice. In many cases, with their knowledge of the protocol, nurses take corrective action when what is being prompted does not meet the patient's needs. This workaround is the result of the change in the prescribing procedure.

Scene 40

A nurse tells me that she is very pleased that the organization recently decided to let a pharmacy assistant enter the home medication of a patient into the BCMA. The doctor only has to drag the medication into the activating box to authorize the medication. At the outset of BCMA this task was reserved for doctors (see scene 13). BCMA had a built-in hierarchy that could not be bypassed. In practice, doctors often did not perform this task and gave various reasons for this. The management at first agreed the solution of entering protocols into the BCMA. However this was not conclusive, and they then came up with the idea of the pharmacy assistant being authorized to enter the medication. These are institutional solutions to a practice problem that was initially labelled a behavioral problem. The problem itself was caused by another institutional trigger, namely the legislation of 01-01-2011 around responsibility and accountability.

In the previous two chapters we have highlighted nurses' knowledge and deliberations. In the next chapter I will explicate the tension between the various logics in use.

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6.

Nurses' knowledge and deliberations crucial to Barcoded Medication Administration Technology in a Dutch Hospital

Discovering nurses' agency inside ruling

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Abstract

This article aims to show how Barcoded Medication Administration Technology institutionally organizes and rules the daily actions of nurses. Although it is widely assumed that Barcoded Medication Administration Technology improves quality and safety by reducing the risk of human error, little research has been done on how this technology alters the work of nurses.

Drawing on empirical and conceptual strategies of analysis, this qualitative study used certain tools of institutional ethnography to provide a view of how nurses negotiate Barcoded Medication Administration Technology. The study adopted Smith's model of 'the small hero' and her interest in 'ruling relations'. The approach also uses elements from practice theory in order to discern how technology operates as a player on the field instead of being viewed as a 'mere' tool.

A literature review preceded participant observation, whereby 17 nurses were shadowed and data on an Orthopaedic ward was collected over a period of nine months in 2011 and 2012.

Barcoded Medication Administration Technology appears to rely on nurses' knowledge to mediate between the embedded logics of its design and the unpredictable needs of patients. Nurses appear to negotiate their own professional logic of care in the form of moment-to-moment deliberations which subvert the ruling frame of the Barcoded system and its objectified model of patient safety.

The logic of Barcoded Medication Administration Technology differs from the logic of nursing care, as this technology presumes medication distribution to be linear, even though nurses follow another line of actor-bound safety practices that we characterize as 'caring deliberation.'

Keywords: Barcoded Medication Administration, technology, nursing, nurses, institutional ethnography, Practice Theory, safety, deliberation.

6.1. Introduction

As in other economically advanced nations, health care governance in the Netherlands has been subject to economic rationalizations aimed at reducing healthcare costs while at the same time attempting to increase accountability, transparency, and safety. In line with 49 studies throughout the world (Nebeker, Hoffman, Weir, Bennett & Hurdle, 2005, Cescon & Etchells 2008, Wulff, Cummings, Marck, & Yurtseven, 2011, Holden, Rivera- Rodriguez, Faye, Scanlon, & Karsh, 2013) one strategy to meet these goals was the introduction of a system of Barcoded Medication Administration technology (BCMA), which is expected to better combine the work of pharmacists and nurses and to improve efficiency and safety of ordering, dispensing, and administrating medications. It is anticipated that the regulated technological system that is built on procedures and protocols will result in safer medication practices: the right medicine, in the right dose, at the appropriate moment to the right patient. When nurses interface with the BCMA system they electronically scan the barcoded medication system *and* each patient's barcoded bracelet. This requires step by step identification and matching of each patient to each prescribed medication. By addressing 'the human factor', the system is expected to reduce the number of errors (Patterson, Cook, & Render, 2002). The underlying presumption is that *people* make mistakes and that errors can be reduced by applying technology. As Greenhalgh and Stones stated, such a programme "is seen by policymakers as key to improving the quality, efficiency, and safety of healthcare" (Greenhalgh & Stones 2010, p. 1286).

The research reported here suggests that technology changes the roles and identities of nurses, as mutual expectations amongst care workers on the ward are adapted in a subtle though far-reaching manner. Our research is congruent with Greenhalgh and Stones' caution that, although technology can create possibilities of new and efficient ways of communication and interaction between staff and patients, "it is sometimes associated with newly produced forms of disorder and inefficiency, and the need for stressful workarounds."(Greenhalgh & Stones, 2010, p. 1286).

6.2. Background

Prior to the empirical study, we conducted a systematic review of 49 articles. Most of the articles we reviewed emphasized the possibilities of BCMA as a technology to prevent errors and to increase patient safety (Roark, 2004, Cescon & Etchells, 2008, Fowler, Sohler, & Zarillo, 2009, Poon, Keohane, Yoon et al., 2010, Young, Slebodnik, & Sands, 2010). Other articles focused on the effects of the workarounds nurses' employed when using the technology (Koppel, Wetterneck, Telles, & Karsh, 2008, Miller,Fortier & Garrison, 2011, Rack, Dudjak, & Wolf, 2012). There were several articles discussing how the

BCMA influences workflow, with an emphasis on the amount of time spent on medication rounds (Elganzouri, Standish, & Androwich, 2009, Holden, Brown, Alper, Scanlon, Patel, & Karsh, 2011). One article reported the interruptions nurses experienced before and after the implementation of BCMA (Stamp & Willis, 2010). Marini, Hasman, Huijer, and Dimassi describe nurses' behaviors around the BCMA and conclude that nurses experience the benefits of BCMA but also experience the system as a burden because it fails to reduce their workload (Marini, Hasman, Huijer, & Dimassi, 2010). Other articles related to medication work includes the work of Eisenhauer, Hurley, and Dolan (2007) who studied the thinking processes of nurses during medication administration and showed that medication distribution is not merely a technical task but involves a highly complex display of thinking and knowledge. Despite their important contribution, in our view Eisenhauer, Hurley, and Dolan insufficiently *described* the complexity that led to their conclusions. The study we report here is based on an ethnographic approach directed towards actual observations and descriptions of nurses' acting and thinking whilst engaging their medication work. It responds to the work of McDonald (2006) who advocated for more research on practice. In addition, despite the empirical design of the study we conducted, the analytic findings respond to Wulff, Cummings, Marck, and Yurtseven (2011) who, following their own systematic review, concluded that more theory-driven research related to medication administration is called for. Our study addresses gaps in prior research: 1) there is no research that uses direct observation; 2) most research relies exclusively on self-reports; 3) much of the work relies on secondary analysis; and finally, 4) most of the conclusions are not validated by research subjects.

6.3. Conceptual Framework

Our study adopts two robust conceptual frameworks to support an analysis of nurses' medication work as it arises within bar code technologies. Dorothy Smith's (2005) institutional ethnography (IE) provided early direction for this study that was conducted from the standpoint of nurses in direct practice – the 'end-users' of the BCMA. According to Smith (2005) such 'standpoint informants' are the expert knowers of their own work processes, and researchers must explicate the knowledge embedded in that 'standpoint' (Smith, 2005). The goal of IE is to study problems that arise in a standpoint location and to describe how these are coordinated within a purposive 'institutional order'. The premise is that the institutional work being carried out by people who are outside a local setting is often vested in textual representations of select issues (such as medication errors). It is thus a version of what is going on that has been abstracted from the context of the standpoint informants' work and leaves out a great deal of what the standpoint informants know. IE researchers examine people's textual work that

directs and represents what is happening (called 'ruling relations') in order to produce empirical evidence about how problems are (often unwittingly) being organized. Our study describes nurses' use of BCMA and their deliberations and decisions (daily activities in relation to drug distribution), showing how nurses' medication practices are organized within the ruling relations of BCMA manuals, protocols, scanning devices, and other institutional frames related to efficiency and safety.

The research deviates from the integrity of a conventional IE study when we use Nicolini's (2011) practice theory as a way to think about the data. Well aligned with IE, Nicolini has argued that humans participate in a social world (thus constructing the social) but, *at the same time,* human conduct *derives* from this participation. To Nicolini "knowing" is a verb, we *are* and we *do* knowing. We found Nicolini's theoretical analysis useful for examining nurses' deliberations within the ruling barcoded technology. Nicolini's work drew our attention to a *particular form of knowing*. Knowing is something that nurses do in their practices and is often based on those practices. This *knowing* is vital for co-operation and carrying out care.

Each of these approaches has a focus on practices. In combination they are used as a heuristic set of lenses. IE offers us the option to map how the BCMA technology institutionally rules nurses' practices. Practice theory provides the opportunity to view how nurses take their knowledge into consideration in relation to this institutional ruling. In the discussion section of this paper we also reference the philosophy of Verbeek (2005) whose writing offered insights into the relations between labor and technology.

6.4. The study

6.4.1. Aim

The aim of the qualitative empirical study was to determine how, from a standpoint of nurses, the use of BCMA institutionally and textually mediates nurses' deliberations in the process of decision-making.

6.4.2. Design

The study involved nine months (2011-2012) of qualitative field research in a Dutch hospital that included direct observation of people at work and an examination of documents. The first author performed participative observations of nurses distributing medication to patients. This standpoint data was used to identify the tensions and contradictions that nurses encountered while working their shift. Consequently, the field notes were used as a starting point to investigate the social organization of the

problems, by empirically tracking how nurses were coordinated within the logics and textual systems of the barcode technologies.

6.4.3. Sample

IE-linked descriptions of institutional practices constitute the 'sample'. The researcher sampled observed activities that lead into and extend out from the standpoint informants' work. The sample was guided by a focus on problems – some ordinary and mundane, others more serious – that can be traced to other people's work. The sample may be limited by practicalities such as access to informants, access to texts, and the time available to follow the 'threads'. It is possible for the sample to be small and confined to work that is done in close proximity to the standpoint location (for example the sample could be confined to how work on a nursing unit is linked into work in a pharmacy). Or the sample could be a broad set of institutional practices (for example how nurses' work is linked into the work of bioengineers and software developers). The adequacy of the sample is determined by whether the problems are seen to be familiar or plausible and whether the researcher's analysis contributes new insights into the social organization of the setting.

This study sampled the institutional practices implicated in nurses' work with the barcoded medication system. The sample included nurses, clerks, pharmacists, medical doctors, and managers. The many computer fields and other texts (policies, protocols, guidelines, and so forth) were critical features of the data that was sampled and analysed.

6.4.4. Data collection

Data was collected on an orthopaedic unit where seventeen nurses were shadowed during their use of BCMA. The first author performed 63 hours of observation of activity connected to BCMA. Observations were conducted during a range of differently scheduled shifts (several overlapping variations of days, evenings, and nights). During the observations nurses were asked to think out loud, and to reflect on their actions while mediating the BCMA into their work. Most observations were audio recorded and transcribed verbatim. Four nurses were interviewed. The interviews focused on their experiences of working with BCMA and were audio recorded. The observations produced about 151 pages of field notes that were analytically organized into 249 scenes. Approximately 2000 pages of documents were read and analysed. Analysis was focused on nurses' use of the technology and how the fields embedded in the technology coordinated what they did. The relevant documents (safety and error reports; policies; electronic drug libraries and so forth) were used to establish the empirical links between the nurses' work and institutional practices.

6.5. Ethical considerations

The study was ethically exempted by the research ethics board of the hospital where the study was conducted. The exemption was based on the assessment that patients were not actively recruited and there was no risk of harm to patients. Despite the exemption, the ethics and politics of this research study were complex and required careful consideration. First author, Boonen, the orthopaedic unit manager, invited nurses to participate in the research. Nurses were informed about the study in a team meeting and participated on a voluntary basis. The motivation for conducting the research was generated by the concerns nurses had raised about BCMA, and Boonen was committed to supporting the nurses to resolve the problems. He thereby positioned himself as an ally, rather than taking up an evaluating or monitoring role. Consequently, he entered the setting as a researcher with a genuine interest in illuminating the problems the nurses were expressing and with a desire to help to sort out those problems together *with them*. At any time nurses could withdraw their participation. Each nurse was given the opportunity to read the final reports arising from the observations of their shift and to correct it for errors. All the data was anonymized to protect anyone who was implicated in data collection.

