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Original Research

# Automated dose dispensing in Danish primary health care - a technology under construction

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**ABSTRACT***

Objectives: The purpose of this study was to conduct a health technology assessment (HTA) of automated dose dispensing in the Danish primary health care sector. The present article answers the sub question of how various groups of actors spoke about and understood the shaping of automated dose dispensing (positioning in discourses).

Methods: The project utilized two methods: 11 qualitative research interviews with selected key actors and a net-based qualitative questionnaire of 97 selected practitioners.

Results: Three main types of discourse were identified with respect to the development of automated dose dispensing, namely 'optimistic', 'sceptical' and 'pragmatic'. A wide diversity of opinion about automated dose dispensing was identified among the three discourses and their attendant scenarios. A number of factors are found in all three types of discourse, and are therefore considered to express common recommendations for decision makers and practitioners. These factors are described in the article.

Conclusions: The article argues in favour of HTA, which to a great extent clarifies and initiates the perspectives of various groups of actors about the same technology. Our analyses show that conscious strategies must be employed to make the technology work successfully with the actors involved. The preferences, ideas and proposals for future actions and initiatives identified in the project could be the basis for defining future development strategies.

**Keywords:** Patient Compliance. Automation. Qualitative Research. Denmark.

**DISPENSACIÓN AUTOMÁTICA DE DOSIS EN LA ATENCIÓN PRIMARIA DANESA - UNA TECNOLOGÍA EN CONSTRUCCIÓN**

**RESUMEN**

Objetivos: El propósito de este estudio fue realizar una Evaluación de Tecnología Sanitaria (ETS) de la dispensación automática de dosis en la atención primaria danesa. El presente artículo responde a la sub-pregunta de cómo varios grupos de actores hablan y entienden la idea de la dispensación automática de dosis (posicionamiento en discurso).

Métodos: El proyecto utilizó dos métodos: 11 entrevistas de investigación cualitativa con actores clave seleccionados y un cuestionario cualitativo en 97 facultativos seleccionados.

Resultados: Se identificaron 3 tipos fundamentales de discursos respecto a la dispensación automática de dosis, el optimista, el escéptico, y el pragmático. Se identificó una amplia diversidad de opiniones sobre la dispensación automática de dosis entre los 3 discursos y los consecuentes escenarios. Se encontraron varias variables en todos los tipos de discurso, y por tanto se consideró expresar recomendaciones comunes para los políticos y los facultativos. Estos factores se describen en este artículo.

Conclusiones: Este artículo discute a favor de la ETS, que clarifica bastante y apunta las perspectivas de varios grupos de actores sobre una misma tecnología. Nuestro análisis muestra que deben emplearse estrategias conscientes para hacer que la tecnología funcione suficientemente bien con los actores involucrados. Las preferencias, ideas y propuestas de futuras acciones e iniciativas identificadas en el proyecto pueden ser la base de la definición de futuras estrategias a desarrollar.

**Palabras clave**: Cumplimiento del paciente. Automatización. Investigación cualitativa. Dinamarca.

## INTRODUCTION

In 2001, legislation was passed requiring Danish pharmacists in the primary health care system to supply drugs in automated dose packs to individuals, automated dose dispensing.[1-4] Thus, dose dispensing done manually by nurses in the eldercare system could now be automated by pharmacies and supplied as dose packs of medication for two weeks of use at a time. The

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Danish Medicines Agency has the authority to approve 'dose-pack' pharmacies, which then have permission to install and use special equipment that can automatically dispense medication in dose packs. In June 2007, a total of 32,656 people in Denmark received medication dispensed in automated dose packs.[5]

The existing literature in the dose dispensing area show that a majority of the studies, which have either a controlled design or a before-and-after design, were conducted in the USA, UK or Canada in hospital settings.[6-12] This made transferring the results of the studies to a Danish primary sector setting very difficult. Even though Danish pharmacies have been using the technology automated dose dispensing for a couple of years, the documented experience base is still limited, and the technology has not been implemented to the extent that the health care authorities had originally anticipated. One of the most important Danish experiences with dose dispensing is an experiment with manual dose dispensing from 1997, which showed that users could achieve greater safety and security by using dose dispensed medication.[13,14] To date there are no general systematic evaluations of the consequences of increased use of medication dispensed in automated dose packs, either nationally or internationally.

