Selective Automation And Flexible Standards: A Study Of Collaborative Medication Practices In An Outpatient Setting

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SELECTIVE AUTOMATION AND FLEXIBLE STANDARDS: A STUDY OF COLLABORATIVE MEDICATION PRACTICES IN AN OUTPATIENT SETTING

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Abstract

Expectations are high when it comes to the transformational potential of information and communication technologies (ICT) to help improve quality and efficiency of practices within and between organizations. Ethnographically inspired studies however have seriously challenged such expectations, arguing that realizing this potential is difficult as work is inherently local and situated; the socio-technical rigidity introduced with ICTs does neither adequately support collaboration nor the ever-present need to work outside the plan as contingencies arise. Similarly, this paper illustrates workarounds and additional work put into the effort of making new automation technology and standardized procedures across contexts work in practice, within in a municipal health care setting. More importantly however, our analyses focus on how selective automation and flexible standards allow and partly support the observed workarounds. By keeping the old infrastructural arrangement in place, both in practice and as described in standardized procedures, this supports the working of the new by allowing flexibility, adding resilience and improving quality to the overall work process. Through a work oriented infrastructure perspective we analyse and document what makes this new socio-technical, infrastructural, arrangement work in practice.

Keywords: automation, standardisation, infrastructure, health care
1 Introduction

Main contributions from social studies of information systems document convincingly the situated nature of work (Suchman, 2007), explaining some of the observed challenges of making more formalised plans for work (through the use of technology) actually work in practice (Orlikowski, 1996). The health care sector offers some especially illustrating examples of such challenges with the increased automation of medication management practice as an effort to address the well documented high risk of errors (Kohn et al., 2000). While such technologies are reported to protect against selected types of medication errors (Van Doormaal et al., 2009), a number of empirical studies also demonstrate socio-technical obstacles to their collaborative use as they typically assume sequential clinical work flows, and are designed with the tasks and responsibilities of individual professional groups in mind (Aarts et al., 2007, Balka et al., 2007, Pirnejad et al., 2008). This has of course serious implications for patient safety. Studies of tight integration of information in health care document similar challenges, in that differences in perspectives and interests generate distinct perceptions about what constitutes complete and high quality information, severely hampering collaboration in practice (Ash et al., 2004). While it is necessary to appreciate local variations in work practices and information needs in design, both across professional and organisational boundaries, there is however a the need to scale up from locally adjusted systems if we are to counter these challenges (Winthereik and Vikkelso, 2005, Ellingsen and Monteiro, 2006); to collaborate electronically across systems and organizations a certain level of standardization is required, and it is necessary to study standardization across context where all local needs cannot necessarily be met in the same solution.

The empirical basis of this paper is a longitudinal (2007-2011) case study of collaborative medication management practices for elderly in a Norwegian municipal health care setting (dubbed CityN). Drug management in general is a challenge due to the fragmented character of western health service. Frail elderly's often complex health problems and high number of drugs adds to this complexity. To reduce the risk of medication errors in CityN, automatic drug dispensing was introduced in 2006 along with new standardised procedures for tighter inter-organizational collaboration on drug order and delivery. From reading the literature it is our understanding that automation and standardisation in this context should be very difficult: responsibilities are shifted from public municipal home care to semi-public family practice and private pharmacy settings; practices across these different types of organizational settings are integrated more tightly; the involved work practices touch across quite different professional perspectives and formal requirements; and finally, home care nurses are worried about deskilling and loss of control over the medication management process, and consequently, about the continued well-being of their clients. We found that despite the extensive changes, the process of drug order and delivery functions well with remarkably few exceptions, and while the exceptions that exist require considerable amounts of work to ensure patients still get the right drug at the right time, this additional work is largely accepted by the involved health workers. We found the question of how this particular effort could be so seemingly well-functioning to be particularly intriguing. We ask: what makes this automation and standardisation effort work so well in practice? Through a work oriented infrastructure perspective we argue that the selective automation and the flexible standardisation of the collaborative practices in this case allows standardisation of the standard cases, while leaving valuable time and enough flexibility to handle the exceptions, or the special cases. In turn, this seems to contribute to the shared understanding that the new socio-technical, infrastructural arrangement improves the overall quality of the medication management service.

