

# Physicians' evaluation of clinical pharmacy revealed increased focus on quality improvement and cost savings

Lene Juel Kjeldsen<sup>1</sup>, Trine Bjerregaard Jensen<sup>2</sup> & Jens Jørn Jensen<sup>3</sup>

## ABSTRACT

**INTRODUCTION:** The aims of the present study were to evaluate physicians' satisfaction with medication services delivered by a clinical pharmacist (CP); to investigate and document to which extent a CP could improve the medication quality and reduce medication costs at an intensive care unit (ICU); and to explore which types of tasks the CP was asked to perform.

**MATERIAL AND METHODS:** The project was conducted at an ICU from 1 February to 31 August 2008. The intervention consisted of certain tasks being performed by a CP. The intervention was evaluated on the basis of documentation of the intervention performed and on a questionnaire filled in by physicians at the end of the study.

**RESULTS:** The majority of the physicians reported that the CP's intervention had raised their attention to medication costs (70%) and medication quality (76%). This physician-reported impression correlated with the CP's intervention which improved medication quality and catalysed an annual estimated cost saving of at least DKK 330,000, which was achieved by targeting particular medication areas. The CP was asked to perform various medication-related tasks during the project period. Indeed, the physicians reported that they found the CP qualified to perform several medication-related tasks – and many physicians reported that they had benefitted from input regarding those tasks.

**CONCLUSION:** The intervention occasioned positive physician feedback on clinical pharmacy services and the study shows that the CP was perceived by the physicians as a valuable professional collaborator.

**FUNDING:** not relevant.

**TRIAL REGISTRATION:** not relevant.

National initiatives focusing on patient safety and quality assurance have caused clinical pharmacy to grow as a profession in Denmark over the past ten years. Furthermore, in 2004 The Danish Medicines Agency published a report based on extant literature identifying various areas that could benefit from the introduction of a clinical pharmacy perspective [1].

Various papers on the effect of clinical pharmacy in hospital settings have been published. A review by Kaboli

et al [2] of 36 international studies reported that the introduction of clinical pharmacy services in general led to improved quality, safety and effect of patients' medication treatment. Recently, a randomized controlled trial of 368 patients aged 80 years or older performed in Sweden showed that comprehensive clinical pharmacist intervention reduced medication-related re-admissions by 80%, reduced hospital contacts by 16% and led to significant cost savings compared with a control group [3]. In addition, a review evaluated the economic effects of clinical pharmacy interventions [4]. Despite methodological challenges, most studies found an economic benefit from the introduction of clinical pharmacy services [4]. In Denmark, a study from 2007 showed that screening by a clinical pharmacist (CP) of 2,500 patient charts identified medication discrepancies in 20% of the charts within ten focus areas [5]. Recommendations were made by the CP. Physicians accepted these recommendations in 70% of the cases. Savings on medication costs were observed during the project period [5].

The extent of clinical pharmacy in Denmark in 2008 was documented in a survey among 13 of the 14 hospital pharmacies in Denmark [6]. The survey showed that 95 pharmacists were involved in clinical pharmacy, some spending a few hours weekly while others working full time on clinical pharmacy activities with much variety between the hospital pharmacies. Hence, the number of CPs has risen by 190% compared with a national survey published in the above-mentioned report from The Danish Medicines Agency [1, 6].

The Regional Hospital Viborg, Skive, Kjellerup (RHVSK) is expected to change its status to become an "acute hospital", which may lead to an increase in the treatment of complicated patients and in the use of costly medication, especially at the ICU. The Hospital has experienced advantageous results by using clinical pharmacy at a medical ward, where a CP evaluated the frequency of medication-related errors by conducting systematic medication reviews. Hence, a project at the ICU was designed to include clinical pharmacy in daily practice.

## ORIGINAL ARTICLE

- 1) Amgros I/S, SAFE,
- 2) The Regional Hospital Viborg, Skive, Kjellerup, Hospital Pharmacy, and
- 3) The Regional Hospital Viborg, Skive, Kjellerup, Intensive Care Unit

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FIGURE 1

Rate of non-intravenous administration forms (e.g. tablets) compared with intravenous use of ciprofloxacin and metronidazole. The arrow indicates the intervention period (February-April 2008).