**Health technology assessment**

A health technology assessment (HTA) of the Danish automated dose dispensing scheme seemed useful for describing the process leading to the finished technology and for describing the consequences of the technology. A health technology assessment in helath care has been defined as "technology assessment in health care is a multidisciplinary field of policy analysis. It studies the medical, social, ethical, and economic implications of development, diffusion, and use of health technology".[15] The purpose of conducting an HTA of automated dose dispensing in this study was specifically to document experience with and practical application of the technology. In turn, this would make it possible to inform decision makers about appropriate application and implementation strategies with regard to the technology. The obstacle to the technology that must be overcome so that use can continue to be improved is in focus.

The HTA consisted of a project in three parts: 1) a literature review[16]; 2) a qualitative study of actors' perspectives comprising a questionnaire survey of practical experience with the implementation and operation of automated dose dispensing in the primary sector and an interview survey of key actors' opinions and perceptions of the activities, consequences and prerequisites for automated dose dispensing[17,18]; 3) a register survey of the use of automated dose dispensing and its future potential.[19,20] Thus, the HTA carried out did not cover all HTA aspects, and must therefore be regarded a partial HTA. For instance, did the HTA not sufficiently cover patient-related experiences from using automated dose dispensing. An additional study, thus, focused on these patients' aspects.[21]

Table 1: Selected results from the register study and the literature study influencing the questions posed in the qualitative study

| Selected results from the register study influencing questions posed in the qualitative study | Selected results from the literature study influencing the questions posed in the qualitative study |
|---|---|
| Socio-economic position of current ADD-users:<br>* Mostly women (2/3) and elderly (70% more than 70 years old)<br>* About 25 % of the ADD-users live in institutions (elderly homes etc.)<br>* Only few younger, employed persons among the ADD users. | Concerning technology:<br>* Very few packing errors are observed when using dose dispensing systems<br>* Increased safety as an effect of dose dispensing is experience-based rather than evidence-based<br>* The are a number of discrepancies between the medication profile/patient medication record and dose dispensing charts<br>* Some users have problems handling the packages<br>* Amount of wasted medicine and discarded medicine seems reduced due to dose dispensing systems<br>* No evidence that dose dispensing increases the overview of drug therapy, safety and control with prescriptions<br>* No evidence that dose dispensing alone increases compliance and no evidence of any health-related effects following from dose dispensing<br>* Dose dispensing combined with patient education, drug use review, reduction of daily dosages and individual medication strategies increases compliance. |
| Medicine use:<br>* Each month, a typical ADD user receive 5 different ADD packed medicines 1 medicine not ADD-packed | |
| Potential ADD-users:<br>* If all GPs prescribed ADD about 29.000 persons would recieve ADD-packed medicine.<br>* More than 300.000 persons show a "stabilized" medicine use pattern (3 or more medicines).<br>* More women and elderly use ADD-packed medicine | Concerning organisation:<br>* Healthcare professionals are satisfied with dose dispensing systems, even though working with the systems is time consuming<br>* Barriers for implementation are lack of co-operation (the most influential barrier), unclear working and responsibility<br>agreements, insufficient sharing of electronic data and undefined economy |
| Before-and-after-analysis:<br>* Medication consumption unchanged before and after implementation of ADD<br>* Turnover in pharmacies increases by from ADD (due to a special ADD charge). | Concerning patient:<br>* Individuals with a cognitive, mental, psychological or physical impairment are potential users<br>* It is unclear if dose dispensing increases patient self-management. |
| | Concerning economy:<br>* There is a potential for reduced costs, primarily reduced drug costs and personal expenses – no long term economic calculations or results, though. |

This article reports the results from the qualitative part of the HTA. For selected results from the literature study and the register study influencing the qualitative study see Table 1.