6.6. Rigor

The study included two intervals for 'responsive evaluation' (Patton, 2002) where first author Boonen talked to different people to gather their responses to the analysis being developed from the data. Both evaluations were planned for the end of the day, with invited participants who had been briefed on the design and purpose of the study. The participants were asked to be critical and frank about the warrantability of the analysis and the meetings established a way to question and confirm findings. The first responsive evaluation was conducted within a multi-disciplinary group including the nurses involved in the research, pharmacists, information and communication technology (ICT) staff, a supplier, a manager, and a physician. This multi-disciplinary evaluation broadly confirmed our findings. The second responsive evaluation was conducted in a volunteer group of fifteen nurses from different wards who were all working with BCMA. During this evaluation the nurses confirmed that the analysis validated their experiences and expanded their understandings about the social organization of their work. Throughout the analysis Boonen also talked to different methodological experts and scholars to gather their responses to the analysis.

6.7. Findings

This paper focuses specifically on how:

1) BCMA is expected to organize nurses to adhere to a stepwise process that technologically embeds a series of safe practices. However, patient safety *actually* depends on nurses' mediation of the system.
2) Nurses' practical knowledge of administering medications – accumulated through generations of 'hands on' experience – is being lost.
3) New 'conceptual knowledge' about medications, and complex knowledge about the *technology,* is dominating nurses' actions.
4) Despite the stepwise design built into the BCMA, nurses' work is *necessarily nonlinear* and nurses *must be able to accommodate* what is going on in the setting. In this regard, the BCMA is an obstacle to safe practice.
5) The BCMA inserts ruling relations that *promote* rule breaking by nurses; it *requires* them to work in ways that are not sanctioned.

6.7.1. The dominant discourses in nurses' work with the BCMA

To present and develop these findings we begin by using data from an interview with a nurse. The interview contains several traces of the various 'discursive practices' that we identify and track. The nurse described working with a patient with Parkinson's disease whose personal medication timing, imperative to his wellbeing, differed from the standard hospital medication rounds. The BCMA was not equipped to deviate from the standard prescheduled timetable. The patient was reliant on the nurses' memory for correct medication administration. To help with this, one of the nurses introduced an old fashioned method – a paper-based medication administration record (MAR), which was placed on the cupboard close to the patient. However, those nurses who had only ever worked with the BCMA were at a loss with the paper-based MAR: for the less experienced nurses it seemed to complicate rather than clarify the patient's care.

This data illustrates nurses' patient-related knowledge and 'old fashioned' practical knowledge on how to administer medication was necessary to mediate the medication technology. The data also has traces of how the BCMA is *supposed* to work, as a tool to improve patient safety, with established routines and protocols that are built into the system to 'force' adherence in line with the knowledge of computer experts, health safety experts, risk managers, and so forth. Although this knowledge is generated *outside* the setting, nevertheless it directs how nurses *should* proceed. Our findings show that nurses routinely (reasonably and sensibly) break these rules. For nurses, the BCMA, including its accompanying systems and 'stops', introduces uncertainty about what is 'good' nursing practice and whether their practical knowledge of patients can

be brought to the fore or must be subordinated. Our data were rife with the sorts of dilemmas that this data excerpt represents.

The problems that nurses encounter when working with the BCMA system are organized within a variety of 'conversations' that make up the dominant discourses among nurses when they make each moment-to-moment decision about whether, and how, they might mediate the problems the BCMA produces. These are schematically represented in figure 1. (below). Our findings point to those institutional activities that are implicated in the issues introduced into nurses' work processes by the BCMA . The dashed line (figure 1.) around the item BCMA/ Technology (T) identifies the BCMA as our focus, and represents the 'traffic' between the ruling relations of 'the state'[8], safety practices, and the design of the BCMA system. Although there is a top-down hierarchical safety discourse in place, this is not our entry point. The schematic positioning of the nurse inside the authoritative system becomes relevant as soon as nurses begin their work within a conceptual, discursive, technological frame that does not fit with what they know about their medication work. This mismatch was seen over and over again during the observations.

The institutional discourse related to medication is dominated by the safety concept (SC) – a belief that administering medication is inherently risky, and that nurses' professional adherence to protocol is crucial in ensuring safe practice and preventing catastrophic events. These beliefs about safety are built into the BCMA technologies design (T) which is buttressed by the organizational discourse (OD) which inserts specific rules and policies that are reciprocally embedded into the BCMA technology and also supported by nurses' education and training. It is at the juncture of the organizational discourse that we noted nurses compromising the ruling guidelines by activating an informal discourse that we termed the "nurse discourse" (ND). This discourse is more closely aligned with 'actual work processes' – such as the work processes described in the interview excerpt above – that ensured an adequate nursing response to the specific needs of the patient with Parkinson's disease. The 'nurse discourse' (ND) is based on immediate practical knowledge. We depict this with the dashed line because it is *always* what the nurse must *mediate* with the OD (the protocol-based knowledge) that directs a certain standard way of acting. The space between the two dashed lines (between the ND and the OD) alert us to how the ND (that which is known from 'being there') coordinates a workaround (or rule breaking). The blurred line between organizational and nursing discourse represents whether or not a nurse's activity might be

8 Smith's idea of 'the state is here defined as the pressure from society and culture towards a rigorous safety discourse, allowing no room for any risk taking.

institutionally *worked on* as rule breaking or not. It represents the discursive practices that determine how nurses make decisions about what to do in their medication work. It provides a bigger picture of the various sources of knowledge that nurses must address when trying to decide how to proceed. Our data show a form of informal and 'renegade' knowledge that nurses use to determine how they can safely break the rules so that the patient needs are met. Concurrently, work processes are activated so that the nurse does not get reprimanded. Building on the conceptual framework of the model of nurse discourse (ND) (figure 1.) we elaborate on how nurses routinely break the rules and how their rule breaking work is exacerbated by assumptions about how medication work *should* proceed.

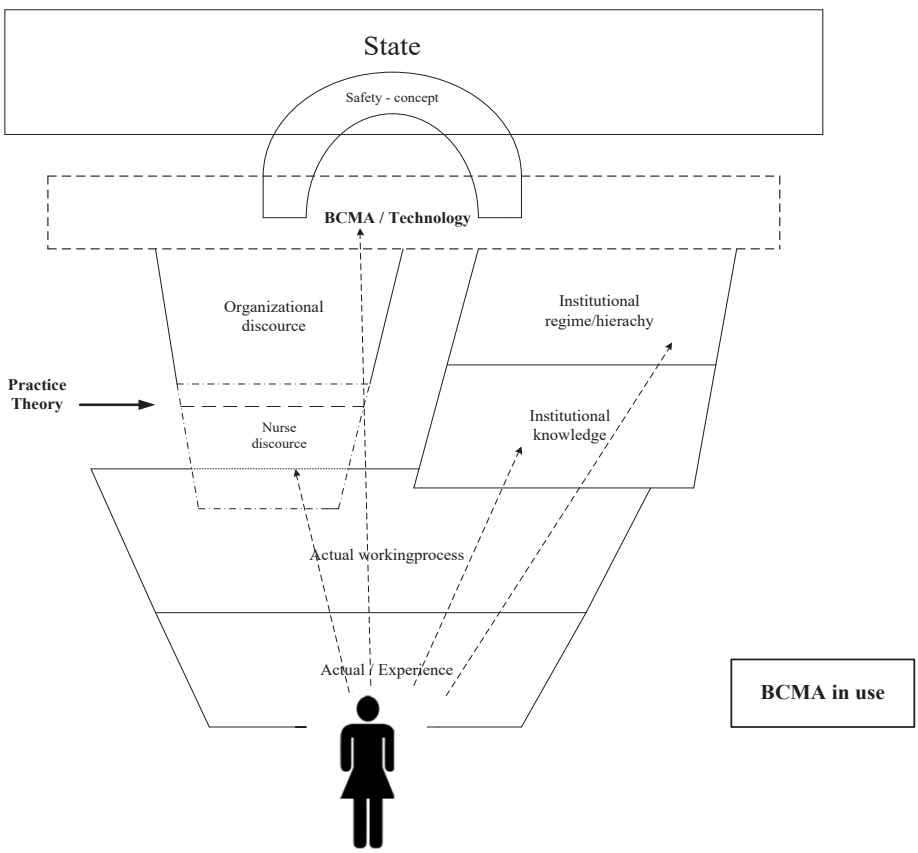


Figure 1. Model of nurse discourse

6.7.2. Rule breaking

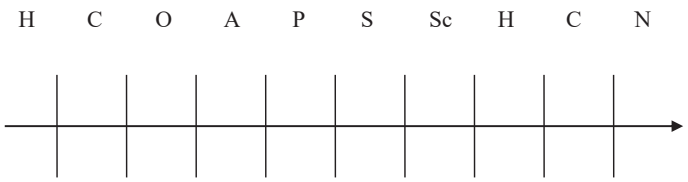
An important finding from this study is in the social organization of rule breaking. During observations Boonen frequently witnessed nurses being stopped by the system but also finding ways to work around these stops. This was the case when a physician had given the order to administer oral pain medication to a patient who was reporting nausea. The nurse knew that the oral medication may trigger vomiting and be an ineffective intervention for the patient's pain. Although the nurse scanned the barcode of the pill she actually administered a suppository. The nurse's decision was complicated. She knew that, at the next dosage, the patient's nausea would likely be resolved and oral pain medication would be indicated. She also knew that officially changing oral medication into a suppository would require her precious time and effort: the nurse would need to phone the doctor, acquire a new order which would require lots of scrolling and clicking in order to make proper changes in the system. Her safe and simple solution made more sense in *that* moment of her practice.

The ruling (abstract) assumption on how nurses proceed on a medication round is that medication administration is their *exclusive focus*. However, our research shows that this is rarely the case. Despite the presence of a protocol that is embedded in the BCMA design (institutional ruling) which entails highly systematic and stepwise practices, most nurses subvert these into a personal system that reduces risk of error and increases their capacity to respond to patients' individual needs. These are not only medication needs but multiple issues that arise during a hospitalization.

A good example from the data was when a nurse encountered a situation which drew her into a circuitous process. The nurse was doing her first medication round and did not yet know the details about the patient whose medications she was preparing. Prior to the introduction of the computerized medical record and BCMA, at the start of the shift each nurse would print out a list with the names of the patients whose care was assigned to them. They would make notes of the important things that are relevant in the care process of each patient. However, nurses are now expected to rely exclusively on the digital patient files as these are considered the most current and 'safest' source of information. Opening the patient's full electronic file while working with the BCMA system is cumbersome and time consuming. It requires the nurse to click through multiple computer fields. Consequently, some nurses routinely break the rule and continue to use a printout as a pocket tool. In this case, however, the nurse being observed was following the rule; she did not have a printout to provide the detail about the hip surgery the patient had undergone and the patient could not supply those details. The situation that arose related to a prescription for Indocid that is prescribed for its analgesic and anti-inflammatory effects following a total hip replacement. Routine

administration of Indocid is part of the hip replacement protocol. However, Indocid is contraindicated for patients with a history of gastric ulcer. The nurse noted that the analgesic on record was Paracetamol. In view of the patient's incomplete report, the nurse had questions about the Paracetamol. She needed to confirm exactly what kind of a hip surgery this patient had undergone in order to know how to proceed with the medication round. In order to save time and to get the information she needed, she consulted with a colleague who had broken the rule and had a printout at hand to confirm that the surgery was a hip replacement that fitted the protocol for Indocid. The first nurse then queried why Indocid had not been ordered and the second nurse responded that the patient is allergic to Indocid. She did not get this information from her printout, but from her prior knowledge of the patient. The allergy was *not* noted on BCMA screen.