The paper is organized as follows: In the next section we present the theoretical lens through which the observed practices across contexts are analyzed. Then, we outline our research approach and introduce the case. Thereafter, we illustrate and discuss how selective automation and flexible standards allows local workarounds that contribute to the seemingly well-functioning process.
2 Theory

2.1 Automation, plans and situated actions

Automation of work assumes an ability to replace human action by performing “a number of tasks according to a set of well-specified ‘procedures’ that have been developed (by management) as efficient and effective means to certain ends” (p. 22, Schmidt and Bannon, 1992). Information systems research into the contextual conditions for work practices has firmly established that work is subject to ever-present contingencies and that users’ interaction with technology is situated (Suchman, 2007, Orlikowski, 1996). It is suggested that organizational plans or procedures are more fruitfully understood as resources for competent workers, as they will be of little value in work that must cope with contingencies, while to some extent being able to describe efficient ways of doing things under more ideal conditions (Suchman, 2007).

In the case of medication management it is possible to picture the plan for circulating the prescription from a doctor as a mere diffusion process, where the doctor prescribe a drug in a specific dose and form to a patient, and the “only” task of secretaries, pharmacists, nurses, assistant nurses and others is to mediate the prescribed drug between doctor and patient (Markussen and Olesen, 2003). This is however one of the more serious critiques of most automation technologies, as they assume sequential steps in a pre-defined work flow. Medication plans are tightly connected with the patient’s changing health status, and the associated treatment trajectory, creating a situation of non-sequential, inter-professionally negotiated, situated collaborative process. In their study of the successful introduction of an electronic medication module in plastic surgery ward, Markussen and Olesen (2003) argue that a translation model is more appropriate, as it assumes that all participants, all agents, receive and translate the prescription in accordance with their own project and interests due to the situation at hand.

2.2 Work oriented infrastructures

In order to understand the complex challenges of introducing new technology and standardised practices it is suggested to conceptualise the complex web of already existing networks of technologies and practices, as an information infrastructures (Hanseth et al., 1996). In an information infrastructure perspective “the technology cannot be separated from social and other non-technical elements” (p. 349, Hanseth and Lundberg, 2001). In local medical practices the orders, reports, drugs, drug dispensers, meetings and ad-hoc conversations together have all the characteristics of an infrastructure, that is linked to and part of the infrastructure for collaboration between all health care organizations; “They are shared resources, or foundations, underlying the collaboration inside the hospital [and outside] just as the Internet is a resource shared by and supporting the cooperation between university students, managers, teenagers, stores, stock markets, banking, associations, medical staff, etc.” (p. 355, Hanseth and Lundberg, 2001).

Hanseth and Lundberg (2001) suggest using the term ‘work oriented infrastructures’ when moving form universal service infrastructures (like electricity and transport) to infrastructures that support specific communities of practice. “In this case we are talking about highly complex and specialized practices whose properties are largely hidden for those who are not members of these communities” (p. 367, Hanseth and Lundberg, 2001). The heterogeneous aspect of such infrastructures also implies that they would not work without the work of the large numbers of support personnel. In the case of medication management, medication plans, automation technology, and specified work procedures functions as infrastructural ‘ordering’ devices (Berg and Timmermans, 2000, Bossen and Markussen, 2010). To make an infrastructure work, the infrastructural elements must fit together, and gateways are accordingly key elements in the evolution of work oriented infrastructures as “they make it possible for users to explore improved versions of large installed infrastructures at the same time as they are using the existing ones” (p. 369, Hanseth and Lundberg, 2001).

The primary aim of this paper is to analyse what characteristics of the new infrastructural development in our case makes it work so seemingly-well in practice.


3 Research method

This paper reports on an ongoing longitudinal research project starting in 2007. We have employed an interpretative approach that aimed for “an understanding of the context of the information system and the process over time of mutual influence between the system and its context” (p. 14, Walsham, 1993). Given that our research context involved numerous institutions with multiple, distributed stakeholders, we strived to be sensitive to the different views, opinions and concerns of the stakeholders (Klein and Myers, 1999). The access to our field was granted through the municipality and assumed we committed to present findings to the involved stakeholders for discussion.