The purpose of the qualitative part of the HTA was to explore the variation among selected key actors involved in the development of automated dose dispensing in Denmark in terms of their attitudes towards and their perceptions of activities, consequences and assumptions related to automated dose dispensing. A secondary purpose was to make a theoretical analysis that could provide an overall view and understanding of the significance of the actors' perspectives on the formation of a technology, in this case automated dose dispensing.

The present article answers the research question of how various groups of actors spoke about and understood the shaping of the Danish automated dose dispensing system (positioning in discourses) and it describes the content of the discourses and their attendant scenarios.

## METHODS

### HTA theory

The entire HTA worked on the basis of a broad understanding of technology.[22] A broad understanding of technology is advocated on both the national and international level.[23] In Denmark, in particular, the concept of technology is often considered to have four elements – patient, organisation, technology and economy – all equally important with respect to carrying out a HTA.[23] We use this model in this project, which is why all four elements are part of the analyses below.[22]

An HTA can be conducted at different phases of the technology[24]:

- Phase 1: Technology not yet developed
- Phase 2: Technology ahead of introduction
- Phase 3: Technology being introduced
- Phase 4: Technology in general use
- Phase 5: Technology on way out

Automated dose dispensing in Denmark is in phase 3. In this phase, the social and technical design of the technology is being changed and optimised continuously, and the final result (phase 4) can prove to be very different from the conclusions of an evaluation made in phase 3. A future-directed technological assessment conducted in phase 3 follows the process of the technology as it is introduced, thus providing the opportunity to help optimise the technology. The weakness of conducting a HTA in phase 3, though, is that observations must be made on an unstable object.

Therefore, in keeping with the HTA project's general definition of technology, the study was based on the theoretical assumption that technology is not just a technique that will be implemented unchanged in society after the development phase. Since technology is constructed through social practices and meanings, it will be constructed differently by different social groups depending on their opinions.

A constructionist approach was needed to encompass the fact that technology is 'narrated' and constructed in different versions, depending on who is interpreting. Therefore, a discourse concept[25] and the social construction of technology theory (SCOT theory) were used to conduct our analyses.[26]

Discourse analysis can be used in studies of how certain ways of speaking about and understanding a segment of the world are used to promote and influence a case, and which statements can be made at a given point in time, in a given situation and by whom.[27]

One main point of the SCOT theory is that the 'construction' of the actors takes place simultaneously along with the construction of a technology. In addition to a theoretical approach, the SCOT theory also comprises a systematic three-part method of analysis for technology development: sociological deconstruction, social construction and explanation/generalisation.[26] For details on the SCOT theory see Table 2.

Table 2: Content of the SCOT theory[26]

| Sociological deconstruction | Social construction | Explanation/generalisation |
|---|---|---|
| Relevant social groups of a given technology and its interpretive flexibility are described:<br>- a relevant social group has the same perception of a technology, considers the technology to have the same problems, etc.<br>- relevant social groups constitute a technology by giving it meaning<br>- there are as many technologies as there are relevant social groups<br>- the relevant social group's contribution to the total variation in opinion about a technology is designated the interpretive flexibility of the technology. | The concepts of closing and stabilising the technology are described:<br>- if a controversy over a technology is closed, the interpretive flexibility disappears, consensus is established between the various relevant groups, and the technology prevails<br>- Stabilising refers to the development of a technology within one relevant social group<br>- Stabilisation is not a question of either-or, but rather expresses the idea that there can be a greater or lesser degree of stabilisation within each of the relevant social groups. | A broader explanation of technological development is developed through the concept of a technological framework<br>- a technological framework structures the interaction between actors in a relevant social group, but the framework is not characteristically tied to an individual, system or institution: it is localised between the actors<br>- content of a technological framework may include: goals, key problems, solution strategies and requirements, theories, tacit knowledge, test procedures, design methods, design criteria, user practice, alternatives, exemplary objects and expectations |

**Study**

The project design comprises qualitative research interviews with key actors, which as such allow in-depth analyses of the organisational mechanisms in connection with the implementation and ongoing construction of automated dose dispensing, as well as a qualitative questionnaire survey of selected practitioners, because they have actual experience in implementing the technology available at the time of the survey.