This example shows the incongruence between the portrayal of medication administration as a stepwise series of events (figure 2. below) but actually unfolds in consecutive scenes such as the circuitous work process depicted in figure 3. In reality, each nurse is connected to the immediate environment that consists of people with needs that are unpredictable. However, the BCMA is designed (in theory) for a predictable and linear institutional organization (figure 2.). Our data shows that nurses' practice rarely follows the linear line and is most of the time characterized by a circular course of events (figure 3.). The institutional control that is ordered by BCMA in the straight line does not always fit the reality of the care process that is at the core of nursing practices. In



H= Hospitalization of Patient
C= Check medicationlist
O= Order by doctor into BCMA
A= Activate list in BCMA
P= Preperation by nurse
S= Scan patient bracelet
Sc= Scan medication
H=Handing over medication to patient
C= Close medication list
N= New patient

Figure 2. The linear way of BCMA ordered by (S)tate in a safety discourse of medication reconciliation and verification, translated into (T)echnology of BCMA and processed into (O)organizational (D)iscourse

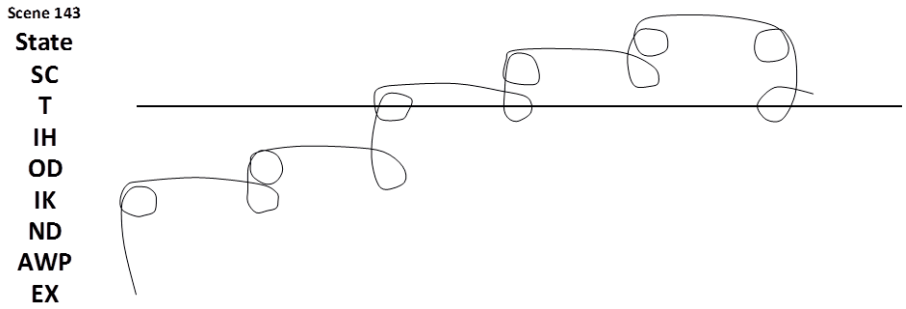


Figure 3. Example of scene and the ruling relations (from Figure 2.) that are activated in every scene

the 249 data scenes examined, there were only seven scenes that followed the straight line embedded in the BCMA technology. Most of the time nurses followed a line of *necessary* 'episodic discontinuities' (Smith 1987) in order to meet the expectation of good and safe care in relation to the medication distribution as shown in figure 3.

6.8. Discussion

BCMA is a tool, a *material actor* that introduces practices into nurses' work. It is constantly present as it enters and withdraws from the relation between nurses and their world of caregiving. It is a powerful ruling relation that forms and gives meaning to nurses' medication practices. BCMA is characterized in temporality, it has or constructs a past, a here and now and a future, and thus cannot be looked at in isolation. Nurses do not primarily react to BCMA but they react to the *possibilities* that the BCMA allows them as it directs and constructs their medication rounds. Institutionally they have to follow a technology that seriously reduces the possibilities that are open to them and, in this case, they establish strategies to mediate the system to provide good care.

Rule breaking is needed because of a discrepancy between the institutional and technological imperatives and the practices necessary to respond to patients' needs. The impact of BCMA on the caring process is made visible when nurses' use of the technology is described as a concrete set of practices that are embedded in nurses' everyday work. According to Verbeek (2005) everyday work with established technology leads to it becoming an unnoticed, taken-for-granted part of the setting. The technology only attracts notice and creates awareness when it disturbs the normal flow: "technology can only become invisible when [it] is . . . conceived as springing from a particular manner of thinking or from the functional organization of modern social life." (Verbeek, 2005, p. 6).

The nurses' practices with BCMA that are governed by institutional ruling take place within a context where reciprocity between systems and practices is everywhere. According to Nicolini, practical wisdom is the production of praxis or, in other words, actions fed by sensible value-driven deliberations (Nicolini, 2012). So, while there is a shell of institutional ruling and coercion in which reciprocity moves within stipulated frameworks, *nurses do not relinquish agency*. Dealing with BCMA in the institution creates a certain towing force that, in most cases, is loosely followed. However, there are times when the nurse wants to postpone BCMA directive, and nurses have learned how to 'click it away'. Or, for the sake of good care, the nurse simply ignores the order and works around it.

Connecting practice theory to IE gave us the opportunity to see how nurses deliberate within the ruling relations of the technology, as they continue to draw down their own (located) knowledge to provide good care during medication rounds. We suggest that this combination shows how institutions, technology, knowledge, and practices are connected in a network of dependency and co-creation. Although the examples from the data are necessarily brief, they are also familiar, and will make sense to nurses who read them. We have shown that despite the use of BCMA, nurses' knowledge and deliberations are crucial for safe medication distribution. The implementation of new technology installs new knowledge but also dissolves useful historical knowledge and invisibly mediates serious flaws in the work of nurses (with a cost to nurses and patients) that, within the dominant discourses of safety and technology, are essentially rendered invisible for critique.

The literature review conducted at the outset of this study identified that current research into the BCMA and nurses' medication work is dominated by unquestioned assumptions about that work. Knowledge about 'safety' is generated from a textual system of error reports that construe nurses' rule breaking as 'error' (Koppel, Wetterneck, Telles, & Karsh, 2008). The current trend in research that focuses on 'interruptions' (Stamp & Willis, 2010) upholds an Archimedean view that nurses' work can be mechanistically broken into discrete tasks that can be isolated. Our reading of Smith's descriptions of the 'episodic discontinuities' (Smith, 1987) that characterized her mothering work matched the observations of nurses at work. Our analysis challenges the dominant conceptual framework upon which the 'interruptions' discourse is built. Our findings are congruent with the rare critical work being done to understand nurses' medication work, such as the supporting work of Eisenhauer, Hurley, and Dolan (2007) who argue that medication processes cannot be disconnected from the rest of nurses' daily activity.

6.9. Limitations

This study has certain limitations. The observations focused narrowly on BCMA, thereby potentially overlooking other important issues that arise at the juncture of the episodic discontinuities that characterize nursing work and the logical rationality of the clinical and managerial technologies that are increasingly infiltrating the nursing care setting. This study may also be criticized for its ambitious attempts to combine IE (that explicitly resists theorizing) with the ideas of Nicolini whose work is inherently theoretical. However, we were driven by our interest in extending what can be known through IE about the increasing efforts to tightly harness nurses' work into conceptualized systems of safety and efficiency and to examine more closely the possibilities that nurses have for 'agency' within these regimes. Nicolini provided those tools.

Within the conventions of IE, the presentations of these findings omit some of the empirical details (evidence) that make the explicit links between the broad discourses we identify in figure 2. and the two data excerpts that inform our assertions about 'what actually happens'. The data we use in this study are necessarily brief. Despite these limitations, we are confident that readers who are nurses and who work with BCMA will 'recognize themselves' in the important arguments we make about the risks inherent in seeing nursing care as a linear process capable of 'interruption' and, more importantly, the social organization of rule breaking within discourses of safety and professionalism.

6.10. Conclusion

BCMA systems are dominated by linear thinking, which include a digitalized, rational logic that cannot accommodate the actualities of nurses' work (Boonen, Vosman, & Niemeijer, 2015). This is buttressed by a long history of a nursing safety discourse that also characterizes medication work within a rigid, stepwise set of rules and hospital policies that are frequently so detailed as to direct nurses' handwashing practices at the outset of their medication work. The assumed linearity of technological applications in clinical practice settings carries a logic that is often oppositional to the multiple discontinuities that characterize moment-to-moment judgments and adaptations of nurses.

Our research provides an in depth insight into how nurses work to deliver the right medication at the right dose via the right route at the right time to the right patient (the five rights). It shows *how* this is accomplished, as a discretionary practice that depends upon knowledgeable experts who routinely make adaptations to ensure medications are 'fit for purpose'. Our findings show that nurses' knowledge of the specific patient

context is crucial to medication distribution. It is this feature of safe medication administration that seems to be overruled in the new technologies aiming to support safe medication practices. We suggest that this introduces new risks (both for nurses and patients) that have not yet been well studied or described. By combining IE and practice theory in this study, we have brought to the surface some of the everyday tensions and adjustments that nurses make. These are safe and reasonable actions but, nonetheless, are carried out subversively and viewed as unacceptable by those people whose work is to supervise or control nursing work.

6.11. Acknowledgements

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6.12. Conflict of interest

No conflict of interest has been declared by the authors**.**

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Interlude

In chapter 4 we used three heuristic lenses to look at our research field and eventually focused on the various kinds of knowledge that nurses possess and activate while working with BCMA. In chapter 5 we used the IE and the three distinctions made by Robert Schmidt to look at our data and create an understanding about nursing practice which we call 'deliberative tinkering'. In this chapter we zoomed in on the linearity of the technology as it threatened the circularity of the caring process characterized by 'caring deliberations.'

Scene 62

The nurse scans medication and gets a pop-up on her screen with the message: 'Patient uses dose which deviates from the standard, and prescribes 15 milligrams.' The Hospital pharmacist only delivers 10 milligrams. The nurse takes two pills and breaks one of them in half. Where nurses are taught to follow the system, the organization relies on the ability of the nurse to anticipate and interpret the message: the organization regulates the practice of nursing through the technology. There is no control mechanism prescribing that the nurse should break one pill in half and this actuality cannot be retrieved within the BCMA system. During this shift I also observed several occasions where a patient offered their wristband in a reflex action when the nurse entered the room with the scanning device.

Scene 70

A nurse removes the drugs from the package and puts them in a medication cup. Sometimes she struggles to get the drugs out of the package. She says: *"Yeh…people have to do this themselves..convenient (cynically) if they have rheumatism."* She continues and explains that she does this for all of her patients. *"In this way I do not have to remember which patients are capable of doing it themselves and which are not."*

The nurse is wearing a purple vest, with a text in white letters on the back stating 'do not disturb'. This vest was introduced to prevent the nurse from being disturbed during her medication round. The idea originated in considerations of safety, along with the institutional rule that nurses must not be distracted during medication rounds. The 'problematic' here is twofold. Rules say that the nurse has to wear the vest and has to take the medication cart into the patients' room (medication distribution must be carried out close to the source). The fact that the nurse enters the room and wears a very striking coloured vest means that patients start asking questions. In several observations a nurse gave this as a reason for breaking the rule and not taking the cart

with them into the room. I also observed that some nurses began a shift where only two nurses were available to take care of 30 patients. It was impossible to perform the medication round and not get interrupted. Many times the other nurse had to ask for help because she could not take care of a patient alone. In several cases there were urgent requests from patients which she could not ignore.

7.

How bar code medication administration technology affects the nurse–patient relationships: an ethnographic study

An ethnographic study.

Under Review International Journal of technology Assessment in Health Care

Boonen, M. Vosman, F. Niemeijer, A.

Abstract

However, it is as of yet unclear how this specific form of technology affects care for patients. This article therefore aims to explore how inpatients experience care through medication technology, which is literally placed between the nurse and the patient.

A qualitative explorative ethnographic field study was conducted in an orthopaedic ward of a Dutch general hospital.

After analysis the following two themes could be discerned: (1) the use of bar code medication technology changes the spatial relation between patient and nurse and (2) an institutionalized ruling of patients takes place: patients are subjected to the institutionalized routines of the hospital, which conflict with the manner in which their medication is provided at home.

Barcoded Medication Administration technology cannot be considered merely a relationally neutral tool, but rather an active component within the caring relation between a nurse and her/his patient, as it rules the distribution process in such a way that the patient's experiential perspective is objectified and mediated by procedures and protocols.

Keywords: Patient, institutional ruling, bar code medication technology, hospital, technology.