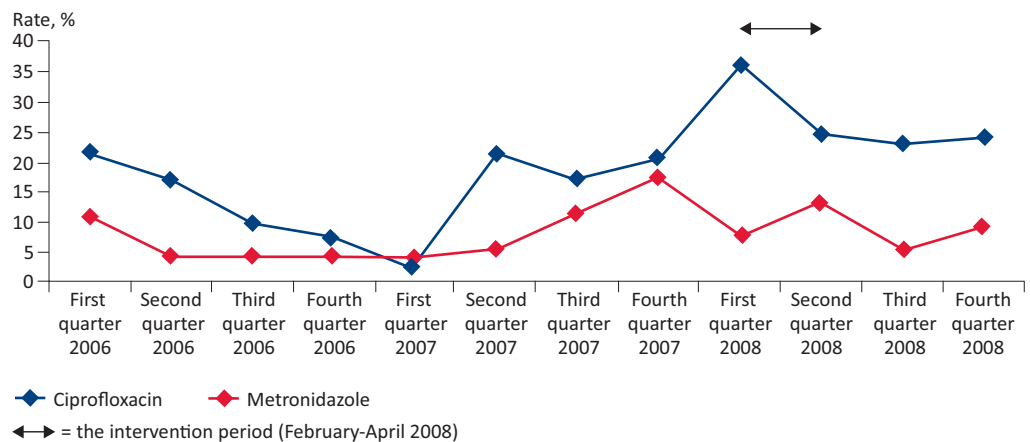
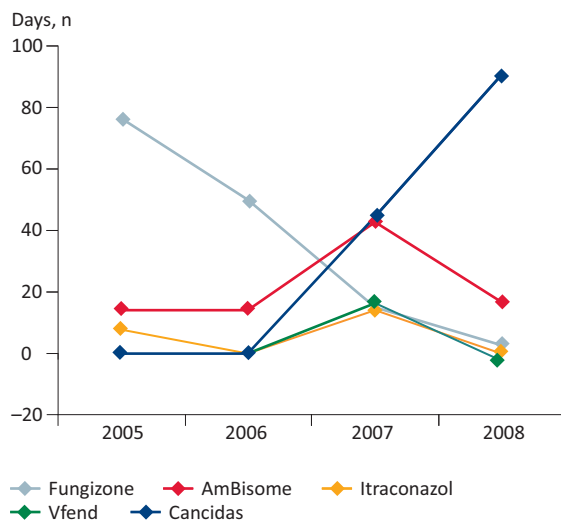


FIGURE 2

Use of antifungal medications during the project period. The results are presented in number of days of treatment. Alternatively, defined daily dose as a unit could have been used, but one defined daily dose of AmBisome is 50 mg although the usual amount used in practice is 350 mg per day. One defined daily dose of Cancidas is, however, 50 mg, which correlates with the typical daily dose used in practice.



tended the ward on weekdays from 8 am to 3 pm. The RHVSK comprised ten mixed surgery and medical ICU beds, and in 2009 the annual number of patients was 998.

The pharmacist's tasks included:

- To perform medication reviews on all patients admitted to the ward and to discuss recommendations with the relevant physician
- To perform tasks relevant to clinical pharmacy during the project period. These tasks were identified and treated as focus areas during the project period.

#### Data collection

The project was evaluated on the basis of documentation of the intervention prepared by the CP during the project period. After the intervention period, a satisfaction survey among physicians was conducted using a questionnaire with questions on the physicians' satisfaction with the services provided by the CP. The questionnaire was distributed to all physicians attending the ward in October 2008.

#### Cost calculation

Cost savings were calculated by comparing the medication costs that would have been accrued by maintaining the existing prescribing pattern with the actual costs incurred as a result of the CP's intervention. No indirect costs were included in the calculations.

*Trial registration:* not relevant.

The primary aim of the present project was to evaluate physicians' satisfaction with medication services performed by a CP. Another aim was to investigate and document to which extent a CP could improve the quality and reduce the costs of medication use at the ICU. A final aim was to explore which types of tasks the CP was asked to perform at the ICU.