**Interviews**

Eleven interviews with key people and representatives of the pharmacies, general medical practice, hospital doctors, main authorities, professional organisations for nurses, doctors and pharmacists, the drug industry and patients were carried out. The interviewees were recruited from a snowball technique, where a literature search gave ideas for the first interviewees, who then suggested new interviewees. The interviews were arranged by e-mail and through the local authority in the home care system. The interviews took place between November 2003 and August 2004. The interviews were conducted using a semi-structured guide containing the following general themes:

- The actual course of events with regard to the design and organisational placement of automated dose dispensing.
- Assumptions (facilitators and obstacles).
- Expectations about the consequences of automated dose dispensing, its actual impact and subsequent explanations
- Development options and alternatives

The individual interview guides were adapted to each actor's place in the system, just as data from previous interviews were used to further develop the questions. Interviews lasted from 60-90 minutes; all interviews were recorded on tape and subsequently transcribed in thematic form, after which they were sent to the people interviewed for their approval. After approval, the thematic transcriptions were coded in the analysis program NVivo, and every theme in the data material was systematically described.

**Qualitative questionnaire survey**

The narrations from practice were collected through a qualitative questionnaire survey that aimed to gather practical knowledge about local plans and experience with the implementation and operation of automated dose dispensing. On the advice of the drug consultant for each region, a questionnaire was sent to representatives (home care, pharmacists and GPs) of the one local authority in each region considered to have the most experience with automated dose dispensing. The questionnaire was also sent to the regional drug consultants and all 10 'dose-pack' pharmacies in Denmark. In total, questionnaires were sent to one selected local authority in each of Denmark's thirteen regions, as well as to selected areas in the City of Copenhagen and Frederiksberg. One local authority was excluded due to limited use of automated dose dispensing. The questionnaire consisted of open responses exclusively and asked broadly about experiences with the start-up and operation of automated dose dispensing, as well as what respondents would like to see happen with automated dose dispensing in future. In total, questionnaires were sent to 97 representatives of which 47 responded: 24 from the home care services (out of 47 possible), 7 general practitioners (out of 15 possible), 7 from the pharmacies that distribute dose packs (out of 15 possible), 5 from pharmacies that pack the doses (out of 10 possible), as well as 4 from regional level (out of 15 possible).

**Data analyses**

Kvale uses the following interpretation levels for qualitative analyses[28]:

- The self-understanding of those being interviewed
- Critical common sense interpretation
- Theoretical interpretation

Related to these levels, a theme analyses was conducted of interview data using a very descriptive categorisation. This was done in order to account for the variation of opinions found in the material close to the self-understanding of those being interviewed. The categorisations were inspired by the HTA reference frame mentioned above[23], and can thus be said to form the basis for a critical common sense interpretation level.

The written responses from qualitative questionnaire survey were collected and retold as one story describing experiences with start-up, organising the scheme, including work flow, staff, cooperation, users of the scheme and the advantages and disadvantages experienced with it. Then a list of 'good solutions' and 'recurring problems and wishes for the future' was compiled. The stories from the 'dose-pack' pharmacies were collected into one single story in the same way.

In the present theoretical analyses, an interpretation based on the data categorisations from the theme analyses conducted in accordance with the discourse concept and SCOT theory is presented. Using the discourse analysis as an analytical point of departure with respect to the qualitative data material the motives and barriers of the actors with regard to automated dose dispensing was shown.