7.1. Introduction

Central in this research is Barcoded Medication Administration Technology (BCMA), which is one of the many forms of medication technology used in hospitals and often involves the scanning of a patient's wristband using a wireless handheld device. According to Young, Slebodnik, and Sands, BCMA is used to guarantee and verify the 5 rights of medication management: right drug, right time, right patient, right dose and right route and has effectively reduced the incidence for medication error (Young, Slebodnik, & Sands, 2010).

However, the majority of studies on medication administration technology mainly focus on the reduction of medication errors, through the elimination of the 'human factor' (Boonen, Vosman, & Niemeijer, 2015). Franklin called attention to the fact that the patient perspective is missing from the research done on the different stages of the medication process (Franklin 2014). What is more, these articles seem primarily interested in the pharmaceutical impact of the medication on the patient. Consequently, no studies were found reporting how BCMA intervenes within the relational triangle of technology, nurse and patient. This is remarkable, due to the fact the use of BCMA not only changes the work of nurses (Holden, Rivera-Rodriquez, Faye, Scanlon, & Karsh, 2013), but also standardizes the medication process (Boonen, Vosman, & Niemeijer, 2015) and (thereby) has the potential to organize and influence patient experiences on medication use. For instance Niemeijer, Depla, Frederiks, and Hertogh have shown how patient experiences of monitoring technologies always entails a certain ambivalence, whereby unforeseen spin-off effects of the new technology measures sometimes take on more significance than the main purpose it was intended for, making it difficult to predict how patients will experience them (Niemeijer, Depla, Frederiks, & Hertogh, 2015). In the case of BCMA there appears to be a lack of awareness of what the (moral) impact is when supplying every new patient with an electronic wristband. Andersson Marchesoni, Axelsson, Fältholm, and Lindberg have warned that a 'technology-based rationality' may compromise a care-based rationality.'(Andersson Marchesoni, Axelsson, Fältholm, & Lindberg, 2015, p.1). As Marck has noted, the use of technology provokes moral choices in daily life, necessitating a critical dialectic in nursing, whereby nurses should develop a (more) critical standpoint with regard to what it means to be a nurse in a world of technology (Marck, 2000). To that end, the practice of nursing might look more towards approaches that try to 'capture' thoughts in action and use both theory and story. Accordingly this study reports on an ethnographic study carried out in a Dutch hospital focusing on the experiences of nurses and patients with BCMA.

7.2. Method

7.2.1. Design

For this study, use was made of institutional ethnography (IE). IE focuses on a 'problematic', namely the everyday experiences of people working and living in an institutional environment. In this case the everyday experiences were those of nurses and patients in an orthopaedic ward of a Dutch Hospital. One researcher (the first author Boonen) carried out participant observations between 2011 and 2012. These observations entailed following the nurses during their shifts, asking them questions and closely observing all medication related activities.

In addition, interviews and focus groups were conducted with staff and relevant others. The gathered data was recorded on tape and later transcribed ad verbatim. Although the patients' point of view was not our direct point of entry, information from the patients' files, were used to create a better understanding of these experiences, thus enabling the researchers to reflect on the role of the patient and his/her institutionalization. Crucial to IE, according to Smith (2005), is the understanding that acting subjects in practices, either physically, or in their activities, are always connected with others, and that these practices are institutionally ruled through texts (such as laws, procedures, manuals, protocols etc.) (Smith, 2005). 'Ruling' is also the concept that Smith uses to describe the socially-organized exercise of power that shapes people's actions (Campbell & Gregor, 2004).

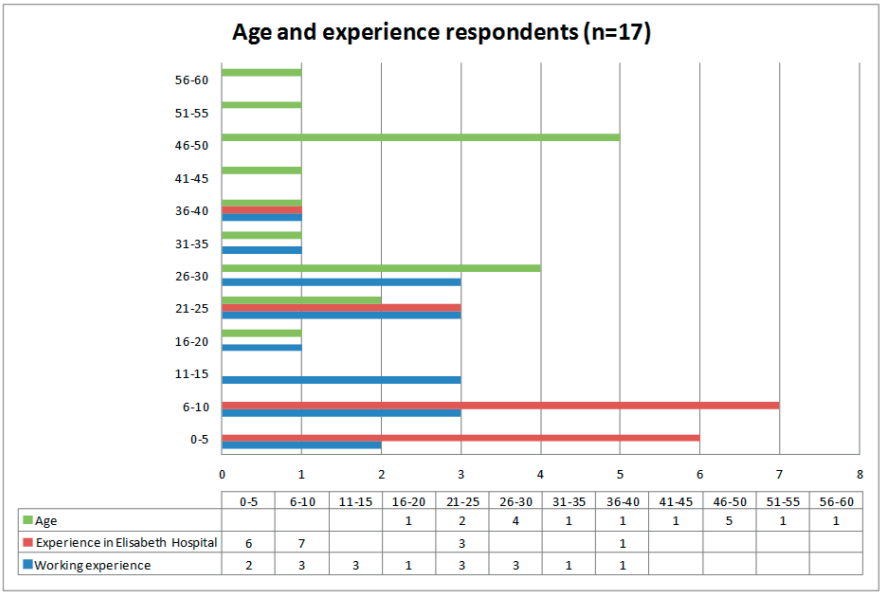
One of the main entry points of IE is the *small hero*. In our case, the small heroes were the nurses, who are regarded as having inside knowledge of their situation, thereby possessing 'organizational literacy'(Smith, 2006). Using this epistemological lens of IE during the analysis, close attention was paid to how institutional ruling manifests itself, both in the observations, interviews and the analysed documents.

7.2.2. Setting

The research was conducted in a large general hospital in the South of the Netherlands. The orthopaedic ward of this hospital had a capacity of 30 beds with a staffing budget of 21 fulltime nurses. Some of the nurses work part-time, so the team exists of 26 level 4 or 5 nurses and 2 level 3 caregivers.

7.2.3. Participants

All of the informants were nurses with a 4 or 5 educational level who are qualified to distribute medication. All respondents were female nurses (figure 1.). Seven observations during seven different shifts were performed. Dates were selected at random,



	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
Age				1	2	4	1	1	1	5	1	1
Experience in Elisabeth Hospital	6	7			3			1				
Working experience	2	3	3	1	3	3	1	1				

Figure 1. Overview participating nurses

picking shifts and approaching nurses with the request to observe them during their shift whilst working with BCMA.

7.2.4. Informed consent

The ethics committee of the hospital where the research was conducted approved this study, whereby it was stipulated that even though patients were not directly involved in the study, they had to be informed and all data had to be anonymized. Informed consent was asked twice of the participating nurses. First, at a team meeting the nurses were informed about the study. Each nurse who decided to participate provided informed consent verbally. Secondly, just before an observation of a shift would start, the nurse would be asked again for his/her consent. Permission was given to record the observations, to which no one objected. Nurses subsequently read the transcriptions. Also, all participating nurses were informed that at any time in the research they had the option to withdraw from the study.

7.2.5. Data collection

Data were collected over a nine months period between September and May. Rather than solely interviewing the nurses, participant observation was conducted, which also entailed spect-acting as a specific strategy (Gill, 2011). Spect-acting offers the researcher, who is also a 'knower', the opportunity to participate in the process he or she is researching- in this case that of medication distribution, thereby making the re-

searcher's presence feel (more) natural. Seventeen different nurses (who were selected at random) were followed during their shifts. In total seven observations of eight hours (the complete duration of one shift) were conducted, including three day shifts, two evening shifts, and two night shifts, in order to get a comprehensive overview of what medication distribution looks like 24/7. In addition to these observations, four nurses were interviewed (semi-structured) using vignettes describing their experiences working with BCMA. Documents like policies, manuals, working instructions, reports of project-meetings, procedures, and protocols were analysed regarding BCMA used in the hospital.

7.2.6. Analysis

As stated above, the analysis of the data drew on central epistemological tenets of IE, thus focusing on the ruling relations of the small hero (Smith, 2006). The data collected was subsequently cut grouped into what can be called 'scenes', as a unit of analysis. The idea of a scene as a group or cluster of activities is put forward by Woo, Rennie, & Poyntz. Instead of viewing a scene as a linear scenario in a film, they suggest that a 'scene' analyses how action is enabled, mediated, and constrained (Woo, Rennie, & Poyntz, 2015). By using scenes certain trails could be followed regarding BCMA and also rendered the data discussable and prepared it for further rounds of analysis. The parts of the scenes were thus numbered in ascending order for traceability reasons, and given a reference code, ultimately resulting in 249 unique scenes.

Two responsive evaluation sessions were conducted: one in 2013 and one in 2015.In line with IE, the collected data and concomitant analysis is 'given back' to the practice that was researched. Therefore the first evaluation was done with a multi-disciplinary group including nurses, pharmacists, information and communication technology (ICT) staff, a vendor, a manager, and a physician and was intended as a member check. The second responsive evaluation was conducted with a group of fifteen nurses from different wards, all working with BCMA, and was intended as a form of triangulation, the idea being that if the data and analysis would resonate with this group it would improve validity. Finally, the data analysis was also discussed amongst several methodological experts and scholars ('peer debriefing'). If there were discrepancies in the analysis, these would first be resolved in the research group, and if necessary through consultation with the experts. This increased the quality of our study. In the presentation of the results we have chosen for the *thick description* of two scenes (which were accordingly selected) as opposed to using multiple examples, by describing the phenomenon observed in sufficient detail, thereby allowing for a richer analysis.

7.3. Results

In this section, two scenes will first be described where nurse, patient, and the BCMA form a triangle within medication distribution, thereby allowing us an entrance to the observed practices. The two scenes will subsequently be discussed.

Scene 56

When a patient is admitted an assistant of the pharmacist performs the intake. All the home medication is subsequently checked and data are entered into BCMA. Afterwards if the doctor decides to continue this medication she/he can import the medication data into the order menu thereby enabling the nurse to administer prescribed medication to the patient.

A nurse enters the room of Miss M.

It is just past 17.00 hours

Ms. M.: *"Hello nurse, at this time of day I normally take Tramal?"*

The nurse scans medication, sees that the first administration entered by the doctor is 22.00 hours. The nurse then scans the medication and hands it over to Ms. M.

Ms. M.: " *Excuse me nurse, but this pill has a different color. I am not going to take this."*

Nurse explains that the hospital probably has a different supplier to the formulary which explains this difference.

The husband of Ms. M., who happens to be present at the bedside, agrees with the nurse and tries to convince his wife to take the pill. Eventually he gets Ms. M. to take the medication.

Scene 99

Ms. L. asks for her diclofenac (pain medication).

N(urse): *"Let's see (thinks out loud), how many days after surgery. (Hums)..actually, you are supposed to be discharged today?"*

Ms. L.: "*Yes, but something came up." (talking simultaneously).*

N: *"Yes, but that is why the pain medication has been stopped, because you only get this the first…..(doesn't finish her sentence, but N refers to a protocol that prescribes how long a patient receives pain medication after surgery)."*

Ms. L.: *"So, I get nothing for the pain?"*

N: *"Three days yes, no, no that's the principle."*

Ms. L.: *"Well that's clear then?"*

N: *"Yes…..do you have pain now?"*

Ms. L.: *" Yes.. I will feel comfortable when I can get one."*

N: *" It gives relief?"*

Ms. L.: *"Yes, sure."*

N: *"Euhm…"*

N: " *You can get these painkillers in every store in town."* N looks at the researcher to see if he agrees.

Ms. L.: *"When I use diclofenac, do I have to take antacids?"* Ms. L knows this from the experience of recent days.

