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SHORT RESEARCH REPORT

Availability of information on renal function in Dutch community pharmacies

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Abstract *Background* Early detection and monitoring of impaired renal function may prevent drug related problems. *Objective* To assess the availability of information on patient's renal function in Dutch community pharmacies, for patients using medication that might need monitoring in case of renal impairment. *Methods* Per pharmacy, 25 patients aged ≥65 years using at least one drug that requires monitoring, were randomly selected from the pharmacy information system. For these patients, information on renal function [estimated glomerular filtration rate (eGFR)], was obtained from the pharmacy information system. When absent, this information was obtained from the general practitioner (GP). *Results* Data were collected for 1632 patients. For 1201 patients (74 %) eGFR values were not directly available in the pharmacy, for another 194 patients (12 %) the eGFR value was not up-to-date. For 1082 patients information could be obtained from the GP, resulting in 942 additional recent eGFR values. Finally, recent information on renal function was available for 72 % (n = 1179) of selected patients. *Conclusion* In patients using drugs that require renal monitoring, information on renal function is often unknown in the pharmacy. For the majority of patients this information can be retrieved from the GP.

Keywords Clinical risk management · Community pharmacy · Estimated glomerular filtration rate (eGFR) · Pharmaceutical care · Renal function · The Netherlands

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Impacts of findings on practice

- Renal function of patients is often not systematically monitored in pharmacies.
- eGFR values are not always exchanged between different healthcare providers in the Netherlands.
- To increase medication safety, the exchange of information between the different healthcare providers should be improved.

Introduction

Due to aging of the general population and an increased prevalence of chronic diseases such as diabetes and hypertension, the number of patients with impaired renal functioning has increased [1, 2], with a prevalence between 2 and 12 % in Europe [1].

Impaired renal function negatively affects the pharmacokinetics of drugs eliminated by renal clearance [2, 3] and contributes to 10 % of medication-related hospital admissions [2]. In 59 % of these cases, information on renal function was lacking, that would have been essential to ensure medication safety. Early detection of impaired renal function is thus important [2, 3]. As most patients in the Netherlands are registered with one pharmacy in which they fill all their prescription medication, community pharmacists are well positioned for clinical risk management regarding drug therapy.

In the Netherlands, prescribers are legally obliged to inform the pharmacist about the patient's renal function [4]. However, to date, implementation of this legal obligation is limited. Renal function is not systematically monitored for patients using medication that might benefit

from monitoring or dose adjustments in case of renal impairment. And, when available, information is not always exchanged between healthcare providers [5].

Aim of the study

The aim of this study was to assess information availability on renal function in community pharmacies, for patients using medication that can potentially harm patients in case of renal impairment.

Ethical approval

The study protocol was approved by the Institutional Review Board of the Pharmacoepidemiology and Clinical Pharmacology division, Utrecht University.

Methods

We conducted a cross-sectional study in which availability of information on renal function was examined in patients aged ≥65 years who chronically used ≥1 of the following drugs that might need monitoring or dose adjustments in case of impaired renal function: metformin, digoxin, sotalol, allopurinol, angiotensin-converting-enzyme (ACE) inhibitors and/or angiotensin II receptor (AT2) antagonists, hydrochlorothiazide, chlorthalidone and spironolactone. Chronic use was defined as filling of ≥2 prescriptions for any of these drugs in the previous 12 months. The drug selection was based on drugs listed in the "top ten drug list renal impairment" defined by the Royal Dutch Pharmacists Association [6].

Setting

The study was conducted in community pharmacies, distributed across the Netherlands located in both rural and urban areas, belonging to the Utrecht Pharmacy Practice network for Education and Research (UPPER) [7]. Pharmacies that provided internships for master students of the Utrecht School of Pharmacy during September 2014–February 2015 were invited to participate. Data were collected by the interns.

Data collection

In each pharmacy, interns who collected the data were asked to select all patients per pharmacy who filled a risk medicine during the previous month. A random sample of 25 patients aged ≥65 years using ≥1 of the above described high-risk (those who filled ≥2 prescriptions in the previous year were considered chronic users) was selected. In some pharmacies, we selected more than 25 patients as these were visited by a research student (who had more time for data collection), resulting in a mean number of 30 included patients per pharmacy. For selected patients, interns completed a structured checklist.