As the first step in the discourse analysis, a set of profiles for the actors who took part in the interview survey was developed and comprises the following main technological framework elements from the SCOT theory:

1. Understanding and delimitation of the technology
2. Main objectives and expectations
3. Understanding key problems
4. Understanding key solutions

These actor profiles, along with the theme analyses of the interview survey and results of the questionnaire survey, were then used as the basis for the following more general and interdisciplinary construction of the discourses the actors conducted about the implementation and use of automated dose dispensing.

The first two of the SCOT categories listed above were systematically reviewed (understanding and delimitation of the technology and main objectives and expectations) for each of the identified main discourses and each of the HTA themes: technology, organisation, patient and economy. We also evaluated the extent to which there were tendencies to close and stabilise the understanding of the technology. In conclusion, we wrote a scenario concerning the main challenges, problems and solutions for each discourse based on all of the analyses.

## RESULTS

### Actor profiles and main discourses

Three main types of discourse with respect to automated dose dispensing in Denmark were identified, namely: 'optimistic', 'sceptical' and 'pragmatic' discourses.

The 'optimistic' discourse exists among enthusiastic supporters and innovators in the automated dose dispensing scheme, actors who have great expectations for and interest in the potential of the technology. Actors who dominate in this discourse are representatives of pharmacies and local authorities, as well as regional drug consultants, users and practitioners.

The 'sceptical' discourse exists primarily among actors who see problems with the scheme and do not believe in the expectations about the technology that have been promoted by optimists in particular, as well as actors whose interests are threatened by the introduction of the scheme. Actors who dominate in this discourse are representatives of doctors and nurses, practitioners in these professional groups as well as scientists who lack documentation and evidence about the consequences and potential of the scheme.

The 'pragmatic' discourse exists among the solution-oriented actors who believe that automated dose dispensing is valuable if the technology is used correctly, regardless of any weaknesses in the scheme. Thus, they are to a certain extent willing to adapt their expectations to the technology and the related system in order to optimise the scheme. Dominant actors are representatives of the central administration (Ministry of the Interior and Health, The Danish Medicines Agency and the National Board of Health).

A technical discourse exists as a sub-group under the pragmatic discourse, conducted by technicians who design and implement the many technical, organisational and economic systems that make up the automated dose dispensing scheme. Dominant actors include The Danish Medicines Agency, The Danish Pharmaceutical Association, pharmacies packing the doses, the pharmaceutical industry, local authority and regional actors and others with special insight into the systems in question.

### Main challenges and solutions

Each of the general types of discourse is documented with regard to the HTA themes technology, organisation, patient and economy. Three scenarios that correspondent to the general discourses identified are used to summarise the theoretical analysis. The aim here is to show the connection and logic in each of the main discourses in order to analyse their possible contribution to further development.

In the 'optimistic' scenario, automated dose dispensing is considered a medical technology with the potential to become a key technology for drug safety and rational pharmacotherapy. The scheme is evaluated as the tool to ensure that 'the right person gets the right medicine at the right time and at the – presumably – right price'. automated dose dispensing will achieve better compliance, patient satisfaction and fewer hospitalisations if administered properly. The scheme also has the potential to lead to considerable rationalisation for home care, which can mean more relevant use of home care resources and direct savings.

According to the 'optimistic' discourse, the challenge in future will be to expand the technology, so that its full potential is realised. This will require numerous proposals for offensive solution strategies aimed at overcoming technical, organisational and economic obstacles (see Table 3).

In addition to the proposed solutions mentioned in Table 3, some doctors and pharmacists point out that the economic benefits are not strong enough to strengthen expansion of the scheme. Some actors in the pharmacy sector see opportunities in this discourse for solving organisational problems connected with expansion through greater utilisation of the pharmacy's professional clinical pharmacy resources. This could be done, for example, by paying pharmacies for doing medication reviews, patient counselling and follow-up.

Conversely, increased expenses are not a desired solution at the local authority level, where actors in the optimistic scenario also want the scheme expanded. Some actors see potential in making automated dose dispensing obligatory for some patient groups, since it is expected that the savings potential of the scheme will be realised due to the increased number of people included under the scheme.