N: *"Yes, you'll have to use pantazol. At home I also use diclofenac without pantazol, but it has been found that this can become problematic."* (again talking simultaneously with the patient). *"But if you want I can give you a diclofenac right now?"*

Ms. L.: *That would be a luxury."*

N: *"Luxury,* (starts to laugh) *We don't do luxury here, just painkilling."*

7.3.1. Double Institutionalization

Using an IE lens allows us to see in the two scenes how both, the two patients and even the acting nurse(s) are institutionally ruled. This ruling however differs with regard to context (i.e. home situation versus hospital situation). For instance, the moment that Ms. M. points out to the nurse that this is a pill she doesn't recognize, Ms. M. appears to

partake in the institutionalized ruling of her home situation, where she is confronted with the preference policy of her insurance company to only reimburse designated versions of medication. Interestingly, the hospital pharmacy has its own purchase system of medication, which means that as soon as Ms. M. is admitted, she will enter into a different part of the insurance system which, due to different ways of financing, requires the hospital to provide Ms. M. other versions of the same medication. However it is not the only institutional ruling which dictates the manner of medication distribution with regard to Ms. M. The fact that at first Ms. M. refuses to take the pill she doesn't recognize is also because she is accustomed to the leaflet of her home medication which contains a governmentally issued instruction for people to be responsible citizens and never take medication you don't recognize. What is more, as a patient of the hospital she has also been asked to be vigilant and take action whenever they perceive potential risks (as instructed per hospital safety card, specifically designed for elderly patients and distributed on admittance). Ms. M. does not think in terms of medical errors and efficiency, rather, she worries about her home medication habits and her own safety. The reason she left her medication at home is because she automatically assumed that the same medication would be provided by the hospital as soon as she was admitted. Because the nurse who scanned her bracelet can't find the right medication in the system, she turns up with a pill with a totally different name, which leaves Ms. M. even more worried. Consequently, by initially refusing the medication, Ms. M. is also addressing a safety issue in relation to her medication, which appears to not be properly valued as such by the nurse. Eventually she agrees to taking the other medication, but only after mediation of her husband and because she doesn't want to be a burden to the nurse, thereby ultimately partaking in the institutional ruling of the hospital.

With regard to Ms. L., the nurse is looking for a loophole within the hospital protocol, trying to find a legitimization which might solve this practical problem. There are strict rules within the hospital about the use of diclofenac, as the nurse is not allowed to provide Ms. L. with diclofenac without a prescription of the doctor, even though outside of the hospital diclofenac can be bought in practically every drugstore. Another one of those rules dictates that patients always have to combine the use of diclofenac with an antacid, which is (also) not the case outside of the hospital. What is more, the nurse even confesses to Ms. L. that she herself uses diclofenac without antacid at home.

A double institutionalization can thus be traced, according to whether you live at home or are admitted to a hospital. To Ms. L. it is not only a matter of taking the medication, but also about what meaning the nurse gives to taking diclofenac both within a hospital and within a home situation. In hospital, safety considerations including scientific knowledge (i.e. diclofenac to be combined with antacids, in order to prevent

the risk of ulcers) appear to prevail, whereas in the home situation other considerations such as habit, practicality and extra expenses appear to be more important when combining medication. In both cases Ms. M. and Ms. L., who are initially part of the institutional ruling of home-care pharmacy, are confronted with the institutional ruling of the hospital after admittance, which ultimately leads to Ms. M. acquiescing to the institutional ruling of hospital regulations, despite her attempts to stay loyal to her home medication.

7.3.2. Technology

With regard to Ms. L., BCMA as a technology only shows the entered orders despite the underlying discussion between the nurse and Ms. M. about the difference in medication (specifically in pill color) with regard to the medication she is used to taking at home. The nurse and Ms. M. thus have to adapt to what the system dictates, because not complying would ultimately result in no pain relief.

What is more, due to the late admission of Ms. M. (17.00), the physician does not know whether she has taken her medication at home already, and because it is the end of his shift and he is pressed for time, in order to prevent that Ms. M. might take a double dose, he enters 'first distribution' to commence at 22.00 hours into the BCMA, to be on the safe side. Fortunately, Ms. M. points out that she hasn't taken her medication yet, and due to her experience, the nurse also immediately understands what the underlying intentions of the physician were when she read his directive. So she solves this problem by selecting the admission of 22.00 (even though it is still early, around 17.30) and hands over the medication to Ms. M. The nurse subsequently writes down on her printed patient list that the admission of 22.00 (which has now already been given at 17.30) has to be changed into the BCMA as a 'one time admission.' (thereby not disturbing the initial directive of the physician). This is an alternative route she discovered in the BCMA. If she does not do it this way, official protocol dictates that she has to bother a physician and convince him or her of the fact that the whole order of distribution in the BCMA will have to be re-entered, which is very time consuming.

In case of Ms. L. the BCMA and the protocol appear to rule the deliberations of the nurse and leave the patient with a remaining problem: the non-elimination of pain. The technology demands a new order, even though the actuality of the situation might ask for a different intervention. For instance, in the case of Ms. L. the BCMA makes the nurse focus on the protocol instead of Ms. L.'s message telling her that she is in pain. The BCMA indicates to the nurse that it is no longer allowed to provide her with painkillers.

7.4. Discussion

Our findings indicate that BCMA appears to follow a linear logic which can contrast with the local 'care logic' nurses adhere to, in order to best support their patient. As Mol has pointed out, a "logic of care" is not a matter of simply making error-free choices, but is something that grows out of collaborative and continuing attempts to attune knowledge and technologies to diseased bodies and complex lives: "to act without seeking to control. To persist while letting go." (Mol, 2008, p. 28). BCMA however, seems to provide a barrier when trying to solve a problem or dilemma, which comes to the surface as a result of the institutional ruling that is mediated through the BCMA. As a consequence, both nurse and patient are constantly looking for opportunities to work *around* instead of *with* the BCMA.

In the context of nurse-patient practices, as soon as technology such as BCMA is introduced in a caring relation, it starts to behave as a third person. According to Verbeek, technologies can be the terminus of our experience. This 'alterity relation' occurs when interacting with a device as if it were another living being or intelligent actor, as appears to be the case with BCMA (Verbeek, 2005). Technology is not neutral within this triangular relation, it can be very steering and decisive, as is exemplified by nurses who state: "I can't give you this medication because the system won't let me." Instead of removing BCMA from the equation, both nurse and patients keep talking with, through and around the technology, thereby remaining within the relational triangle the whole time. What is more, BCMA gives another meaning to even the most mundane forms of taking medication: rather than just being able to follow the instruction of the medication's leaflet, protocolled mouse-clicks are constantly involved.

Consequently, BCMA can potentially set back the patient in his or her participation in the caring process, as the BCMA becomes leading (i.e. color of the pill and request for pain medication) instead of the (need of the) patient. This is in part due to the fact that BCMA constantly draws the attention of nurses towards the technology rather focusing on the actual patient in need. What is more, BCMA seems to install in the nurse a different 'presence': namely that of a system administrator. To Pols and Willems users of medical technologies are involved in a mutual activity, which 'shapes different goals that characterise the process, that may eventually lead to domestication – or rejection. In this process of experimenting, none of the actors stays the same (Pols & Willems, 2011). Although nurses' actions are steered by institutional regulations, whenever there appears not to be a 'fit' they have to bend the rules in order to provide good care. Nurses are not able to communicate this with the organization. Moreover, we found that, as a reaction to these 'workarounds' in nursing care, the hospital had installed a so-called 'flying brigade' consisting of managers. The flying brigade would

descend to the work floor to point out to the nurses that they had to follow the technology instead of working around it, even if the nurses had a plausible explanation for their work arounds. As was seen in our findings, this can lead to the technology being "the main reference point to interpret and evaluate clinical patients outcome." (O'Keefe-McCarthy, 2009, p.786). Consequently, BCMA should not be regarded as a mere 'instrumental' technology, as it consistently intervenes within the caring-relation (Verbeek, 2005, O'Keefe-McCarthy, 2009).

7.5. Limitations

A limitation might be the narrow focus on BCMA, not including additional healthcare technologies (such as ventilators, dialysis machines or monitoring devices such as insulin pumps), thereby potentially overlooking other important issues. However we believe that in order to capture multi-faceted and complex practices, the focus had to be narrowed down to a very specific form of technology. What is more, we specifically chose the example of BCMA because of the underlying safety discourse which surrounds its application (i.e. BCMA is supposedly inherently safer, because it reduces human error). Our findings might possibly be common in different settings, including different technologies. This however, warrants further study.

Another potential limitations of this study might be the lack of heterogeneity of the cohort that participated (i.e. all participants were female) which might raise questions with regard to generalizability. However, we believe the cohort that participated is reflective of the average working nurse in the Netherlands. There is a risk in including multiple perspectives as this might lead to conflicting perspectives and contradicting information. Nevertheless, observation alone would probably not have elicited as much variety and richness of information (Niemeijer, Depla, Frederiks, & Hertogh, 2015). Accordingly, we did not strictly adhere to the fundamentals of IE which only focuses on small heroes, institutional organization and ruling of the actuality. Instead we opted to allow insights from Practice theory, in order to convey the deliberations behind the actions of both nurses and patients.

7.6. Conclusions

The use of BCMA is often an extension of institutional ruling which can profoundly affect the patient's participation in the care process. Even though technology in general is often considered as a means to enable patients' self-care, BCMA (as a technology) does not appear to take the unique circumstances of each individual patient into account, but is rather organized around a generalized individuality. This results in pa-

tients becoming even more dependent on technology than the nurses who use it. What is more, although technology such as BCMA might solve problems (in particular with regard to safety issues), it also transforms care, specifically the relationship between nurses and patients. The dominant view within the hospital setting is that reduction of the human factor through the introduction of more advanced technology increases patients safety. The organization continues under the assumption that all technology will increase safety and is almost infallible. This research shows that whilst being stuck between the organizational ruling and the patient's needs, the processes of nurses' deliberative tinkering nevertheless supports safety (Boonen, Vosman, Niemeijer, 2016).

As Tronto has pointed out, the caring process starts with caring about: "It calls for moral quality of attentiveness, of a suspension of one's self-interest, and the capacity genuinely to look from the perspective of the one in need."(Tronto, 2013, p. 34). However, due to its systemic rationality, the use of BCMA inherently involves turning attention away from patients. Or as Achterhuis formulates it: "Technology preordains or at least channels our decisions." (Achterhuis, 2001, p. 20).

Ultimately, any hospital organization wishing to implement new care technology successfully should take into consideration how new technologies both continuously affect the caring relation and the organization of care in general, rather than viewing it as a relationally neutral tool. Using qualitative approaches such as IE and combining it with elements of practice theory might be more fruitful in determining how institutional textual ruling might influence nurses' actions and behavior.

Ideally, hospitals and vendors should invite nurses and even patients to participate in the development, preferably *before* implementation of medication technology, so that BCMA is used in such a way that it addresses the specific needs of both nurses and patients.

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7.8. Conflicts of Interest and Source of Funding

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Interlude

This last chapter shows that BCMA not only changes the position of nurses but also subordinates patients. The only way of escape for patients – as I have suggested several times – is to bargain with the nurse and convince them that they can handle the responsibility. In the instance quoted, the nurse only accepted that she could take responsibility for changing the procedure after the doctor had expressed no objections in respect of safety. (Certain medication is not allowed before an operation).

Scene 49

The nurse notes (during the medication round) that a patient has to get an antibiotic. It is 16.00 hours. At first she thought it was an intravenous administration, but now she sees that it must be administered orally.

She puts the pill in a medication cup, and with a black marker she writes 17.00 hours on it. She tells me that this is a reminder for the patient and she explains this to the patient also. She places the cup on the table near to the patient who is on his way to the restroom. In this case, the nurse is breaking the rules. According to the rules, she must hand over the medication at the right time and is not allowed to leave it unattended. Later the nurse explains to me that, due to the workload and workflow of a shift, it is impossible to follow the rules. Many patients are not in their rooms when she brings the medication. Following the rules would mean that whenever a patient turns up in their room the nurse has to go to the locked medication room fetch the heavy rolling medication-cart push it through an automatically closing (safety) door, which is physically very inconvenient, take the cart into the room, start up the system hand over medication to the patient, close the system and bring the cart back. She explains that this causes stress and is, in any case, impossible because it is too time-consuming, especially during the evening shift on an operating day where there are many patients who need special care. Patients are aware of the pressure on the nurses and cooperate by reassuring them that they will remind the absent patient to take their medication when they return to the room.