<table>
<thead>
<tr>
<th>Site</th>
<th>Observed staff</th>
<th>Hours spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 home care units (HC1, HC2)</td>
<td>Trained and enrolled nurses</td>
<td>2007: HC1: 38,5 HC2: 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2010: HC1: 23,5</td>
</tr>
<tr>
<td>1 pharmacy</td>
<td>Pharmacists and pharmacy technicians</td>
<td>2010: 30</td>
</tr>
<tr>
<td>1 general practice, reception area</td>
<td>Health secretaries (doctors in passing)</td>
<td>2007: 8,5 - 2011: 17,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total: 126 hours</td>
</tr>
</tbody>
</table>

Table 1 Observed site and staff categories, and time spent.

Data collection consisted of observations, semi-structured interviews and document analysis conducted in two phases; in 2007 when the multi-dose process was in its pilot phase, and again in 2010-2011 when the process had been two years in normal operation. Observations (for details see Table 1) followed daily work practices, specifically focusing on tasks related to medications. Special emphasis was also put on the research subjects’ interactions with other organizational entities involved in collaborative patient treatment and medication management. Questions were posed to clarify and elaborate observations to obtain the kind of background understanding that is emphasized by Klein and Myers (1999). The extent and format of these obviously varied with what was possible without intruding too much with the ongoing work, often postponing them to less hectic periods. During the observations handwritten notes were taken and subsequently transcribed. Photographic documentation highlighted work situations of particular interest.

A total of 13 semi- and un-structured interviews were conducted, most lasted from 1 - 1.5 hours while a few lasted up until 3-5 hours. In our first round we were searching into historical background of e-health related projects in CityN, and we conducted 5 interviews with people within and outside the municipality. 4 interviews were conducted with the unit managers of the observed units targeting organizational roles and the nature of work tasks in each setting. Subsequent interviews targeted sources of frustration with existing routines, followed by issues of improved process quality developed later. During interviews, handwritten notes were taken that were transcribed and annotated. Document analysis included strategy memos and project documentation for municipal e-health related projects, as well as guidelines and municipal work procedures. Documentation on exceptions to the order and delivery of automatic drug dispensing at the pharmacy was also analyzed.

Data analysis is on-going and iterative and overlapped with data collection. The author collectively went through data analysis sessions with colleagues where interpretative categories our interpretations were presented on three occasions in meetings with several of the study subjects. When possible, we reflected on observations and discussed potential issues to pursue further. Presenting our early findings at feedback sessions provided us with valuable validation, as stakeholders could raise issues and challenge our interpretations. First, we produced process-oriented understanding of the sequence, content and resources involved in medication management at each site. Partly driven by deductive influences, early coding identified patterns of quality assurance practices across sites. This did not however identify why the MDD process seemed to work well in practice. Later, through a bottom-up categorization we identified three central qualities of the process that the observed activities in our interpretation was found to contribute to; flexibility, quality and resilience.
4 Case: Medication use assistance in CityN

Our study took place in a mid-sized Norwegian city (CityN) with a population of about 170,000 people. Some 3000 individuals receive municipal home care nursing services, organized by 10 semi-autonomous organizational units that on average serve 350 clients each. About two thirds of the 3000 home care nursing clients in CityN is no longer able to handle their own drug use. The level of assistance needed varies widely between clients; some are able to self-reliant if supplied with a week- or fortnight’s supply of pre-dispensed drugs, others simply need a daily visit to be reminded, while a few cannot safely keep any drugs in their homes and nurses visit several times a day, bringing the drugs to be taken and assist in the administration.

Figure 1 Left: A ‘7 x 4’ pill dispensers for manual dispensing. Right: Multi-dose dispensed drugs.