In the 'sceptical' scenario, automated dose dispensing is considered a new health technology that can produce new errors posing greater patient safety risks. The scheme is also seen as a centralised, organisational solution that is economically motivated. In this scenario, automated dose dispensing is a system for automatic medicine dispensing without sufficient assurance that documentation (dosage charts, etc.) is updated and correct; that prescribing is in order generally; that prescription changes are implemented correctly; that other medications are given correctly; that patients who take their own medications are informed and in control of the situation; that treatment results are monitored adequately and that patients are observed. In accordance with this discourse, it is not clear who is actually responsible for ensuring that these tasks are carried out, and this more than any other factor is seen as the main weakness of the scheme.

Table 3: Problem-solving proposals from the three discourses in the ADD area

| Proposals from the 'optimistic' discourse | Proposals from the 'sceptical' discourse | Proposals from the 'pragmatic' discourse |
|---|---|---|
| * A medication review should be conducted to ensure there are no drug-related problems before the patient joins the scheme<br>* A dosage chart should include all of the patient's medications (dose-dispensed and not dose-dispensed)<br>* The pharmacy should update the dosage chart for non-ADD medications as well as ADD medications<br>* Instructions should be drawn up for hospitals on how to handle patients receiving ADD medications upon hospitalisation or discharge<br>* The patient should have the correct ADD medicine from the moment of prescribing, for example, by having the hospital supply dosage dispensed medication until the pharmacy is able to supply ADD medication to the patient<br>* The pharmacies should be obligated by law or volunteer to supply new ADD medication for less than a week when acute changes in medication have been made<br>* Home caregivers should take responsibility for removing medication from dose packs when a prescription is discontinued or reduced | * Safety problems and new errors should be charted<br>* Research should be conducted to document impact on safety, compliance, health, hospitalisation and patient experience<br>* Executive orders and guidelines on ADD should be adapted in order to avoid safety problems, particularly with regard to hospitalisation and discharge<br>* Guidelines should be drawn up regarding responsibility for processes concerning administration of dosage charts, initiating prescription refills, changes in dose packs delivered, patient information, follow-up and observation<br>* Common, real-time electronic documentation systems should be established<br>* Unrealistic expectations about savings should be dropped; e.g. home care observations should be maintained when considered necessary and there should be payment for medication reviews | * Formal responsibility should remain where it is (with the patient's doctor)<br>* Guidelines should be drawn up for the continuation of care<br>* Instructions should be drawn up when needed<br>* Participants should be forward looking and solution oriented, bringing the involved parties together, rather than focusing on obstacles and conflicts of interest<br>* Frequently asked question (FAQ) services should be set up<br>* The best solutions should be developed on the local level by exchanging experience (via contact person schemes at pharmacies, in local authorities and home care service)<br>* The scheme should be limited to simply being a new way of packaging medication and thereby avoid the idea that all present quality aspects of the medication process must be solved as part of the ADD scheme<br>* Safety problems should be solved by ensuring that the scheme is only used for relevant target groups<br>* Work in the home care service should be redistributed and no more than minor savings should be expected |

While patients may indicate satisfaction with the scheme, sceptics say that patients can also experience pressure to accept the scheme, or that they feel insecure, for example, by discovering errors or from lack of contact with competent professionals. Actors in this discourse question whether the medication of the weakest patients is stable enough for them to use the scheme, particularly when hospitalised and when their prescriptions are changed. Sceptics fear that big savings in home care increase costs from drug related problems. They also fear that the scheme will lead to cuts in home care or increase the tasks of caregivers without compensation.

For this discourse, the future challenge is safety and clarifying responsibility. First and foremost are the tasks of clarifying responsibility, economy, problems with patient safety and what conditions need to be in place so that automated dose dispensing can lead to more realistic goals.

