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Title. Registered nurses' use of computerised decision support in medication reviews – implications in Swedish nursing homes

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Abstract

Purpose - To explore the implications of registered nurses' (RNs) use of a computerized decision support system (CDSS) in medication reviews.

Design/methodology/approach - Quasi-experimental, one-group pre-test/post-test design with three- and six-month follow-ups subsequent to the introduction of a CDSS. Eleven RNs initiated and prepared a total of 54 medication reviews. The outcome measures were the number of drug-related problems (DRPs) as reported by the CDSS and the RNs respectively, the RNs' views on the CDSS, and changes in the quality of drug treatment.

Findings - The CDSS indicated significantly more DRPs than the RNs did, such as potential adverse drug reactions (ADRs). The RNs detected additional problems, outside the scope of the CDSS, such as lack of adherence. They considered the CDSS beneficial and wanted to continue using it. Only minor changes were found in the quality of drug treatments, with no significant changes in the drug specific quality indicators (e.g. inappropriate drugs). However, the use of renally excreted drugs in reduced renal function decreased.

Practical implications – RNs' use of a CDSS in medication reviews is of value in detecting potential ADRs and interactions. Yet, in order to have an impact on outcomes in the quality of drug treatment, further measures are needed. These may involve development of inter-professional collaboration, such as established procedures for the implementation of medication reviews, including the use of CDSS.

Originality/value. - This is, to the best of our knowledge, the first study to explore the implications of medication reviews, initiated and prepared by RNs who use a CDSS. The paper adds further insight into RNs' role in relation to quality of drug treatments.

Keywords Computerized decision support systems, drug monitoring, drug-related problem, medication review, nurse, nursing home, patient, pharmacovigilance

Paper type Research paper

Introduction

Aging is often associated with concerns about the effects and safety of drug treatments. Nursing home patients are among the frailest of older people, making drug treatment even more complex. Polypharmacy and adverse drug reactions (ADRs) are common, as is the prevalence of errors in prescribing and monitoring drugs (Barber et al., 2009). ADRs related to impaired renal function are one of the most common causes of hospitalization (Helldén et al., 2009). Optimizing drug treatments is a time-consuming process, requiring a multi-professional approach that includes extensive communication, frequent monitoring and reviews (Hilmer et al., 2012).

Medication reviews are proven to be a way of improving drug therapy (Alldred et al., 2016; Brulhart and Wermeille, 2011; Milos et al., 2013). Such a review involves a structured evaluation of a patient's drug therapy, with the aim of reaching an agreement with the patient, which optimizes beneficial effects while minimizing drug-related problems (DRPs) (Holland et al., 2007). In Sweden, health care providers are obliged to offer yearly medication reviews to all patients of 75 years or older who are prescribed at least five drugs, or should DRPs be suspected (Swedish National Board of Health and Welfare, 2013). The procedures followed and the health care professionals involved in performing medication reviews vary. Pharmacists are often involved, either alone or in multi-professional teams (Wallerstedt et al., 2014). In recent years the use of computerized decision support systems (CDSSs) has shown clear potential for improving the quality and consistency of medication reviews (Bindoff et al., 2012). A CDSS is a system designed to improve clinical decision-making. The characteristics of individual patients are matched to a computerized knowledge base, and from this patient-specific recommendations are generated (Garg et al., 2005). CDSSs can identify and address DRPs but little has been reported on the effectiveness of such systems in nursing home settings (Bernstein et al., 2014).

Previous interventions involving medication reviews from nursing home settings have mainly focused on reviews by pharmacists, physicians (Milos et al., 2013; Olsson et al., 2010a; Zermansky et al., 2006) or multidisciplinary teams (Brulhart and Wermeille, 2011). However, studies focusing on registered nurses (RNs) are sparse, even though their position enables them to report on changes in the patient's status and compliance and on suspected adverse effects (Brulhart and Wermeille, 2011). There are also few studies reporting on the use of CDSSs in medication reviews. Not only could a CDSS be supportive for prescribers and clinical pharmacists, but also for the RNs who screen for

DRPs (Bernstein et al., 2014; Dilles et al., 2013; Koskela et al., 2016). The provision of high-quality, safe care is highly dependent on the RNs' ability to access and integrate relevant information into their clinical decision-making (Fossum et al., 2011).