#### MATERIAL AND METHODS

The project was conducted from 1 February to 31 August 2008 at the ICU at the RHVSK, where a CP at-

#### RESULTS

The CP attended the ICU a total of 105 days during the project period.

### Medication reviews

Medication reviews were performed on all patients (an average of 7.1 patients per day) admitted to the ICU during the 105 days. Among 105 suggested recommendations, 91% were accepted by the physicians, while 3% of the recommendations were rejected. The CP implemented 6% of the recommendations herself. Among the accepted recommendations, 91% were implemented in full, while 3% were partly implemented (usually a decision to use another dose than that recommended by the CP) and 6% were not implemented. Non-implementation was due to forgetfulness or severe patient illness where a physician deemed that a patient would not benefit from the intervention. The majority of the recommendations (70%) were made for the therapeutic group of antibiotics (ATC group J).

As a part of the medication reviews, analogue substitution of Losec (IV) (omeprazole) to Nexium (IV) (esomeprazole) was performed resulting in an estimated annual cost saving of DKK 200,000.

The majority of the interventions were made with the aim of improving medication quality. Even so, only 32% of the interventions entailed increased costs, while 56% decreased costs; the remaining 12% of the interventions were cost neutral.

A wide variety of quality improvements were evident as a result of the medication reviews. These improvements included, among others, avoidance of potential unwanted side effects where excessive doses had been prescribed; achievement of clinical effect where sub-therapeutic doses had been prescribed. Recommendations made by the CP regarding electronic charts were, e.g., lack of consistency between medicine prescription in the text part of the electronic chart and the medication module of the electronic chart. If not prescribed in the medication module, the prescription would not be visible to the nurse and hence not administered.

### Focus areas

Substitution of intravenous (IV) antibiotics with oral formulations was chosen as a focus area because this was expected to yield costs savings, fewer compatibility problems upon administration and a decrease in nurse-dependent medication administration and the rate of non-IV antibiotic use compared to the use of IV antibiotics (**Figure 1**). Intervention in this focus area led to an estimated annual cost saving of DKK 20,000 on the use of Ciprofloxacin and DKK 10,000 on the use of Metronidazole. These estimated cost savings did not include potential indirect cost savings on administration time consumed by the nurse.

Another focus area was choice of antifungal medication. By substituting a broad-spectrum antifungal

medication, amphotericin B (AmBisome), with a narrow-spectrum medication, caspofungin (Cancidas), an estimated annual cost saving of DKK 100,000 was achieved. During the project period, the use of other broad-spectrum antifungals decreased: amphotericin B (Fungizone), voriconazole (Vfend) and itraconazole (Itraconazol) (**Figure 2**). Since these medications were not chosen as focus medications, they were not included in the calculation of cost savings.

The cost of performing the study was equivalent to the salary of the CP only.

### Other tasks

During the project period, various other tasks were performed, e.g. preparation of IV-guidelines. Presentations of the use of antibiotics were prepared and presented at microbiology conferences, and lists of use of oral medications in stomach pumps were prepared. In addition, the CP assisted the staff by answering medication-related questions and handling stock problems.

### Physicians' evaluation of the clinical pharmacy services

Among the 23 physicians who received the questionnaire, 17 (74%) returned a completed questionnaire, whereof 12% attended the ward on a daily basis – and an additional 18% attended the ward several times weekly. The remaining physicians only attended the ward a couple of times monthly or less. Among the physicians, 70% and 76% reported that the CP had increased their focus on costs and quality, respectively. Furthermore, 58% of the physicians stated that presence of the CP at the ward had influenced their prescribing habits, while 12% reported that the project had had no influence on their prescribing habits.