The 'sceptical' discourse gives rise to several proposals for defensive solution strategies (see Table 3). Just as in the 'optimistic' scenario, these proposals are targeted at the constructive removal of technical, organisational and economic obstacles.

In the 'pragmatic' scenario, automated dose dispensing is seen as a good service that should be offered to people in a modern health care sector. Used correctly, the technology has the potential to strengthen safety in administering medications, particularly in residential care for the elderly.

The main challenge for actors in the pragmatic scenario is to achieve acceptance of automated dose dispensing. Particularly for practitioners, this will mean that the scheme must find its place among other methods of administering medication; finding compromises so that the technology can work for all involved parties, which can sometimes have conflicting interests; and most importantly avoiding fiascos. To achieve these ends, it is paramount to ensure an acceptable level with regard to expanding the scheme; to secure the main qualities concerning administering the medication to weak patients; to avoid heavy pressure to cut costs; and to overcome resistance among practitioners and professional organisations.

The pragmatic agenda leads to more dialogue and learning-oriented solution strategies than those in the other two discourses (see Table 3). As a starting point, technical changes to the scheme are not considered necessary; focus is on the organisational dimension instead. The actors in this discourse are not prepared to initiate large studies or large reforms of automated dose dispensing. They see 'puzzle-solving' as the way forward.

## DISCUSSION

The above qualitative analyses identified a significant variation in opinion (high interpretative flexibility) among the actors involved in implementing the automated dose dispensing scheme. However, at the same time a number of

solutions were developed in the practice field, showing that the scheme can be adapted and made to work. The lack of agreement and common understanding can be seen as a weakness in the scheme. In contrast, however, the diversity of perspective and perception can be regarded as resources that can be used to develop and strengthen the chance for organisational solutions to work successfully in many different cultural, social and technical contexts.

This study will be most useful seen from this constructive point of view. Acknowledging the logic of the views of the various actors will open up many alternative options for action. Similarly, the solutions posed by the scenarios above all have relevant development potential.

It is not possible to make objective recommendations on the basis of a study of actors' perspectives. If automated dose dispensing is to result in better use of medication, we recommend first and foremost that the discourses meet so that the participants in them have the opportunity to listen to the agendas of the other discourses and see their own contribution as part of the overall system, as well as to evaluate the effect of these different contributions and understandings. We agree with ten Have[29] and Reuzel[30], both of whom claim that an HTA in which the (often conflicting) interests of the various actors are put into play results in a richer and more interesting HTA than the 'traditional' one-sided focus on safety, effectiveness and cost-effectiveness. Generally, we support the international literature[31-33] according to which new technologies should be evaluated before they are allowed to diffuse, unevaluated, into clinical practice. But when such an HTA is not conducted prior to the introduction of the technology, an HTA in the late phases of the technology must be considered preferable to no assessment whatsoever.

Several factors appear in all three types of discourse, and they are thereby evaluated as expressing common recommendations for decision makers and practitioners, as follows:

- Ensure that guidelines are drawn up for the continuation of care
- Ensure that instruction are drawn up as needed to clarify the division of responsibility
- Find the best solutions at local level by exchanging experience
- Chart safety problems and new types of error
- Ensure that automated dose dispensing is only used for relevant target groups
- Make delivery times for acute changes in medication more flexible
- Improve the quality of documentation systems so that all actors have correct, current and updated information at all times

As mentioned earlier, it has not been possible to identify other studies using the same social constructionist approach as this study to show the significance of various actors' viewpoints on the design of automated dose dispensing. Nonetheless, the automated dose dispensing literature provides the opportunity to discuss the extent to which selected elements of the three discourses and scenarios can be found outside the context of the Danish primary health sector. In the following, we will compare the three scenarios one by one to existing literature.