In nursing homes, RNs carry the major responsibility for drug management, including monitoring the effects and adverse effects (Lim et al., 2010). This applies also in Sweden where the RNs in nursing homes have described themselves as responsible for planning and prioritizing the physicians' work, and are given full authority to evaluate and monitor drug treatments (Johansson-Pajala et al., 2016). Because of RNs' extensive responsibilities, it is essential to explore how their work can be supported and if their use of a CDSS can benefit the quality of drug management in nursing homes. Previous research has suggested that a key to improving health care may involve an expansion of the RN's role, including drug monitoring. Nurse-led drug monitoring has been studied previously (Gabe et al., 2014; Jordan and Kyriacos, 2014), but it has not involved structured medication reviews supported by a CDSS. In the current study, we explore the implications of RNs' use of a newly introduced CDSS in medication reviews. The study focus is on (I) RNs' observation of DRPs as compared to those indicated by the CDSS, (II) RNs' views on how the CDSS affects their drug management, and (III) changes in the quality of drug treatments.

Material and methods

Design

A quasi-experimental one-group pre-test/post-test design (Harris et al., 2006) with three- and six-month follow-ups conducted after introducing a CDSS for drug monitoring.

Setting

In Sweden, qualification as an RN requires the completion of a three-year university education. The RNs collaborate with unlicensed personnel, henceforth referred to as nursing staff, but the RNs carry the principal responsibility for the nursing care. They are responsible for a large number of patients and often depend on observations made by nursing staff who are more closely involved in bed-side care (Furuåker and Nilsson, 2013).

This study was carried out at four nursing homes located in two regions in the central part of Sweden. Purposive sampling was used for recruiting the nursing homes, of which one had recently started to use the CDSS while the other three began using it in connection with the implementation of the study. The nursing homes were all run by non-profit community services and varied in their number of patients from 40 to 75, altogether about 220. The number of RNs working in each nursing home ranged from two to four, with 14

altogether. Physicians based in primary health care centres visited the nursing homes once a week. The study was approved by the Regional Ethical Review Board Uppsala (Dno. 2013/488) and was performed according to the Helsinki Declaration. Informed written consent was obtained from the municipalities and from all participating patients and RNs.

Sample

The inclusion criterion for the RNs was that they were employed at one of the nursing homes. All 14 RNs agreed to participate but three of them were not actively involved, due to sick leave, end of employment or lack of interest. Ten women and one man, with a median age of 43 years (range 31–62) participated. They had a median of eight years (range 3–12) of nursing experience, of which four years (range 1–11) had been in the present nursing home. During a dayshift, the RNs were responsible for the nursing care of approximately 10 to 48 patients. On evening shifts and weekends the number could increase to 300 to 400, then including patients in other facilities. The recruitment of patients for the sample was performed by the RN responsible for the care of each patient. The RNs identified those of their patients who were 75 years or older and who were prescribed a minimum of five drugs. In addition, they had to be able to describe their own health condition. Patients in dementia wards were excluded as were any others who were unable to communicate for whatever reason. Fifty-four of the 157 eligible patients residing in the nursing homes fulfilled the inclusion criteria (Figure1).

The computerized decision support system

The CDSS introduced into the settings is a web based decision support system designed for use by health professionals for drug prescribing and medication reviews. In the present study the CDSS was only used by the RNs. This system can be linked to virtually any source of drug use information, including electronic medical records. The CDSS evaluates the quality of drug treatments based on national indicators compiled from the Swedish National Board of Health and Welfare (2010), as well as potential ADRs based on an assessment of the patient's symptoms. The national indicators, which are partly based on international criteria such as STOPP/START (O'Mahony et al., 2015) and Beers Criteria (Campanelli, 2012), form the basis for recommendations for drug therapy in people aged 75 years and over (Fastbom & Johnell, 2015). The Swedish indicators are both drug specific (inappropriate drugs, drug-drug interactions etc.) and diagnosis specific (drug-disease interactions, contraindications etc.).

In the present study, only drug specific indicators were used. These were the same indicators as those referred to previously in similar studies (Klarin et al., 2005; Olsson et al., 2010b). The CDSS retrieved patient specific information from available drug lists and symptom assessments and then presented a quality report on each patient. These quality reports provided warnings and explanations about, for example inappropriate drugs, drug-drug interactions, drug use in decreased renal function and possible ADRs.

Outcome measures

The outcome measures for comparing the RN's observations of DRPs with what the CDSS signaled (I) were the reports of ADRs, drug-drug interactions, inappropriate drugs and drug duplications. The RNs documented their own suspected DRPs in a questionnaire (Q1), which corresponded with the quality reports produced by the CDSS. Additional observations made by the RNs, e.g. of untreated symptoms/conditions, unclear indications, and lack of adherence, were also documented as potential DRPs.