The manual drug dispensing process (that is partly replaced) is based on home care nurses keeping track of all of a patient’s paper prescriptions, prescribed by different physician, at all times, and a complete medication record is kept in the municipal electronic patient record (EPR). This system is common for home care nursing and nursing homes in CityN. Based on this medication list, drugs are ordered from the pharmacy and stored in original packing sorted by patient in an office with restricted access. A patient’s drugs are manually dispensed every week into a pill dispenser imitating a 7 days a week, 4 times a day-pattern (morning, lunch, dinner and evening) (see Figure 1, Left). Drug dispensing is performed by trained nurses and is always subject to a double control by another trained nurse. Only trained nurses or enrolled nurses with a medicine course are allowed to distribute and assist in administration of drugs to patients.

The introduction of automatic drug dispensing was motivated by the potential of both reducing the risk of manual dispensing errors and the time spent on drug management by home care nurses. Multi-dose drug dispensing (MDD) means that all drugs to be taken at a given time of intake are automatically machine-packed into a labelled disposable bag. Only tablets and capsules are suitable for robotic sorting and packing and a fortnight’s supply are packed into a string of bags (Figure 1, Right). MDD delivery is based on patient consent, and patients are informed that MDD will improve safety and may reduce medication cost, as they will only pay for the actual amount of drugs taken, as opposed to buying drug packages they will perhaps not finish. If MDD for some reason is not suitable for a patient, drug management is continued through the old system of manual dispensing in CityN. The focus of this paper is on the new multi-dose drug order and dispensing process.

4.1 The MDD process

Along with the automatic dispensing, a collection of 13 standardised procedures were introduced for coordinating drug order and delivery between home care nurses, family doctors and one local pharmacy. This was an effort to counter the challenge of keeping consistent medication lists between family doctors and the municipal home care nursing service. General practices in Norway are separate legal entities with their own local EPRs and databases and family doctors in Norway at the time didn't routinely keep complete and updated drug lists for all patients. The Family Doctors’ Cooperative Committee in CityN agreed however that they would establish lists that would serve as basis for the automatic dispensing for these patients. One pharmacy chain was contracted by the municipality through a bid for tender process to deliver all the automatically dispensed drugs, handled in practice by one of their local offices in CityN.
4.1 Review

A patient’s MDD process starts when a home care nurse places a ‘MDD suitability assessment’ request to the family doctor. A printed copy of the municipal electronic drug chart is sent to the family doctor to uncover any inconsistencies, and for the family doctor to decide whether any of the drugs are suitable for MDD delivery. Are the drugs taken regularly? Is the dose likely to remain stable within the next 2 months or so? Even if only some of the drugs are suitable for MDD, the doctor creates a complete electronic drug list in her EPR system. The list is printed and sent by fax to home care. A home care nurse then visits the patient and collects all drugs and prescriptions in his home and compares this to the list from the doctor, to possibly detect any further inconsistencies. The final list is eventually delivered to the pharmacy, either by messenger or fax, along with any necessary start up information from home care.

4.1.2 Order and Dispense

At the pharmacy, a pharmacy technician logs on to their MDD manufacturer’s server and manually enters the medication list in the multi-dose system. When the registration is complete, the MDD system indicates what drugs may be included in the fully automated MDD packing. Drugs that cannot be included are delivered to home care by the local pharmacy outside the MDD routine, although included in the complete list. When the MDD packing order is completed, a double control is performed by a pharmacist to ensure the transcribed order corresponds to the original list. The MDD system supports the printing of an ‘ordination chart’ including all drugs registered to the patient, sorted in three categories; ‘in the MDD’, ‘other regular’ and ‘when needed’. A paper copy is archived locally at the pharmacy, serving as a valid prescription for a year. A copy is also sent by fax to confirm the order to the family doctor. The MDD roll is produced at the national MDD manufacturer's site at 10:00 o'clock on a specified weekday, every second week, five days before the first time of intake specified on the first bag of the MDD roll.

4.1.3 Distribute

The MDD roll is delivered to the pharmacy one day after its production, and is further distributed to the appropriate home care unit by messenger. With every new start up or updated MDD roll, a copy of the ordination chart is also included with the delivery to the home care unit. In home care the responsibility is now to distribute the MDD package to the patient’s home. If the home care nurse finds an ordination chart in the delivery, she reviews the information and updates the municipal electronic drug chart. This update is also subject to double control, as not all drugs may be included in the MDD. Additional drugs are dispensed and a printed copy of the local drug chart is brought to the patient's home and kept in a standard location across patient homes.