Scene 34

The nurse scans the wristband of a patient and sees that this woman uses Actokit (drug combination of sodium and calcium in a package of 7 pills). The nurse does not recognize this very specific medication. The nurse looks at the packages: *"This looks quite similar to a birth-control calendar-oriented package."* The nurse deploys her aggregated knowledge in order to grasp how she should distribute this medication. The

package shows 6 small pills and one bigger pill. Pill seven is already removed from the package, so it seems as if the medication has been administered incorrectly. The nurse consults the patient who tells her that on her day of hospitalization she had already taken her medication at home. Now, due to Hospital and insurance policy she has to take medication provided by the Hospital. The nurse who did the admission removed the seventh pill to prevent another nurse from making a mistake and administering a double dose to the patient. The nurse: *"This patient is able to tell me this, but what if that was not the case. Some patients completely put their trust in us and take whatever pills we give them.'*

8.

General Discussion

8.0. Introduction

In this final chapter I will discuss my research and address the major issues concerning nursing practices in relation to the ever-increasing influence of technology on nurses' daily work, using BCMA as an example of technology. Because this research is undertaken from the perspective of the nurse as 'small hero' (see model on page 48) and has a distinct emancipatory goal, I will also do some self-reflection to see whether I have remained loyal to my aspirations, or whether I have had to deviate from my intended path. Finally, I will reflect on the different theories I used, asking whether the theories that I selected were helpful in interpreting my observations. It will become clear that I now feel constrained to amend some of these theories in their application.

In section 8.1. I will further examine the societal and scientific importance of this research. The use of BCMA entails that nurses question the use of technology in their complex nursing practice; this implies questioning the organization, the performance, and priorities of their practice. In my research I have tried to develop an approach that allows reflection on the relationship between nursing practice, technology, and the organization that implements the technology.

Section 8.2. will be a reflection on my adaptation of Dorothy Smith's model of the small hero.

In section 8.4. I will elaborate on the major theoretical findings. The complexity of the nursing practice has urged me to use three different theoretical lenses. Bringing together three different perspectives gives us a grip on the complexity as nurses experience it.

In section 8.5. I will reflect more in-depth on two of the theories applied, Institutional Ethnography and Practice theory, used in combination. While the philosophy of technology, as developed by P.P. Verbeek, characterized my approach at the outset, in order to understand the observations I was making. Since I was examining 'organisationally coded practice', i.e. the practice of medication distribution, I felt it beneficial to introduce IE. However, there were good reasons to use IE in combination with practice theory, in particular the elements that address the physical, material, and temporal character of (nurses') practices. In section 8.5.1. I focus on my observation technique and follow this in 8.5.2. with a short discussion on power. Section 8.6. is dedicated to the implications of the major research findings. I will elaborate on the implications of this research for nurses' practice and the place of nurses in an environment that is ever more invaded by technology.

The conclusion forms section 8.7.

In the study I do take account of the ethics of care. Looking at a caring practice, bottom up, from within a practice, paying close attention to the perspective of both nurses and patients is an approach that I value within the ethics of care. While this study did not aim at advancing the ethics of care, carrying out research with this degree of closeness to a singular and particular practice of care is potentially enriching to that field. The ethics of care claims to work from within practices of care (as promoted by Barnes, 2012, Tronto, 2013, and others). It positions theorizing (on caring practices) amidst the practices of care. This is precisely what I have done, in order to be able to interpret my observations and grasp the chafing that occurs in care practices. In this sense my approach is consonant with the ethics of care research as carried out at the University of Humanistic Studies, whilst I remain modest about contributing to any theory development in the field. I do hope, however, that my quite radical bottom up inquiry from within nursing practice, using the perspective of the practitioners, is inspiring to those who study the ethics of care.

8.1. The importance of this research

What problem on a societal level has been confronted by this research? Technical innovations in care and cure are often implemented to increase patient safety and BCMA is one such innovation. Mistakes with medication administration are often very impactful and often these mistakes are framed as *human* mistakes. Patients' safety is indeed the most important reason for developing and implementing BCMA.There are, however, also more remote causes such as the emphasis in health care policy on effectiveness, on avoidance of negative consequences (like taking distance from protocols and undesirable workarounds), on maximum transparency and accountability: clear cut 'deliverables' have to be presented. When there has been mortality caused by medication mistakes, the deeply felt disquiet is met with a certain amount of calming control (by government or by hospital management). With the use of BCMA comes the introduction of control: data on use of medicines are fully available and subject to influencing and correction. The behavior of practitioners is fully under control. This is the way of framing the problem and presenting the solution. In sum, the use in a general hospital of a drug safety system such as BCMA has a complex background, with different links to policy making. The development and implementation of BCMA works from the assumption that it will increase general safety because nurses are forced to comply with the system.

Whether this is the case in everyday practice is of course questionable. How is the problem framed in academic approaches to the matter? This thesis is about how medication technology (BCMA) intervenes in nurses' practice, and how it also determines those practices. In the philosophy of technology, the straightforward idea of problem solving by implementing coercive technology is questioned. Verbeek (2005) shows how technology serves as an actor (and is not solely a means to an end). With the introduction of a new actor, other practitioners, such as nurses, start to react and will develop new behavior, but not necessarily the behavior policy makers want. Addressing this problem helps us gain some new insights into how technology, with its linear logic, clashes with the non-linear logic of the practice of care. How can we determine the relationship between actual nursing activity and control? Institutional ethnography (IE) raises the problem of how power works. IE enables discernment of the organizational relationships of power and influence. IE concentrates on the relationship between organizational ruling by texts and actual (nursing) practices.

Practice theory on the other hand opens up the space to observe bottom up from within practices. It enables us to see what nurses actually say and do, how their thought actually develops, how they deliberate, while dealing with BCMA *and* with actual patients and organizational circumstances.

Peeling off the layers of the problems as identified by scholarly disciplines, one discovers that practitioners have different sorts of knowledge of their own. In nursing practice it is not just one type of knowledge – provided by technology – that is 'implemented': different sorts of knowledge come together: i.e. theorized knowledge, book knowledge, practical experiential knowledge, knowledge of how things are done, and how it is connected to practice. Schmidt's (2012) theory enabled observation at a deeper level to reveal how physicality, temporality, and materiality act and yield implicit knowledge. So far I have exposed the societal problem that BCMA sought to address, and have shown how different views can be taken, once we recast the problem using the three theoretical approaches. I now turn to the new routine that nurses develop while dealing with BCMA.My research highlights the importance for their work of their practical wisdom.

As was evidenced in our study, nurses try to deliver medication within the institutional ruling of a given technology. At a certain moment, however, their deliberative knowledge forces them to choose an alternative route, whether within the context of the given technology or by completely working around the given technology. They do this in order to deliver good and safe care. Compelled by the particular situations or the demands of the patient, nurses sometimes cannot stay within the boundaries set by

the organization and its technology. Despite their best efforts to stay within the technological logic, sometimes the logic of the caring practices demands another action. The research showed nurses trying to reconcile these different logics.

The *theoretical* focus of this research is on the contradiction between the logic of care and the logic of technology i.e. BCMA. The dominant view within the hospital setting is that reduction of the human factor through the introduction of more advanced technology increases patients safety. The organization continues under the assumption that all technology will increase safety and is almost infallible. This research shows that stuck between the organizational ruling and the patient's needs, the processes of nurses' deliberative tinkering also supports safety. I believe that the important *practical* revelation in my study is that nurses act, think, and speak in an intelligent way when dealing with BCMA. They are, in Dorothy Smith's words, small heroes.

8.3. The adjusted model of the small hero

Before describing my main findings, I reflect on the model I used to examine the nurse discourse (chapter 3). First of all, the model as given by IE offered an analytical framework. It helped me to cut up the observed practices into scenes within which I could observe what a particular nurse thought, did, and said, if and how she related to protocols. I could also examine the texts produced by the BCMA (a pop up text, a command to do 'this' first etc. see chapter 3, section 9). This made the complex data on different practices easier to analyze. The model visualizes the discursive references of nurses (the small heroes) around the institutional texts and ruling relationships (IE) active in their work with BCMA. An example of such a reference is the answer a nurse gave to my question: how do you come to this action (X or Y) in this particular case?: *"I read it in the protocol"*. This is what I call an indication for the institutional regime.

The observations, however, brought out a more complex practice than text referencing only. By bringing practice theory into the model (see arrow in figure 7. p. 63) I created the opportunity to look into *institutional* discourses as well as nurse deliberations. It showed nurses deliberating internally (within themselves) as well as their deliberation with their colleagues. The actual doings and sayings proved to be broader than referencing text only. This is a point of discussion with IE, as IE denies that there is anything more decisive than textual rulings. This is an important addition to Dorothy Smith's model (2005).

I also put an element of the IE version of the model into the background: the original model of Dorothy Smith mentions the State as a level of analysis. It was never my

intention to analyze the institutional ruling according to the meta-level of the State as such: I focused on the analytical level of the hospital ward. By adding the nurse discourse, I enriched the data with the voice of the 'small hero'. I do, however, point to state (political) influences such as the safety discourse coming into the hospital, where they are noticeable in a scene. And I have added something important the nurses' deliberations. These deliberations are not only a way of talking back to the organization in an institutional manner, as IE states, but also talk back in a way that is based on practice-driven experiences.

8.4. Talking back to literature

In this paragraph I will reflect on the use I have made of a particular theory on technology: I came to describe BCMA technology as disruptive to nursing care. Here Peter Paul Verbeek's philosophy of technology, in its moderate version, (2005, 2011) proved to be relevant, especially its stance on practice, in which technology has become a co-creating factor within nursing practices. Within a more classical ethical approach, concentrating on the human rational subject, it is impossible that 'things' act, they are mere tools. Verbeek has provided the argument that 'things' do act, as he describes how technology has invaded human action and co-acts. Verbeek states that people are the inventors and builders of technology and thus implicitly bear responsibility for the technology in use.

This responsibility is not taken in a clear way. In the nursing practice I have observed nurses stating: "*well, I do not have any influence on this technological device"*. During my observations nurses frequently told me that as soon as the technology of BCMA comes into use, it is no longer in their hands, as if technology becomes an autonomous other. Verbeek states that this is a classical view on technology that we have to overcome. We have to take responsibility for the technology we use (Verbeek 2005, 2011).

This 'actorship' in relation to technology is also reflected upon in practice theory (showing how both Verbeek and practice theory are indebted to Actor Network Theories, ANT). Practice theory gives the opportunity to bring in two more crucial insights in IE, namely the materiality of technology and the discourse of nurses.

All the authors that have added to the theoretical notions employed in this study, Smith, Verbeek, Nicolini, and Schmidt, criticize dichotomous thinking. A powerful example of such a dichotomy is the urge to follow at all times the linear logic of BCMA and the absolute ban on any workaround, as safety is defined as 'actions following the system'. Reinterpretation of safety for this particular patient and in these particular

– and complex – circumstances on the ward is a no-go area. Instead of using dichotomous categories we have to bring in forms of knowledge and different kinds of logic and practices and consider them together rather than see them as separate entities. I have noted many examples where the knowledge of nurses, i.e. their feedback to the system builders, was denied value. The feedback, for instance, that going into the room of the patients at night with the BCMA chart (4 people in one room) creates too much noise and all are woken up, was rejected, even when it was a consideration other than safety. Schmidt notes that these two different kinds of knowledge tend to repel each other, whereas it would be advantageous if they were brought together. I have given a model in Chapter 2. figure 2. that is based on the way in which Schmidt reflects on a series of dichotomies and demonstrates a way out. These dichotomies develop into paradoxes and instead of insisting on one single model of thought it proves more effective to bring elements together. This is exemplified in the combination of different and sometimes opposing kinds of thought found in the AGILE approach. The main features of this business model are flexibility and adaptability to customers' wishes, with a focus on added value. This approach would be more loyal to both the aim of safety and to the actual complexity on the ward. If we adopt this type of approach, it will open up a view on practices and their problems in a connected and relational way and we even might find sustainable solutions. I return to this in paragraph 8.6. on findings, as I want to advocate an even more challenging approach which will provoke systems, rather than merely adapting them with feedback loops.