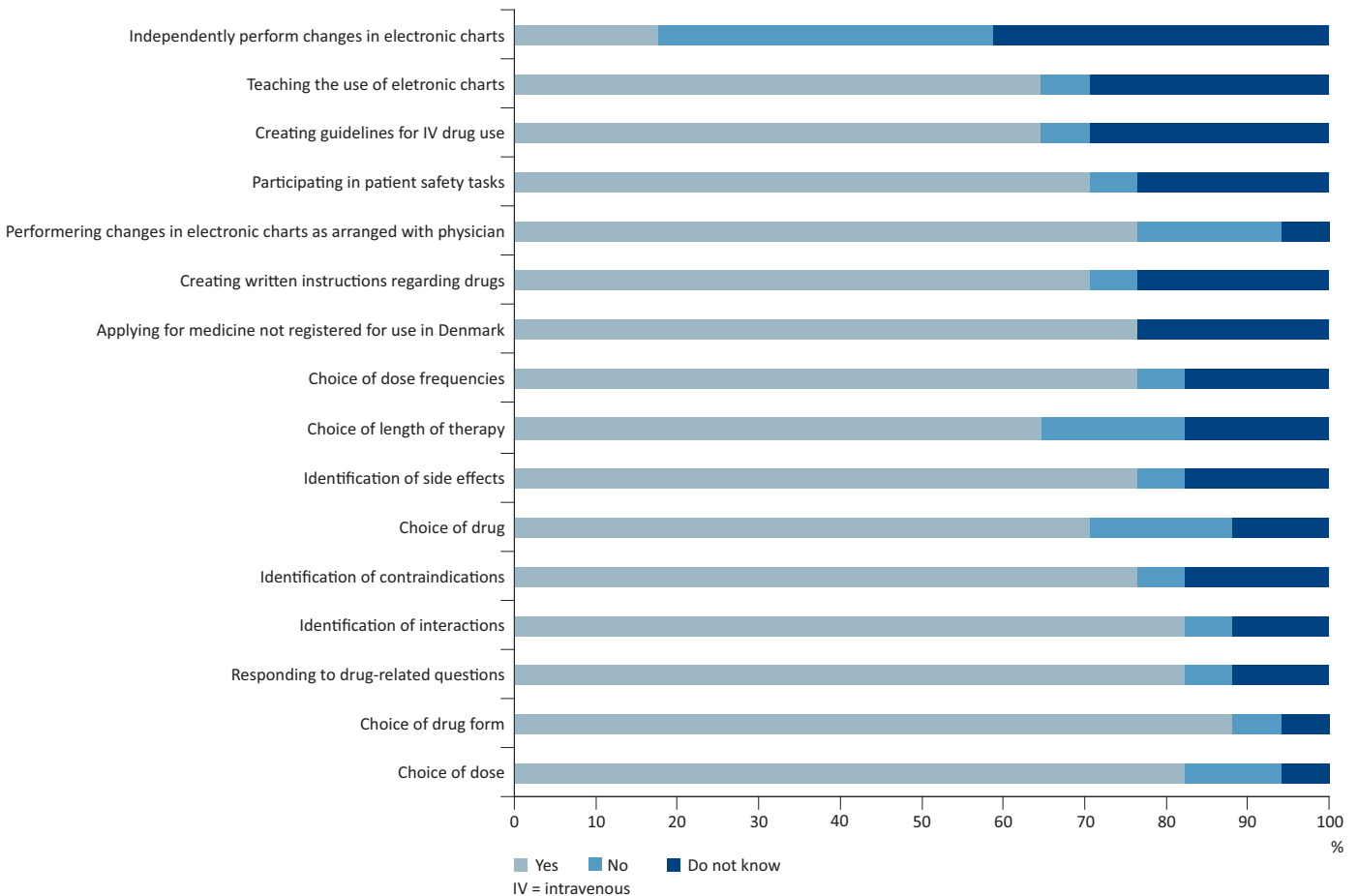
The evaluation of the performance of the CP showed that between 65% and 88% of the physicians found that the CP was qualified to perform each individual task – with the exception of one task: “independently perform



Collaboration between clinical pharmacist and physician (Klinisk Foto, The Regional Hospital, Viborg).


**FIGURE 3**

Physicians' assessment of whether the clinical pharmacist was qualified to perform various tasks.



changes in electronic charts" (Figure 3). Less than 20% of the physicians estimated that the CP was qualified to perform this task. However, if arranged with the physician, 77% of the physicians found that the CP was qualified to perform changes in the electronic charts (Figure 3).