Unless there are any changes to the patient’s drug use, the ‘dispense and distribute’ part of the process may continue running automatically and undisturbed for a full year. By that time, the family doctor is requested by the pharmacy to conducts a medication list review. Whenever there is a change this is communicated to the family doctor who in turn reviews the new information before changing the order.
5 Analysis

5.1 Rigidity and enacted flexibility

One of the most serious critiques of automation is the introduction of socio-technical rigidity that makes it difficult to work outside the pre-defined plan. Document analysis at the pharmacy shows that about 10% of the MDDs produced are on average updated in some way or another during each production cycle (i.e. every 14 days). This illustrates however that the large majority (about 90%) of the about 17-1800 MDD rolls produced every fortnight in CityN are in fact executed ‘according to plan’ (based on unchanged standing orders). This saves valuable time in home care that may instead be spent on the more special cases. Observations in home care nursing indicate that time spent on drug management on behalf of patients receiving MDD in practice is reduced by about 50%, as compared to those handled only manually. This is illustrated by the observation that when the nursing coordinator sat down in her office to document her completed work in the medicine room, she consequently documented spending 10 minutes on patients receiving MDD, as compared to 20 minutes on those outside the MDD process (HC1 2010). This allows time to offer a better service, for instance particularly older patients may have trouble learning how to handle the new MDD packages. Although spending quite some time trying to teach and motivate them to start using MDDs, they do not always succeed. In these cases some home care units have made the decision to offer them a system they are familiar with and confident in handling. Some of the patients enrolled in the MDD deliveries are still provided with manually re-dispensed drugs, as illustrated with an example: “This lady, we really tried, but she just didn’t figure it out. With the MDD we had to visit her four times a day to help her take her medications. With the pill dispenser however she can manage on her own. And she really doesn’t want us to stop by that often, so we simply re-dispense her MDD drugs into a regular pill dispenser” (Nursing coordinator).

Another type of rigidity introduced by the new MDD procedure is that pharmacy staff can’t choose to include everything in the MDD roll unless the order (i.e. the medication list) from the family doctor clearly indicates that the drug should be taken regularly. Sometimes the family doctor does not agree with the fact that the drug is in fact taken regularly, and this may result in some discussions with patients, with home care nurses as the negotiator. “They [family doctors] don’t want the patients to take for instance sleeping pills or pain killers regularly, and therefore they won’t prescribe it so that it can go into the MDD roll. But then – when a patient has been taking those sleeping pills every evening for 20 years they want it in the MDD” (Enrolled nurse (HC1) 2007). As some patients get confused by handling both MDD packages and pill dispensers in such cases, nurses may well choose to still include these patients in the MDD process, although they later manually re-dispense all content into a weekly pill dispenser. While the manual re-dispensing introduces new risks of errors nurses indicate that they feel safer all the same: “we still feel it is safer with MDD, as the family doctor has gone through the whole list” (Nursing coordinator 2010).

According to the municipal MDD guideline the family doctors should indicated on the fax if a given order cannot wait for the patient’s next scheduled MDD production, i.e. that it is a priority change. More often than not however, no indication of emergency or any other information is indicated on the faxed medication list. “Sometimes we have no idea why the family doctor sent the fax in the first place”. (Pharmacy technician 2010) This causes additional work at the pharmacy. All medication lists from the family doctors arrive at the pharmacy on the fax machine. Every day at 10:00 they have an order closure time (OCT) for a group of clients and instead of updating MDD orders consecutively as they arrive, they have dedicated two racks of shelves for sorting and storing all incoming medication lists according to the patients’ OCT (See Figure 2). Every morning a pharmacy technician starts working on the pile of medication lists for that day’s OCT.
The sorting of incoming faxes however is done continuously. To identify the appropriate location and the corresponding OCT of the patient, in order to sort the fax in the correct ‘OCT deadline’ shelf, the pharmacy technician always looks up the patient in the MDD ordering system. If she finds that the change-request just missed the OCT, or if she suspects the change might be important, she makes a call to home care to ask whether this is a priority change. If a priority order is registered in the MDD system by pharmacy staff before 10 o’clock on a regular week day, it is included in the pre-scheduled production, and priority MDD package may be delivered to the pharmacy by the end of the same day. If the priority order is placed later in the day, the resulting MDD roll arrives at the pharmacy the following day. By picking up on high priority changes they make up for a weakness of most doctors’ practice and contribute to the sense of flexibility and responsiveness regarding making changes within the MDD process.