The outcome measures for evaluating the RNs' views of how the CDSS affects their drug management (II) were based on previous findings regarding RNs' drug management in clinical practice (Johansson-Pajala et al., 2015). These were documented in a questionnaire (Q2) containing eleven items, and responses were given on a Likert-type scale (1 = *totally disagree*, 5= *totally agree*). (The questionnaires are presented in the Appendix).

The outcome measures for detecting changes in the quality of drug treatments (III) were the number of drugs and the drug specific quality indicators (inappropriate drugs, drug-drug interactions, drug duplications and three or more concurrent psychotropic drugs). Furthermore, changes in the drug treatments were examined regarding the use of renally excreted drugs and according to the Anatomical, Therapeutic and Chemical (ATC) classification system.

Data collection

The study was performed between December 2014 and April 2016, and included three- and six-month follow-ups. Preparatory information and introductory meetings were held with the RNs, who also were offered specific training in the use of the CDSS. They had access to support throughout the study, both through personal visits and telephone calls. This service was provided in collaboration with the vendor of the product. The RNs initiated and prepared the medications reviews and performed all the data collection and registrations. The procedure involved three stages.

Stage 1 – Stepwise preparation for medication review

- a. The patient's drug list (drugs, dosage, prescription frequency) was entered by the RNs into the CDSS after verifying that it was consistent with the drugs they actually took.
- b. The RNs prepared the medication review by performing a symptom assessment in which the patients assessed their symptoms in relation to 20 health issues, e.g. dizziness, nausea and poor sleep patterns. Other information collected was blood pressure, pulse rate, serum creatinine, height and weight.
- c. The RNs documented their own suspicions of possible DRPs (Q1).
- d. The RNs entered the information collected in step b into the CDSS, which then delivered a quality report on each patient.
- e. The RNs printed the quality report and presented it to the physician before the medication review was performed according to the routines of each nursing home. The physician was responsible for carrying out the medication review and making any necessary drug adjustments.

Stage 2 – Follow-up three months after the medication review in stage 1e

The current drug list was entered into the CDSS and quality audited with respect to the number of drugs and the four selected indicators (i.e. drug-drug interaction, inappropriate drugs, three or more concurrent psychotropic drugs, and drug duplication).

Stage 3 – Follow-up six months after the medication review in stage 1e

- a. As in stage 2
- b. The RNs estimated how the use of the CDSS had affected their drug management, by answering Q2.

In addition, the treatments were examined regarding the use of renally excreted drugs and the ten most commonly prescribed drug treatments according to the ATC-codes.

Fifty-four medication reviews were performed during the study period. Table 1 presents the characteristics of the patients.

Statistical analyses

The Statistical Package for the Social Sciences Version 22 software was used for all statistical analyses. The differences between the RNs' and CDSS reports of DRP were analysed with McNemar statistics, using dichotomized variables. A Kruskal Wallis H test

was used to evaluate the changes in the quality of drug treatments, three and six months after the medication review. A p -value of <0.05 was regarded as statistically significant. Descriptive statistics were used to describe the RNs' views of how the CDSS affected their drug management.

Results

RNs' observations of DRPs as compared with the CDSS reports (I)

Table 2 presents the difference between suspected DRP (≥ 1 per patient) as reported by the RNs and by the CDSS, in relation to the medication review during stage 1. Statistically significant differences were observed regarding the proportion of DRPs reported by the RNs and the CDSS, in the reporting of ADRs (27 and 43 respectively, $p=.000$) and drug-drug-interactions (10 and 22 respectively, $p=.008$). No significant differences were found in the reports of inappropriate drugs or drug duplications.

The total number of suspected DRPs reported for 54 patients (there could be several for a particular patient), was 86 by the RNs and 205 by the CDSS. The most commonly reported was ADRs, 57 by the RNs and 142 by the CDSS, with a 19% agreement. The symptom which the RNs most frequently assessed as an ADR was dizziness, followed by fatigue, dry mouth and nausea. Regarding drug-drug interactions, the RNs reported a total of 11 and the CDSS 42, 16.7% agreement ($n=27$). The RNs suspected inappropriate drugs in 11 cases and the CDSS in nine, with agreement of 22.2% ($n=7$). Drug duplication was noted in seven cases by the RNs and in 12 by the CDSS, 8.3% ($n=1$).