The physicians reported that they had experienced benefit from input from the CP regarding all mentioned tasks. Indeed, more than 60% responded that they had benefitted from input about "choice of dose", "choice of drug form", "responding to drug-related questions" and "identification of contraindications" (Figure 4). These four issues correlated with the four most frequently mentioned tasks regarding the CP's qualifications (Figure 3).

#### DISCUSSION

The study showed that the majority of the physicians at the ICU reported that the CP had increased their attention to cost and quality. This impression correlated with a tendency for the CP to improve the quality of the medi-

cation treatment and to catalyze an estimated annual cost saving of at least DKK 330,000 by selecting a focus area regarding medication treatment.

#### Quality of the medication treatment

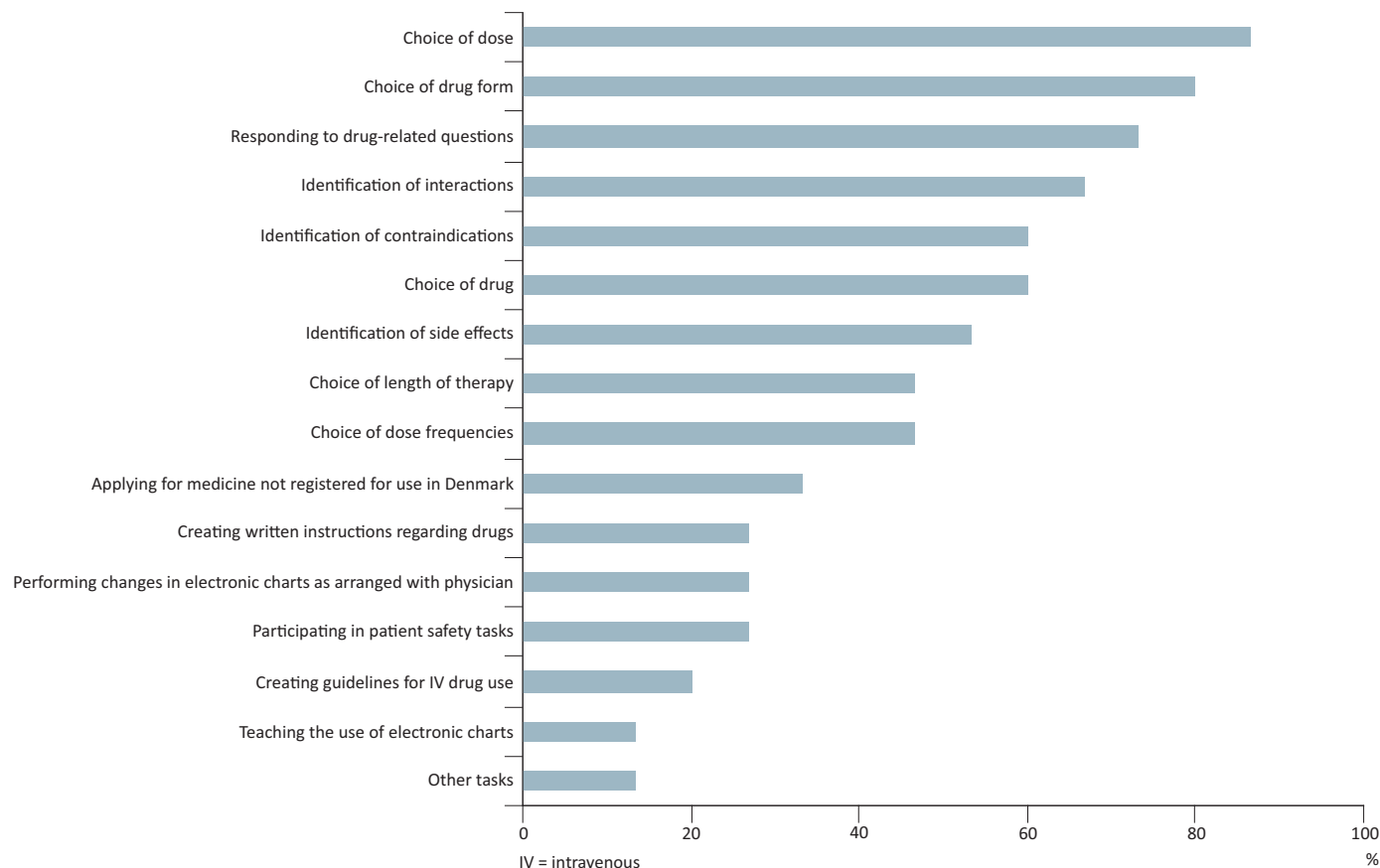
The study showed a high acceptance rate of recommendations. According to a review of medication review projects in Denmark, acceptance rates varied widely between 22% and 89% depending on design, setting and available information [7]. As found in the present study, it is likely that a face-to-face discussion of recommendations between the CP and the physician leads to a high acceptance rate because personal communication improves communication between the professions and the understanding of the relevance and clinical importance of recommendations.