5.2 Quality: the right drug to the right person at the right time

Safe medication use assistance presupposes that the right drug is eventually delivered to the right person at the right time. The automation and standardisation of practices were motivated by exactly the concern to improve this process outcome; the involvement of the family doctors and pharmacy staff with their professional knowledge contributes to the overall quality of the complete medication list; the family doctor considers the treatment plan, pharmacy staffs ensures the plan adheres to current Norwegian drug legislations and help avoid well known drug-drug interactions. It is however well-established fact that work-processes don’t always go according to plan. To ensure that the right drug reaches the right person at the right time – this still requires continuous work and attention by those involved.

As indicated, the MDD system sorts a patient’s drugs according to three categories: (i) ‘in the MDD, (ii) drugs to be taken ‘regularly’ but that are not suitable for automatic packing (i.e. liquid, inhaler or other) and (iii) drugs to be taken ‘when needed’ (for instance sleeping pills). The medication list from the family doctors however only sorts drugs according to whether they should be taken ‘regularly’ or ‘when needed’. This is possible due to the semi-electronic practices of information across sites, where the interface between them is the printed paper. This of course introduces some challenges in comparing the two lists, especially as family doctors often fail to reflect changes made to the delivery by pharmacy staff when faxing an updated order. The pharmacy is for instance required by Norwegian law to deliver the cheapest equivalent drug to what drug the family doctor has prescribed in order to receive the entitled reimbursement from the authorities, as long as the doctor has not clearly indicated that an equivalent drug cannot be used. When the two lists do not match, the pharmacist must establish whether this is due to intended changes, or whether the family doctor did not reflect their input in the new updated order. However, at the pharmacy they prefer that changes are indicated on the previous medication list from the doctor, rather than the doctor using the printed ordination chart received from the pharmacy; “One doctor started doing that during the pilot phase, but we didn’t like it. This made it so much easier to overlook changes to the order” (Pharmacist 2010). This routine of reviewing and establishing trust in the new informational foundation for MDD production involves careful consideration of the order and functions as an extra quality review.
A similar routine is found in home care. A particularly challenging aspect of the MDD process that a particular medication-use pattern is fixed for a longer period than before (i.e. 14 days + an additional 5 days to allow production and distribution), and executing changes involves more people, as the prescribing doctor is not always the family doctor. Accordingly, executing changes takes more time and home care nurses often experience that although changes have been reported (by them) they are not yet reflected in the delivered MDD. During one observation several exceptions were picked up by the nurse working in the medicine room, when going through a MDD delivery. Two new start-ups did not include the copy of the ordination chart that is supposed to inform the home care nurse about the content. “That is a bit risky as we are not able to check whether it is correct [according to our overview]. I will have to ask for them” (Nurse (HC1) 2010). She also identifies two MDD rolls where one drug that should have been discontinued is still in the roll. Finally, she finds that one MDD roll that should have been stopped has arrived anyway. While this observation illustrates weaknesses to the system, the careful practice of checking all incoming deliveries according to their local medication overview adds to the quality of the service. As home care nurses are closest to the patient, it is not uncommon that they possess the most current information about the patient’s health status and the most recent changes to the patient’s medications that due to possible delays in the execution of changes may result in the arriving MDD outdated.