The RNs also reported additional problems, that the CDSS was not designed to indicate. Most common were untreated symptoms/conditions, of which pain was the most frequent, followed by lack of adherence to the prescribed medication (Table 3).

The total number of other DRPs reported by the RNs (there could be several for a particular patient), was 48. Together with the previously reported 86 DRPs (ADRs, drug-drug interactions, inappropriate drugs and drug duplication) this amounted to a total of 134 suspected DRPs in 54 patients. Of these, 79.1% ($n=106$) originated from two of the four nursing homes while the remaining two reported 20.9% ($n=28$).

RNs' views of how the CDSS affected their drug management (II)

Figure 2 summarizes the RNs' views of how the CDSS affected their drug management and their performance of medication reviews. The Likert scale medians ranged between two and four, with most ratings on three, and with the higher values reflecting discussions

with patients and desire to continue to use the CDSS. The lower values reflected discussions with relatives and access to web-based pharmaceutical information.

Changes in the quality of drug treatments (III)

The medication review was followed up after three and six months (stages 2 and 3) and quality audited according to the selected drug specific indicators. No significant differences were found between the time of the medication review and three or six months later, in either the number of drugs, $p = 0.811$, inappropriate drugs, $p = 0.939$, drug-drug interactions, $p = 0.757$, drug duplication, $p = 0.912$ or three or more concurrent psychotropic drugs, $p = 0.679$.

Table 4 presents the ten most prescribed drugs according to the ATC-codes, and the use of renally excreted drugs. The most common drugs were analgesics and antipyretics, which 77.8% of the patients were prescribed. 44.4% of the patients received hypnotics and sedatives or opioids. The use of renally excreted drugs in reduced renal function, which was 92.1% at the time of the medication review, had decreased to 86.8% three months later.

Strengths and limitations

This is, to the best of our knowledge, the first study to explore the effects of medication reviews as initiated and prepared by RNs using a CDSS. One limitation was the relatively small study sample, largely due to the fact that the use of CDSSs in nursing homes is still limited. More patients than expected, also had to be excluded, mainly because they were suffering from cognitive impairment. This could have been avoided by using a symptom assessment form designed for patients with cognitive impairment. However, it was considered appropriate to first establish the effects in patients without cognitive impairment. Another limitation was that no control group was included. However, this design is commonly used in medical informatics literature (Harris et al., 2006). Still, it would be desirable to conduct the study as a larger, randomized controlled trial. Another limitation of the study is the lack of documentation concerning the physicians' and RNs' specific actions and communication. This includes the results of each medication review (stage 1) and to what extent they audited and discussed the generated quality reports. This information would have been desirable in order to better understand some of the outcomes. However, the present study should be seen as a novel attempt to provide an overall picture of implications of RNs' use of a CDSS, in order to explore if it can benefit the quality of

drug management in nursing homes. These implications need to be further explored in more extended studies.

Discussion

RNs' observations and views (I, II)

Our results show that the CDSS indicated more possible DRPs than the RNs did when preparing for the medication reviews. Suspected ADRs were the most frequently reported DRP, both by the RNs and by the CDSS, even though the CDSS reported significantly more. The agreement in the reports (suspected ADRs) was rather low (19%). This could partially be explained by the RNs' knowledge of the patients, which enabled them to assess their symptoms in relation to possible ADRs and thereby overlook some of them. One known problem with computerized screening tools is that they tend to produce too many non-significant warnings (Sjöborg et al., 2007). Another significant difference concerned the reported drug-drug interactions, where the CDSS again indicated significantly more. This finding was not surprising since RNs cannot be expected to remember or to have knowledge of all interactions, which probably also applies to physicians. Regarding inappropriate drugs and drug duplication, the reporting was relatively low, both from the RNs and from the CDSS (ranging from 13% – 17%). In summary, in their preparations for the medication reviews the RNs suspected a total of 86 DRPs in 54 patients, which is 42% (86 relative to 205) of what the CDSS reported. This result suggests that a CDSS has the potential to support the RNs by helping to ensure that fewer DRPs are missed. This is of significance because RNs are usually those who initiate and prepare the medication reviews. By being alerted to potential risks, they can further assist the physician with essential information.

Among the additional problems, reported only by the RNs, untreated symptoms/conditions were the most common (Table 3). This might indicate that RNs are more likely to observe and report untreated symptoms/conditions than adverse effects of drug treatments. However, this also suggests that RNs make other assessments and findings, in addition to those strictly referred to in the CDSS. This is of importance, since a CDSS should merely be considered a “decision support”, and the sight of the individual patient should not be lost (Bowles et al., 2015).