The assumption of the optimistic scenario about the potential of the scheme as a key technology for medication safety is supported in three studies documenting that the error rate with automated dose dispensing is less than in manually packaged dose medication.[34-36] Another main expectation of the optimistic scenario, that dose dispensing will reduce medication expenses, can also be verified in the literature.[13,33,37-40]

In the 'sceptical' scenario, particular problems lie in clarifying where responsibility lies and the fear of cutbacks in home care with a subsequent increase in drug related problems among patients. The literature also shows that lack of clarification about the division of labour and responsibility concerning the tasks related to dose dispensing has presented obstacles to the successful implementation of the technology.[14,39,41-43] Implementation of the dose-dispensing scheme has met particular resistance from nurses[39,42,43] and doctors.[44,45] That automated dose dispensing alone will lead to increased compliance in individual patients cannot be documented on the basis of the available literature, which, on the contrary, emphasises the necessity of combining automated dose dispensing with other initiatives, such as reducing daily doses, patient education, medication reviews, etc. in order to achieve greater compliance.[12,46-48]

As mentioned earlier, the key challenge for actors included in the pragmatic scenario is acceptance. In general, other studies in the field show satisfaction with automated dose dispensing and acceptance of the technology as a link in the medication process among both health care professionals[14,35,38,39,41,42,48] and patients.[14,35,45,48-50]

The literature thus provides a basis for 'verifying' all three discourses/scenarios. However, the constructionist approach underlying this study by no means attempts to describe the technology 'objectively', but rather to clarify the diversity of the given technology.

**Limitations**

The three types of discourse identified in this study should first be understood as basic categories delineated rather sharply. Many individuals would presumably say that they contribute to several discourses, and would be unable to identify themselves as exclusively 'optimistic', 'sceptical' or 'pragmatic'. These very general discourses are carried on by specific groups of actors, but are interdisciplinary in terms of objective interest groups, called relevant social groups in SCOT terminology. Here a relevant social group should be understood as 'forces' in a social system or as gradients that want influence on how a technology is designed, for example, in terms of how the technology is put into a discourse, rather than as cohesive groups.

The categorisation of the discourses should be understood in this sense. Thus, the groups we have proposed are not hard and fast entities, but rather comprise the most meaningful interpretations we could establish to encompass the empirical material. Naturally, the discourses must be seen in interplay with other social powers in this context involving professions, tasks and interests, for example.

Stabilising the perception of a technology is not necessarily a goal in itself. Conversely, it is known that conflicts of interest can present serious obstacles to achieving the goals expected. Knowing the rationale behind other views and interests can help develop solutions. We agree with Kazanjian[51] who operates with the concept of 'strategic HTA', which involves an open discussion of health care in a way that highlights societal and political implications, through analysis of the influence of dominant social relations of technological development and diffusion. The present analysis can make a contribution to such a strategic HTA. See Nørgaard and Morgall[52] for another example of a HTA with focus on the various perceptions of the same technology by different groups of actors.

The above analysis attempts to remain neutral in its presentation of diverse descriptions of the technology with respect for the views of the informants. As researchers, however, we are also 'voices' in the discourse system and it is not possible to observe without interacting with the field. In the social-constructionist view[53], this co-construction has a point and the resulting diversity of perspectives and opinions is seen as helping to develop and strengthen the chances for organisational solutions to succeed and function in many different cultural, social and technical settings.

## CONCLUSIONS

There are many variations of opinion (high interpretive flexibility) about automated dose dispensing. 'Optimistic', 'sceptical' and 'pragmatic' scenarios can be identified. The analyses carried out show that conscious strategies need to be drawn up so that the technology can function successfully with the involved actors. The preferences, ideas and proposals for future actions and initiatives identified in the project can be the starting point for efforts to define future development strategies. The general impression from the analysis is that automated dose dispensing in the primary health sector is a technology with good, potential opportunities to improve the medication of weak patients in particular, but that there are risks involved and many organisational obstacles.

The article argues for the use of HTA and constructivist theory to clarify and set into play the perspectives of the various groups of actors about the same technology.

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## CONFLICT OF INTEREST

There is no conflict of interest. The study from which data in this paper come from is funded by the Pharmacy Foundation.

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