5.3 Resilience: redundancy in skills, practices and information

With increased socio-technical rigidity (i.e. automation), exceptions are inevitable. Although not a goal in itself, the manual drug management process running in parallel is helpful in several ways and thereby adding to the resilience of the automated process. For instance, nurses worried that they would lose control over their client’s drug use with the new MDD process, as well as their general knowledge and familiarity with drugs and dispensing. The fact that manual dispensing is still necessary however has helped counter this concern: “[...] we said that [we would lose experience] before we started [with MDD]– but I don’t think so now. We still get familiar with the tablets, and as you can see they all look a little bit different” (Nursing coordinator (HC1) 2010). At the time of this observation this home care unit had 163 clients receiving medication use assistance. 121 were enrolled in the MDD system, 15 were awaiting a MDD assessment from the patient’s family doctors, while the remaining 27 for different reasons were still handled manually. Some of those received only short drug treatments (antibiotics for instance) or were new clients still having drugs left from that collected from the patient’s home. Also, if a patient has been prescribed an additional drug, home care do, according to the MDD procedure, dispense this additionally until the next scheduled MDD delivery.

If a drug has been discontinued home care may also choose to open the MDD and physically remove the one drug from the plastic bags. This is however seldom recommended by pharmacy staff, as this introduces new risks of errors. “They assume a considerable responsibility if they [home care nurses] choose to open the MDD” (Pharmacist 2010). The final decision to do so is thus usually based on what is considered acceptably safe as compared to the total cost and who should pay for it. All drugs are in principle paid for by the patients, and depending of where in the MDD cycle a change is initiated, the patient may have to pay for a lot of drugs that will be thrown away if ordering a re-pack. Also, the home care service cover the packing cost of 200 NOK, a standard fee for every MDD package, whether in the routine delivery or outside. When they re-dispense the MDD content, they perform the same double control as with regular dispensing; another trained nurse controls that the dispensing corresponds to the written documentation. By keeping the knowledge and skill of manual dispensing intact this practice is considered acceptably safe, although not part of the official MDD procedure.

The pharmacy is also an economic actor in this collaborative setup. In addition to earnings on all drugs delivered, they are also interested in keeping the contract for delivering all drugs to municipal home care nursing, and accordingly interested in providing a good service. Based on observations at the pharmacy, they identify on average about 30-35 special cases every fortnight (about 2%) that in turn are execute as priority changes before their scheduled OCT. Examples include changes that cannot wait, client’s having lost their MDD package, and so on. Indirectly, they also contribute to safety, as this decreases the need of workarounds in home care, in terms of re-packing MDDs. While the
pharmacists strongly emphasize that they never make decisions on behalf of the patients regarding whether a change can wait or not – they still always call the home care service when in doubt to allow a nurse there to consider what is in the patient’s best interest. Quite often, they explain, they also find that the home care service has not yet been informed about any change, thereby contributing to the timely update of the patient’s medications as well as potentially making up for weak communication between family doctors and home care nurses. Given that they provide the same MDD users with their drugs regularly, they do however also develop a sense of customer relationship with these patients, and they get a good overview of the MDD users’ drug use and feel responsible for the resulting quality of the MDD delivery service for patients: “We want to provide a good service. ... And then, when we see a change ... well, maybe it is important to get the treatment started” (Pharmacist 2010).

A final example includes the semi-electronic practice of information sharing. While the redundant practice of reviewing the list adds to the quality of the order, keeping local records both in paper and electronic form increases the chance that there will always be a complete medication list available in case of break down in any one of the local systems.

6 Discussion and conclusion

6.1 Selective automation and flexible standardisation

Most existing literature on extensive automation and standardisation of work practices suggests that this could be very difficult and most likely prone to break downs. In our study we were surprised by the low level of frustration expressed related to the new practices, despite, in our interpretation, the considerable amounts of work going into actually making it work in practice. Intrigued by this observation, we analyse what contributes to this seemingly well-functioning process: what makes this new infrastructural arrangement work in practice?