At the end of the study period, the RNs did not find that the CDSS significantly affected their drug management (Figure 2). The questionnaire item receiving the highest score involved discussions with patients, something the RNs found had increased. Although the

RNs did not report any great effects, many wanted to continue using the CDSS, indicating that they saw potential benefits in it. The use of a CDSS in drug monitoring has previously been described to promote team-collaboration and the acquisition of knowledge (Johansson-Pajala et al., 2017, Koskela et al., 2016), findings that were not confirmed here. However, in the present study 79.1% (n=106) of all DRPs detected by the RNs originated from two of the four nursing homes. In these two nursing homes, the CDSS became frequently used during the course of the study, while the implementation progressed significantly more slowly in the other two. The findings could partly be explained by differences in individual engagement with or insufficient experience in using the CDSS. However, it might also indicate that the CDSS had contributed to the acquisition of further knowledge, making the RNs more attentive when meeting with the patients.

Quality of drug treatment (III)

In the present study, there were no significant effect outcomes in the quality of drug use, either three or six months after the medication review. Previous studies, focused mainly on physicians and pharmacists, reported positive effects from using a CDSS in medication reviews (Bindoff et al., 2012; Ulfvarson et al., 2010), including improvements in the number of drugs and the quality indicators (Ulfvarson et al., 2010). The effects of RNs' use of CDSSs has been sparsely described; however, one study reported that a software program for ADR screening and intended for RNs, contributed to the detection and reporting of ADRs. As with the present study, reports were generated with the intention of their being assessed by the physicians. The physicians confirmed 60% of the detected ADRs, and medication changes were made in 21% of the patients (Dilles et al., 2013). However, in the present study, the effects were audited according to the number of drugs and the selected quality indicators, and no account was taken, for instance, of dose adjustments or existing under-treatments. Nor can it be established to what extent the physicians actually audited the presented quality reports as required or the extent of the RNs' participation during the medication reviews. The physicians are ultimately accountable for the drug treatments. Thus, their commitment is necessary in order to achieve quality improvements. According to Judge et al. (2006), the impact of a CDSS on medication monitoring depends on the extent to which the physicians act on the alerts presented. The results of the current study may, to some extent, reflect developments in Sweden, which show significant improvement in terms of lower use of psychotropics and inappropriate drugs in older people (Fastbom and Johnell, 2015). The CDSS reported nine cases of inappropriate drugs in 54 patients, who, on average, were prescribed 11.5 drugs

per person, which can be considered a low number. However, among the ten most prescribed drugs were hypnotics and sedatives (44.4%), opioids (44.4%) and antidepressants (42.6%), drugs that also require caution in older people (Swedish National Board of Health and Welfare, 2010). While the use of inappropriate drugs in older people, in Sweden, has decreased, there has been an increase in the use of “somatic drugs”, such as cardiovascular drugs and anticoagulants (Weitoft et al., 2012). In the present study, the most prescribed drugs were analgesics and antipyretics (77.8%), followed by drugs for constipation (61.1%) and antithrombotic agents (59.3%). In the three month follow-up, the prescription rate had decreased in these groups, while it had increased in other groups, for instance in opioids. The results were not further analysed because there were no significant differences in the quality indicators. The use of renally excreted drugs in reduced renal function was considerably high (92.1%); also this number had decreased three months later (86.8%), which may indicate that the RNs’ use of the CDSS had some impact.

Conclusion and recommendations

This study shows that the use of a CDSS could be of great value, for the RNs, in detecting potential ADRs and drug interactions. The RNs also found the CDSS beneficial and wanted to continue using it. Thus, it has the potential to support the RNs, by helping to ensure that fewer potential DRPs are missed before an upcoming medication review. In this way, the RNs are able to provide essential information to tailor the drug treatments, as previously suggested by Dilles et al. (2013). In terms of the quality of drug treatments, the effects were sparse, an outcome that may be due to differences in procedures for medication reviews, individual engagement, or indicating that the quality was already satisfactory when assessed in relation to each individual patient. The results could also indicate that only RNs’ use of a CDSS is not enough to improve the quality of drug treatments, further conditions are needed. However, high-quality computer systems are predicted to play a greater role in the routine practice of optimizing drug treatments of older people in the future (Lavan et al., 2016). Because of RNs’ prominent role in medication reviews, their participation should be enabled and facilitated. This may include the support of a CDSS, preferably one that also includes care-oriented assessments, like those identified by the RNs in the present study. With RNs at the forefront of structured medication reviews, supported by a CDSS and collaborating with the physicians, pharmacists, nursing staff and patients, a solid foundation for medication safety should be provided.