In addition to adopting theories such as Verbeek's philosophy of technology , I felt constrained to formulate some criticisms or add insights that have proved essential. There are two observations with regard to Verbeek's idea of technology: (1) the need to extend the definition of technology and (2), the coming together of different logics that blur the unequivocalness of the 'original' logic of BCMA (original: as designed by the engineers).

(1) In my opinion Verbeek does not pay enough attention to the fact that 'techniques' (protocols, instructions and so on) stem from technologies:

"Technique is the creation of the kind of thinking that is necessary for technology to develop and be applied in an efficient and rational manner." (Locsin, 2005, p. 25).

An example of a 'technique' is a manual about how to use a particular kind of technology. My proposal is to use a more precise idea of what technology is: Yes, it is the material, a mere technical device, but also the implied *modus operandi*; the manual (with its many statements in the form of 'if this.. then act like this') is also an integral part of technology. Techniques (in the sense used by Locsin) belong to technology.

In a personal contact with Verbeek we spoke about his broad definition of technology. This brought us to the subject of how to appoint things that derive from, or are necessary for, understanding or working with technology, for example, protocol and instructions. After a long conversation he agreed with me that these techniques, as Locsin calls them, can also be called technologies within Verbeek's definition.

(2) Actually the original logic of the BCMA gets blurred as other logics, e.g. the logic of the hierarchy (physicians are permitted to take different actions from nurses with regard to drug prescription) are imported into the BCMA and changes its original logic. This 'actual messiness' (as I call it) should be considered as an integral part of technology.

Thus, technology, to my mind, should be seen more broadly than Verbeek sees it. This amendment does not diminish the importance of his insight in the co-actorship of technology. It does however radicalize the insight: BCMA co-acts within this broader conception of technology, according to which it is not merely BCMA as a technology which is ruling but also the documents and manuals, arising from, and associated with, the technology.

Thus far I have sketched out the particular use of IE as it was executed in this study, for what reasons it was adopted, and why I felt it necessary to expand Verbeek's ideas on technology. An important feature of the research design was to combine (the altered version of) IE and practice theory, confining myself to the version of practice theory put forward by Davide Nicolini and Robert Schmidt. I did not intend to change, amend, or criticize practice theory. What is original in the design of this study is precisely the bringing together of IE and practice theory in a meticulous way: the practice theory insights on physicality, temporality, and materiality, make us aware of the actual work of nurses while dealing with BCMA.

8.5. Strength and future potential of a mixed IE and practice theory study

I opted for IE as it is particularly sensitive to the strings of power that can be detected in practices, using the IE concept of 'ruling relations'. Furthermore I thought it was appropriate to make extended observations (extended, i.e. with clarifying interviews), in order to get as close to the nursing practices as possible. This is also part of an IE approach. However, I have also gathered insights in two further ways. I have (a) asked nurses to talk out loud about what they were perceiving, doing, and considering and (b), also asked them to write down events that were remarkable from their perspective. As far as I know, this way of data gathering is not described in IE literature. But it makes

it possible to achieve a more in-depth analysis than the standard IE analysis. It is a possible enrichment of IE. A noteworthy example is this: a nurse wrote down that she had taken into consideration a lack of clarity that she perceived with regard to administering antibiotics. As well as noting her observations in the Electronic Patient Data, in her report to me she wrote that when she got home after her shift, she telephoned her colleagues on the ward, explaining her concerns with regard to the patient, and warning the night shift to make the right decisions. BCMA does not give support in a situation where there is lack of clarity.

IE wants to link the local and the translocal. This study enabled us to observe that BCMA even invades the private sphere.

But IE did not prove adequate to enable a thorough understanding of the actual operations in nursing practice. Nursing practice is, to a very great degree, a matter of cooperation, of hard bodily work, and of dealing with people's (patients) physicality. When I introduced the perspective of Practice Theory alongside IE, the combined theories did provide broader insights into the experiences of nurses using BCMA.

The strength of combining IE with crucial elements of practice theory lies in the combination facilitating an examination of the same data through different lenses. As stated in chapter 4, it offers the opportunity to get close to the institutional textual ruling which strongly determines nurses' actions and behavior. An example is to be found in scene 20 where a nurse on her medication round discovers that a patient is in the bathroom. The nurse is stressed because she has to get on with her work. Her instructions require her to push the heavy medicine cart back to the medication room that can only be opened by entering an entry code. As soon as the patient has finished showering, the nurse is expected to go and fetch the medication cart. That is what the institutional ruling dictates. Nurses follow the instructions as much as possible, but when it is busy, or during the evening shift, or when the ward is understaffed, it is impossible to follow this rule. Nurses find a workaround, copying and pasting the barcode number of the patient into the system and putting the medication on the patient's bedside table. After a new release of the system, this workaround stopped being possible. While the workaround is now impossible, stress increased, as did the demand for more staff.

In addition to insights into institutional ruling, practice theory and especially the three distinctions of physicality, temporality, and materiality made by Schmidt (2012) (see also chapter 5), offer an additional analytical frame for this kind of research questions. The distinctions carve out space for the individual or group discourse (deliberation) and the physical, temporal, and material experiences (tinkering) of professionals that

is constantly present, but remains invisible when IE is the only method used. Thus I was able to demonstrate how nursing practice is determined by time, both lived time and time on the clock, and by materiality, in the sense of material circumstances, and physicality – as well as in the weary body of the nurse and the sick body of the patient. It became clear how physicality, time, and materiality characterize the work of nurses (see examples in chapter 5).

8.5.1. Spect–acting

Due to the fact that my research did not only focus on 'text' and institutional ruling but also on the deliberations of nurses, an additional technique was necessary to my observation and I introduced spect-acting as an observation technique into my research. To recall the definition of spect-acting: it is a method entailing both observation and reflexivity *on the part of the informants*, thereby opening up emancipatory possibilities in the field (Gill, 2011) and the self-reflexivity of the researcher.

IE and practice theory put the researcher close to the practice and to the nurse working with BCMA. But I had to take measures to stay faithful to the research objective and retain objectivity, while coming close to the subjects in an open and reflective way. One example of the openness of the observations and discussions is as follows.

During one of my observations I saw a label from an ointment stuck to the medicine-cart. I asked the nurse what the origin was of this practice. I saw the same thing repeatedly during my observations, and each time I saw it, I asked the nurse I was observing about its origin. During the member checks I presented these data and discussed them with the nurses for validation of the data. It was the group of nurses that validated the observation and the analysis I presented. This is an example of construing openness.

Observations and perceptions are never neutral and there is always power involved. At the time of the observations, I was the head nurse *and* performing research on this ward. The fact of me performing both roles possibly influence the observed and thus the outcomes, so there is good reason to be extremely alert on issues of power. Spect-acting is then helpful because it enables people not only to speak with each other in an open way, but it also stimulates different forms of reflection when there is a constant, critical voice through which the relationship between researcher and nurses becomes apparent. As a head nurse I openly recognized the difficulties the nurses had to cope with and allied with them to establish the real nature of the problems they were facing. At the same time, the nurses were also actively reflecting on what I was doing. This is exactly what Gill (2011) means: there is change of perspective if the positions of head and nurse are levelled out. During my observations, nurses working with BCMA spoke

aloud, reflecting on the use of BCMA and on my questions. Gill uses the metaphor of people on stage and people in the audience. In this case, the nurse is on the stage and I am in the audience. But as I was actually participating in the medication round during shifts, I sometimes took the stage and the nurse became the audience. She saw me working with BCMA, which offered her the possibility, in turn, of reflecting on BCMA, on my role with BCMA and on her own actions (Gill, 2011).

These spect-acting observations bring us close to the action and enable reflection. This is in line with IE as it also enables us to come closer to the institutional and textual rulings in nursing practice. My use of practice theory to observe and reflect upon the deliberations and actual discourses of nurses is highly compatible with spect-acting as a strategy.

The deliberation, in the broad sense, comes to the fore. Through spect-acting it becomes possible to suspend the monologue of the BCMA that instructs the nurses to act in line with its particular logic. Spect-acting creates a triangular conversation between technology (BCMA), nurse and the researcher.

8.5.2. Power

Now, zooming out from this treatment of the power issue, I return to IE, the theory leading my research, and the perspective it takes on power. I am confident that my strategy to employ IE and to adapt it to the particularities of the nursing practice has been worthwhile. It was never my intention to dive deeply into the (neo)Marxist presuppositions of IE where power is conceived of as domination. Practice theory also pays attention to power but specifically to the subtleties of power in a practice. Here the exercise of power is not always sheer dominance: there is also a lot hidden, not so obvious push and pull, from all actors. And there is reciprocity too: nurses do exert power with regard to technology, in a seemingly limited, yet vital way. Moreover nurses proved to be critical and independent in their thinking. At first I was tempted to follow up the concept of power that is associated with IE, but this study brought me a more nuanced idea of power. It was the combination of my bottom up empirical research (looking closely, writing down observations etc.) and Verbeek's approach to technology that led me to new insights on power. In the practices of nurses working with BCMA it is not so much about suppression or coercion: power is a far more subtle concept.

It is not so tightly defined and connected to subjects and objects. Using BCMA showed that at times it was the technology that ruled nurses' activities or deliberations. In other situations it was the 'materiality' of the technology, as in the case of the nurse trying to push the heavy cart into a room and, on second thoughts, although it was

not allowed, deciding to distribute medication from the cart standing in the corridor. Sometimes the power being displayed was a mix of ruling, deliberation, physicality, temporality, and materiality. When looking close to BCMA, one can see power shifting between stakeholders, sometimes BCMA as a technology is most powerful (as in influential) sometimes the nurses are in a position of power.

8.6. Findings

In this final paragraph I will summarize the main findings of my research. The principal finding concerns the necessity of creative and meticulous deliberation on the part of nurses while they are dealing with drug safety as provided by an external directive. Without nurses dealing with the actual patient and circumstances, without dealing with complexity in the hospital, the effort to enhance drug safety by using BCMA is a lost cause. The paradox of being coerced to act in a prescribed way and at the same time having to use their knowledge, ingenuity and ability to improvise, allows nurses to demonstrate their ability to do both: they tinker, and they deliberate, and they decide!

But it remains a concern that this ability is debased to the level of 'users knowledge'. To a great extent this has to do with different types of knowledge involved, those that are acknowledged (knowledge on the basis of linear logic) and those that are undervalued or even discarded (practice based knowledge). The advance of technology is possible only when the tinkering of nurses is recognized and authenticated.

The logic of the technology has proven to be rectilinear, while caring (in a hospital setting) is meandering. This meandering is disrupted, and this justifies the use of the phrase 'invasive'. In this study it has become not only clear that the idea of technology as a 'simple tool' is inadequate. I strongly advocate a broader definition of technology, including, in addition, material 'techniques' (Locsin) such as manuals and acknowledging the messiness of technology.

A further finding is concerned with the interaction of the 'players on the field', nurses, physicians, patients and BCMA. I use the metaphor of dance to clarify the interaction.