The high acceptance rate may also be viewed as a measure of the quality improvement of the medication treatment; not least since the majority of the recommendations aimed at improving quality.



FIGURE 4

Reports by the physicians of the tasks for which they had benefitted from the clinical pharmacist's input.



### Cost savings

Due to the relatively modest size of the project, no specific cost analysis was planned. However, some of the interventions implemented were estimated to bring cost savings in the amount of DKK 330,000. In addition, the majority of the recommendations made by the CP caused costs to fall, while 32% raised costs even if the exact cost effects were not assessed. It is likely that a thorough cost analysis would have documented that the CP's recommendations led to cost savings sufficiently large to cover the cost of the CP's wages. The results of the current study correlate with those reported in the literature, which suggests that services performed by CPs have positive economic effects [4]. However, the introduction of CP services should not be seen as a measure only to save costs in so far as the CP's role is also to prevent suboptimal medical intervention, which may imply that medication costs may also occasionally rise.

### Physicians' evaluation of the clinical pharmacy services

Most of the physicians reported that the CP had raised

their attention to the costs and quality of medication treatment. The services of the CP were conspicuous, since the majority of the physicians reported benefit from the CP services. Indeed, more than half of the physicians reported that the CP's presence had influenced their prescription habits. This suggests that the CP was a valuable professional collaborator to the physicians.

A comparison of Figure 3 and Figure 4 shows that the tasks identified by the physicians as those that the CP was qualified to perform were also those from which they derived benefit from the CP's input. It is likely that the top four tasks identified in the figures are those where the CP can best assist the physicians. Alternatively, these tasks are highly frequent tasks performed at the ward, and hence many physicians were presented to recommendations made regarding these tasks.

The physicians' evaluation of one task did, however, stick out. Less than 20% of the physicians estimated that the CP was qualified to independently make changes in the electronic charts, but if arranged with the physician 77% of the physicians agreed that the CP was qualified

to perform this task. During the project period, the CP did perform changes in the electronic chart under physician supervision, but not independently. It is puzzling that even though the physicians generally agree on the CP's qualifications, they do not seem to be confident in handing over to the CP the responsibility for the implementation of medication changes.

In conclusion, the study showed that ICU physicians gave positive feedback on clinical pharmacy practices, and that the physicians found that the CP was a valuable professional collaborator. The majority of the physicians reported that the CP had increased their attention to costs and quality. This correlated with the tendency for the CP to improve the quality of the medication treatment and to catalyze an estimated annual cost saving of at least DKK 330,000.

### Limitations

The study had a relatively modest size and the results presented were based on a single CP's delivery of services to an ICU and evaluation of a single CP. A stricter methodology could possibly have resulted in specific information regarding the quality and cost outcomes, but that would have challenged the design needed to address the aims of the study. Further studies are needed to document whether these results can be sustained in contexts where the services are delivered at other types of wards and whether they can be generalized to similar services delivered by numerous CPs.

**CORRESPONDENCE:** *Lene Juel Kjeldsen, Amgros I/S, 2100 København Ø, Denmark. E-mail: ljk@amgros.dk*

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**CONFLICTS OF INTEREST:** none

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