Before start of data collection, all interns received instructions. They were instructed to start looking for information on renal function in the pharmacy information system. A value was considered recent when determined <13 months ago. In case (recent) information in the pharmacy was missing, the patient's general practitioner (GP) was contacted and asked for information. If the renal function was present or obtained, it was evaluated whether dose adjustment or monitoring was needed.

In addition, data on the pharmacy's procedures regarding clinical risk management of renal dysfunction. Interns filled out one checklist per pharmacy with questions on use of cut-off values for monitoring that were used in the pharmacy, the process of information exchange (lab values) with other healthcare providers and the registration of information regarding renal function in the pharmacy.

Definition

We defined impaired renal function as an estimated glomerular filtration rate (eGFR) < 45 ml/min/1.73 m^2, based on guidelines of the Dutch College of General Practitioners [8].

Data analysis

Descriptive statistics and Chi square testing was performed to study differences between age groups. Data were analyzed using IBM SPSS Statistics for Windows, version 23.0.

Results

Data on clinical risk management procedures were collected in 55 pharmacies, one pharmacy could not provide patient data thus patient information was collected in 54 pharmacies.

Availability of information

Data were collected for 1632 patients (Table 1). Figure 1 describes the availability of information on renal function. For 431 patients renal function information was available in the pharmacy. These patients were slightly older (79.7 vs. 77.6 years) compared to the total population and used

Table 1 Patient characteristics

Characteristic	Total study population N = 1632	Impaired renal function (eGFR < 45 ml/min) N = 156
Male gender, % (n)	46.5 (759)	42.3 (66)
Age, mean (SD)	77.6 (7.7)	82.4 (7.6)
Number of prescription drugs[a], mean (SD)	10.8 (5.9)	14.3 (6.3)
Number of high-risk drugs[a], mean (SD)	1.7 (0.8)	1.9 (0.8)
Type of high-risk drug[a], % (n)		
Metformin	36.0 (588)	28.8 (45)
Digoxin	8.6 (140)	14.7 (23)
Sotalol	7.0 (115)	5.8 (9)
Allopurinol	7.3 (119)	18.6 (29)
ACE-inhibitors/AT2 receptor antagonists	73.2 (1194)	78.2 (22)
Hydrochlorothiazide	29.0 (473)	23.1 (36)
Chlorthalidone	4.0 (66)	3.8 (6)
Spironolactone	7.2 (117)	19.2 (30)