Nurses, physicians and – maybe surprisingly and unintendedly – patients are enrolled in a rather vigorous dance with BCMA, knowing how to adopt, adapt, workaround, and steer against BCMA, while remaining loyal to safety, but also introducing, or rather remembering, another focus for loyalty – that to the individual patient and their actual predicament. This vigorous dance is by no means a type of line dancing, well-orchestrated, with everybody moving at the same time in the same direction. It is more like a

robust Argentinian tango. The metaphor of the dance can be helpful in understanding the intensity of the change brought about by BCMA and the counterbalance provided by the nurses. Nursing practice, while co-acting with BCMA, orients itself on goals other than drug safety in a linear way; alleviating suffering, coping with complexity, and co-operating with others. It is a dance that at different times incorporates different aims. The organizational notion that just sticking to the linear logic of BCMA will enhance safety is simply too simple.

The term 'workaround' has a negative connotation if it is associated with nurse behavior that does not follow the organizational or technological ruling of BCMA (various examples in chapters 4 to 8). Workarounds should be avoided. On the other hand, some organizations make positive use of workarounds which are labeled differently, namely 'system adjustments to ensure smooth progress of the institutional process flow' (recall scene 60, and the example of the anesthetist who does not have to work with BCMA and can still use paper based MATs). I advocate honoring the signaling function of workarounds. It is shortsighted to prevent workarounds by insisting on the linear logic of BCMA. Workarounds are signals both of the intention to provide good care and, when the workarounds are needed, of the dysfunctionality of technology.

The Agile approach, as described in section 2.2.2., is seen as a solution to problems that arise when building and implementing technology. However, Agile is still too institutional because it presupposes a harmonious fluent process of building and introducing new technology and this is rarely the case in the real world. Utilizing this solution to the full by searching for loopholes in the system and reporting them is to be recommended. In a cooperative process of building and 'hacking' the system, technicians and users work together in an attempt to optimize the system and to combine this with an increase in user and patient-friendliness. Inviting nurses to the drawing table is an approach which assumes that the development and implementation of technology is straightforward: involve nurses in the design and things will work properly. It is more time consuming, but ultimately more effective, to design the technology, use it, bring it back to design, and redesign it in a cycle that continues until a workable product is available. The ultimate goal of such development should be that the system supports practices of nurses and patients, and not the other way around. On the other hand, we should always be aware of the fact that new technologies will bring new problems, new possibilities of errors, and thus new workarounds. The best that can be hoped for is to come closer to the optimal solution for patients safety. Nurses do have a role on the road to the optimal solution.

With regard to method, I recommend using the combination of IE and practice theory more widely. It has proven a very fruitful approach in this research. It does have one problem, however. Coping with data is a problem for all researchers but combining methods of research generates such a magnitude of data that more research into efficient and effective ways of analyzing such large amounts of qualitative data is necessary. But advances in data analysis will surely come.

Finally, we made an unexpected discovery that is recorded in our last article (chapter 7). While observing the traffic between BCMA and nurses, I encountered another form of institutionalization that is not strictly a consequence of the use of BCMA. The issue is patient trust in drug safety. Because of insurance and accounting regulations, the drugs prescribed to patients in hospital are often different from the ones prescribed for home use. This decreases patient trust in the actions of caregivers. What I have observed is an accumulation of institutional rulings on the subject. It seems advisable while making policy on BCMA and technologies to pay closer attention to the effect of this accumulation. Individually these rulings have small, barely noticeable effects, but cumulatively they can produce very undesirable effects. This finding requires further investigation.

8.7. Closing remarks

The cover of this book is created by an artist with whom I had some long conversations explaining the essence of my research. Nurses in space! If we continue to exploit the resources of the planet at the rate we are currently doing, will we literally go into space because life on our planet is no longer possible? The illustration is intended to refer to the technological future that nurses face. The nurse in the picture is part human, part cyborg and here technology not only comes between her and her patient but is integrated into her body and can even take over certain caring interventions completely. Even in this Sci-fi representation, however, some parts of nurse's erstwhile identity and pride are indelible – her human face, her cap, and the emblem on her shoulder all connote the caring profession. In real life, in addition to all the objective and subjective knowledge acquired, space has to be carved out in nurse's brain for techno-knowledge, in order to do justice to the needs of patients.

Nurses' positions towards patients are literally and figuratively altered by technology. Literally they stand behind the technology, the technology is placed between patient and nurse. The scanning-device is an extension of the nurses' arm. The nurses' position in the room and on the ward is changed by the BCMA technology. As a result of the institutional ruling of the technology, the discretionary space of the nurse is altered.

My thesis frames technology as a co-actor in the caring practice. But does this co-actor technology actually 'care'? I do not think that technology is capable of providing care in any way that is resonant with Tronto's (2013) view that the caring process starts with caring *about*: "It calls for the moral quality of attentiveness, a suspension of one's self-interest, and the capacity genuinely to look from the perspective of the one in need."(Tronto, 2013, p. 34).

In our case, only our small hero, the nurse, is giving the proper attention, is being competent, responsible, responsive, and present, not the technology. I have shown that the world of nurses has become multi layered because of technology. The quite unique place of nurses in caring is one good reason for them to make their voices heard in order to redesign their 'space'. In the interest of good care that is essential.

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Samenvatting

De introductie van medicatie technologie is gebaseerd op de veronderstelling dat wanneer het menselijk handelen zoveel mogelijk wordt geëlimineerd, de medicatie verstrekking veiliger wordt. Deze gedachte start vanuit de vooronderstelling dat verpleegkundigen fouten maken en dat het toepassen van technologie dit probleem oplost. De verpleegkundigen worden uitgerust met een scanapparaat, zodat ze zich kunnen richten op de handeling omdat de medicatie, bijvoorbeeld paracetamol, wordt veranderd in een barcode die door de computer wordt gecontroleerd. De dominante instructie is, volg de computer, scan medicatie, en vertrouw op de expliciete technologie, omdat dat de veiligheid verbetert. Tegelijkertijd krijgen de verpleegkundigen de instructie zelf te blijven nadenken en de technologie niet blindelings te vertrouwen. Ze worden gevraagd te blijven kijken naar fouten in het systeem, dat een beroep doet op hun praktische kennis. Technologie verandert rollen, identiteiten en wederzijdse verwachtingen op een subtiele maar verreikende manier. In het onderzoek komen cruciale concepten zoals technologie, tijdelijkheid van technologie, verschillende kennisvormen en standpunten aan de oppervlakte. Inzoomen en uitzoomen vanuit diverse theoretische perspectieven (lenzen) brachten inzicht in het invasieve karakter van medicatietechnologie op de verpleegkundige praktijk. Verbeek's visie op technologie gecombineerd met institutionele etnografie laat zien hoe het handelen van verpleegkundigen door de medicatie technologie institutioneel tekstueel gestuurd wordt. Nicolini en Schmidt verstrekten een definitie van de praktijk. De derde lens (kennis) bevestigt de constante aanwezigheid van verschillende vormen van kennis in de praktijk waarin verpleegkundigen werken met technologie. Ons onderzoek is een een kwalitatief empirische en conceptuele studie met een exploratieve etnografische karakter. Het manuscript opent met een biografische reis die ons naar de probleemstelling brengt, gevolgd door een hoofdstuk waarin de relevante literatuur wordt beschreven die is gebruikt. In hoofdstuk drie worden onderzoeksmethoden en -strategie van dit onderzoek uiteengezet, gevolgd door vier hoofdstukken die de artikelen bevatten die zijn gepubliceerd of ingediend bij de verschillende tijdschriften. Het laatste hoofdstuk is een reflectie op dit onderzoek en presenteert de bevindingen en conclusies van dit onderzoek.

Thesis summary

Technology in hospitals has expanded enormously. We see the rise and expiry of one technology, only to be replaced by another 'improved technology'. Technological progress and economization give technology a double mission: it must increase safety of care, but must also contribute to the transparency, responsibility, and cost saving targets of the organization. The possibilities of technology seem boundless. The initial vocational purpose of nursing is drawn into the dominance of the technical and technological spectrum which has become a part of nursing. With the market oriented focus of the hospital, the core business of 'delivering care' is extended.

Practical experiences and anecdotal evidence indicate that all of these developments create tension within the day-to-day practice of the care process. The introduction of a medication technology seems unproblematic. But the medication technology enters the caring relationship and forms a triangle when it becomes an actor in this relationship. The combination of nursing practices and medication technology adds tension to an already pre-existing charged relationship between nurses and their patients, a relationship that is characterized by uncertainty, dependency, and the vulnerability of that patient. From an organizational perspective, medication technology is viewed as unproblematic and is taken for granted. The question arises as to how nurses cope with these strong mediating organizational and technological rulings and still deliberate on how to deliver good and safe care to their patients.

This thesis aims to contribute to a broader view of how medication technology intervenes in nursing practices. It shows how the spatial position of the nurses and the patients is altered in a literal and in a figurative sense. The purpose of this thesis is twofold: uncovering and describing (1) how medication technology rules nurses' actions and how different types of knowledge play a role, and (2), how nurses deliberate in order to line up technology and knowledge with the practice of good care. This research is strongly empirically driven, and data has been obtained by participative observation. The observations are broken down and recorded in discrete 'scenes' that are then analyzed on the basis of a model. The questioning, as well as the choice of methodology and analysis, are supported with literature from the philosophy of technology, from ethnography and from practice theory.

The source of the research question has autobiographical roots that prompted a search for points of reference in the literature, and occasioned preliminary observations and interviews with nurses, peers, and leading scientists in the field of technology, practice, theory, and ethnography. Two years of preliminary preparatory research preceded the formal start of the research project. In chapter 2, the heuristic lenses that were

used to approach the research field are legitimized with reference to the literature. The initial technological perspective was combined with practice theory that enabled distinctions of temporality, physicality, and materiality to be made and offered us the opportunity to get close to the nursing practice. The final lens was needed to get a view of the different kinds of knowledge applied in working with a medication technology.

Chapter 3 argues that the problem statement legitimizes an ethnographical approach which was provided by Institutional Ethnography focusing on institutional ruling. Because we were not only just curious about 'institutional ruling' but also about how nurses use different forms of knowledge in the care process while distributing medication, we used a research model that is informed by Institutional Ethnography and combined with practice theory. The data analysis is performed on the basis of a model of analysis that is derived from Smith's model of the 'small hero'. In this research, the nurse is the small hero.

Chapter 4 focuses on the implementation and use of barcoded medication technology that presumes to increase safety in hospitals by lowering the risk of adverse events caused by the human factor in drug administration. Using heuristic lenses, this article shows this is too narrow a view because it ignores the relevance of nurse knowledge in the distribution of medication.

Chapter 5 is a presentation of some of our results from this extended case study. With the benefit of the overlapping research methodologies, and on the basis of the data gathered, we will show how the use of medication technology creates new problems and causes the nurse to 'tinker' with the process.

Chapter 6 of the thesis shows how the use of medication technology organizes and rules the daily activity of nurses. Although the technology is intended to improve the quality and safety of drug distribution, in a hospital little research is done on how this technology changes the human role. The observed blurring of boundaries and the direction of this vital aspect of nursing show how the logic of technology differs from the logic of care that is dictated by deliberation.

Chapter 7 shows that barcoded medication technology changes the relation between nurse and patient. As well as the nurse, the patient is also incorporated in institutional ruling by the technology. Patients' knowledge is invasively mediated by procedures and protocols and leaves no room for their personal input in the safe use of medication.

Chapter 8 is the concluding chapter and discusses the significance of this research and the findings. Research on practice must be performed close to that practice, in this case the practices of nurses. In research model they are the ‘small heroes’ in the field, working with BCMA as a medication technology. Just as the main objective in my research strategy was to let ‘small heroes’ talk back to an organization, I willl ‘talk back’ to the authors whose literature was important in this research. The mixed method used in this research lays a foundation for future research into practices. This thesis makes a plea that a multi-layered view of technology and nursing practice is taken. Technology and nursing in the near future will become increasingly intertwined and nurses will have an ongoing need to carve out space for their patients.

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