In their study on the implementation of a Picture Archiving and Communication System (PACS) in a hospital radiology department, Hanseth and Lundberg (2001) argue that an important explanation for its successful development was the way its design supported a network of activities (or work practices) that had a fairly clean and simple interface to other such ‘networks of practices’ and that the PACS technology was well integrated with the technology supporting these other networks. In practice, this integration meant that light boards for old radiology films were placed close to computer screens for showing the digital films locally, as well as laser printers for printing PACS images onto film for distribution to other departments. They argue that to succeed with the implementation of technologies, the systems must be designed to support all aspects of the artifact they will replace and that the existing work practices are based on (Hanseth and Lundberg, 2001). Health care practices are still heavily dependent on paper, and in our case we find that the integration of practices across settings is also supported by simple interfaces between networks of practices through the printing of medication lists to enable information sharing across local work routines. While it is likely that this information sharing will become electronic in some way in near future, at the moment this contributes with helpful redundancy and added flexibility. Particularly, this flexibility is illustrated by the fact that family doctors are not ‘forced’ to relate to the strict and detailed medication use pattern as translated into the exact number of drugs to be taken at specific times a day, information that must be fed to the MDD robot. Also in the integration between the new and the old routine of drug dispensing, simple interfaces allows the manual system to work as a backup to the automated routine when the pre-defined ‘automated’ medication plan suddenly doesn’t ‘fit’ on short notice. While we document extensive amounts of additional work and workarounds to the MDD process, the fact is that the larger majority of orders (about 90%) run undisturbed. This saves valuable time for the more special cases in need of additional attention. While workarounds to the standardized MDD process exists, they are often within the accepted practices associated with the somewhat redundant manual system. Practices that are not covered by the 13 MDD procedures but that are considered necessary to ensure high quality process outcome could be considered weaknesses of the MDD process but are instead largely supported by the fact that the old infrastructural arrangement for manual dispensing is still in place.
With the introduction of new technology, Graham and Thrift (2007) argue that as things become more complex, the importance of maintenance and repair become crucial, born out of the ever-present presence of failure and malfunction and error – and the consequent opportunity to learn from them. Infrastructure tends to become visible upon breakdown (Star, 1999) and we should expect failure due to inherent and continuous unreliability within all infrastructural systems. Graham and Thrift argue that most technologies go through a period when they do not mesh and their components are unreliable, for instance; “for at least 80 years, automobiles were susceptible to breakdown on a regular cycle, even with all the labour of servicing that might be put into maintaining them. Whole generations had to become expert at changing oil, mending broken fan belts and replacing spark plugs, as well as makeshift roadside repairs. Nowadays, information and communication technologies have largely replaced the system of auto-mobility as both the most central and yet the most likely to break down […] Whole generations are becoming expert at rebooting, defragging and downloading security patches” (p. 10, Graham and Thrift, 2007). Adopting Susan Leigh-Star’s term (1999), Graham and Thrift argue for the need to ‘surface the invisible work’ of maintenance and repair that continuously surrounds infrastructural connections, movement and flows – and accordingly design products so that they are easily maintained, repaired, upgraded. Much of the resilience of the MDD process is due to the redundancy of the two systems running in parallel. Although this is not necessarily a goal, it is helpful. In our case, the standardisation of the process is to reduce process variability to increase safety, but our analysis have illustrated that what can be argued to be a safe process outcome, may sometimes rest on the ability to work outside the plan (Suchman, 2007). The real improvement may not be due to the actual automation of dispensing, or the new standardised procedures, but perhaps rather the continuous effort of the medication list reviews across sites. Standards provide benefit by “cleaning up” and making future maintenance easier (Hanseth and Lundberg, 2001). Automatic dispensing mainly saves time for the special cases. In sum, this selective automation (i.e. still allowing manual dispensing in special cases), the flexible standards for collaborative practices (by keeping simple interfaces across practices) together with redundant practices produces robustness and enough flexibility to improve the overall process quality.

One reason why collaborative systems often fall apart, is because people fail to do the extra work when they do not experience a direct benefit themselves (Grudin, 1994). In our case however we seem to observe chains of additional work across sites and actors where the overall benefit seems to be to the patient. While pharmacy staff and family doctors receive economic incentives for their work related to MDD, especially at the pharmacy, it is our interpretation that they still go beyond what they receive monetary compensation for in their efforts to provide a good service. Although this aspect is not (yet) sufficiently studied in our case, a concern for the overall quality of the service they provide is indicated. Similarly, home care nurses accept additional work to make up for limitations of the current infrastructure, when they could have pushed this responsibility elsewhere. If this could be due to power relations, professional ethics in general, or more gender specific issue (as the observed staffs were mostly women), remains an open question.

References