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Figure 1. Flow chart of the recruitment of the patients included in the study.

Table 1. Characteristics on included patients.

Characteristics (N=54)	N (%)	Md (range)
Sex f/m	43/11	
Age		89 (78-99)
Number of prescribed drugs		11.5 (5-21)
Most common listed symptoms by the patients ^a		
Tired/exhausted	23 (43)	
Dizzy/unsteady	20 (37)	
Forgetful	19 (35)	
Low mood	15 (28)	
Swollen legs/ankles	15 (28)	
Frequent urination/incontinent of urine	14 (26)	
Renal function ^b		
Normal	9 (18)	
Moderate dysfunction	32 (64)	
Severe dysfunction	9 (18)	

^a The six most common symptoms, expressed by the patients as severe or moderate, in the symptom assessment form. ^b Renal function calculated according to Cockcroft-Gault Equation. N=50 (missing values on four patients).

Table 2. The difference between suspected DRPs reported by the CDSS and the RNs in 54 patients (Q1).
N = number of patients in which ≥ 1 DRP was reported.

Suspected drug-related problem	Reported by the CDSS N (%)	Reported by the RNs N (%)	Difference (CDSS – RNs) N (%)	p values
Reports of adverse drug reactions (ADR)	43 (79,6)	27 (50.0)	16 (34.3)	0.000
Reports of drug-drug interaction ^a	22 (40.7)	10 (18.6)	12 (22.1)	0.008
Reports of inappropriate drugs ^b	9 (16.7)	9 (16.7)	0	1.000
Reports of drug duplications	9 (16.7)	7 (12.9)	2 (3.8)	0.791

Bold figures indicate significance ($p \leq .05$).^a Category C or D (C = clinically significant interactions that can be managed with, for example, dose adjustment; D = clinically significant interaction that should be avoided). ^b Long-acting benzodiazepines, anticholinergic drug, tramadol and propiomazin.

Table 3. Other DRPs reported by RNs when performing medication reviews on the 54 patients (Q1).
N = number of patients in which ≥ 1 DRP was reported.

Suspected drug-related problems	N (%)	Examples
Untreated symptom/condition	21 (39)	Problems with pain, low mood
Lack of adherence to prescription	4 (7)	Patient do not take their analgesics according to prescription
Unclear indications	3 (6)	Prescribed antihypertensive drug, but has low blood pressure
Contraindications	3 (6)	Estradiol and breast cancer
Incorrect dosage	2 (4)	Too high dose of digoxin
Management problems for the patient	2 (4)	Patient drops the drugs due to reduced eye vision
Problems with drug administration	1 (2)	Problems to take a particular drug
Other drug-related problem	5 (9)	Low blood pressure, dizziness, frequent urination

Figure 2. The RNs views of the CDSS's effects on their drug management (Q2) (n=11). The horizontal line displays the minimum and maximum of the data and the box shows the upper and lower quartile. The vertical bold line displays the median of the data. Possible variations: 1 (totally disagree) to 5 (totally agree). CDSS=computerized decision support system, ADR=adverse drug reaction.

Table 4. The ten most prescribed drugs, according to the ATC classification (%) and the use of renally excreted drugs in reduced renal function (%).

		Medication review (n=54)	3 months (n=53)	Difference ^b (%)
ATC-code				
N02B	Other analgesics and antipyretics	77.8	72.0	-5.8
A06A	Drugs for constipation	61.1	58.0	-3.1
B01A	Antithrombotic agents	59.3	56.0	-3.3
B03B	Vitamin B12 and folic acid	53.7	52.0	-1.7
A02B	Drugs for peptic ulcer and gastro-esophageal reflux disease	51.9	54.0	+2.1
C03C	High-ceiling diuretics	51.9	52.0	+0.1
N05C	Hypnotics and sedatives	44.4	42.0	-2.4
N02A	Opioids	44.4	50.0	+5.6
N06A	Antidepressants	42.6	44.0	+1.4
C07A	Beta blocking agents	33.3	32.0	-1.3
Drugs GFR^a<60	Use of renally excreted drugs in reduced renal function	92.1	86.8	-5.3

^a GFR=Glomerular Filtration Rate.

^b Because of no significant differences, the table only displays changes between the time of the medication review and three months later.