[a] Use in previous year

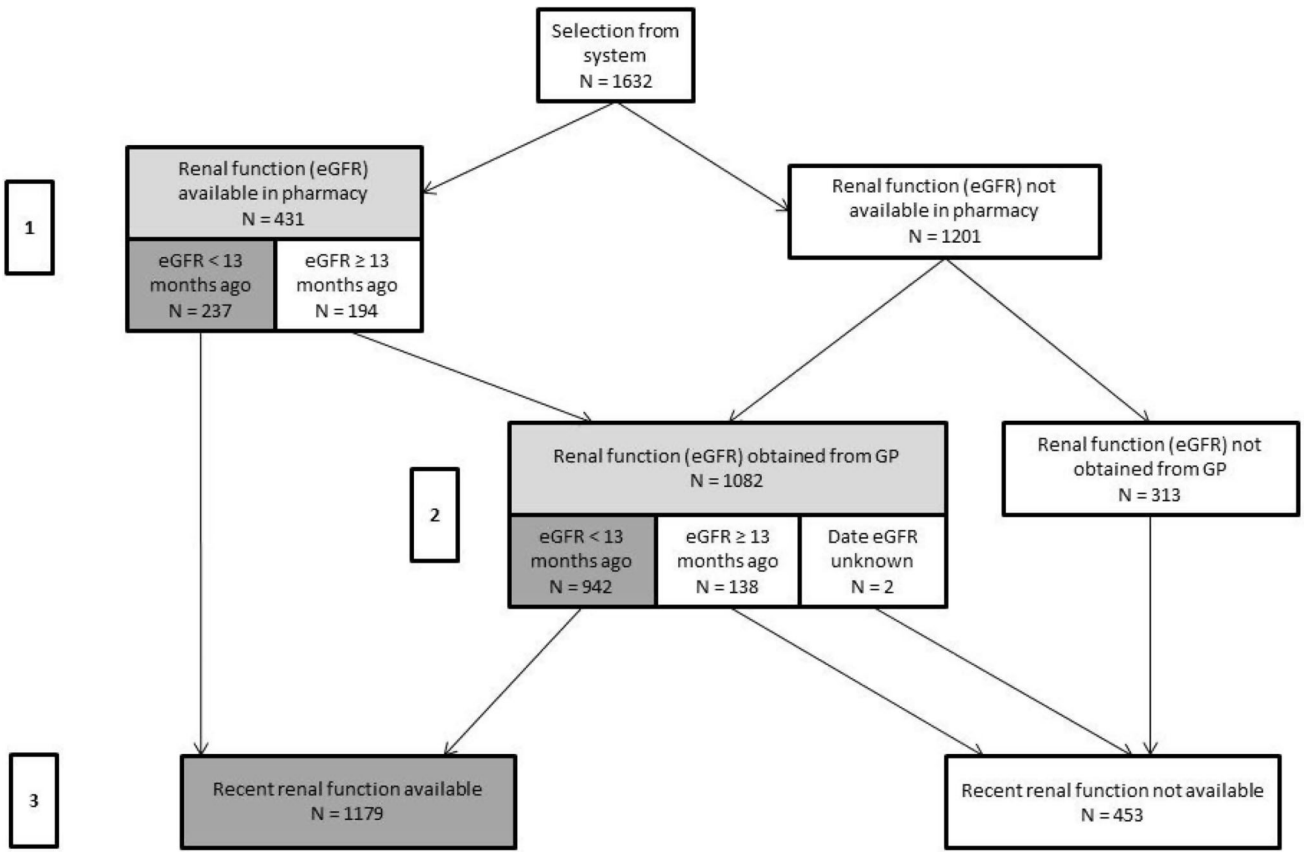

Fig. 1 Information availability

more prescription drugs in total (13.1 vs. 10.8 drugs). For 1201 patients (74 %) information was unavailable in the pharmacy, for another 194 patients (12 %) the eGFR value was >13 months old (step 1, Fig. 1). For 1082 of these 1395 patients (1201 + 194) information was obtained from the GP (step 2, Fig. 1), however eGFR values were

<13 months old for 942 patients. Thus in total, recent eGFR values became available for 72 % (n = 1179) of the included patients (step 3, Fig. 1).

Information availability varied between pharmacies (16.0–92.0 %) and also for different medicines (Table 2). In addition, we showed increasing availability of information with increasing age (66.5 % for patients aged 65–69 years vs. 74.4 % for patients aged ≥85 years, $p < 0.05$).

Evaluation of available information

Renal function (eGFR < 45 ml/min) was decreased in 156 patients (13 %). Patients with decreased renal function were older and used more prescription drugs compared to the total population (Table 1).

For 138 patients (88 %) with decreased renal function, no advice was given based on the eGFR value, for 17 patients the pharmacist advised more intensive monitoring and for one patient dose adjustment was advised. For the majority of patients for whom recent information on renal function was lacking (n = 453), the pharmacist advised to assess renal function (n = 330, 73 %). For 101 (22 %) no advice or action was considered necessary. Although eGFR values were outdated in these patients, pharmacists did not expect substantial changes based on earlier data or did not perceive risks based on the medicine regimen. For another 5 % (n = 22) follow-up actions were unknown.

Process of information exchange and clinical risk management

Most pharmacies in our study retrieved information about renal function from the GP (n = 49) or another physician (n = 15). Some pharmacists obtained data directly from primary care or hospital laboratories (n = 6 and n = 21). Information was mostly exchanged by telephone (n = 41) and less often by fax (n = 19), through a shared information system (n = 17), a website (n = 12) or e-mail (n = 9). Pharmacies used different cut-offs for identification of impaired renal function: 21 of them used eGFR < 50 ml/min, 24 pharmacies used eGFR < 60 ml/min, 6 reported not to use a specific cut-off and 3 pharmacies used another cut-off value.

Discussion

For the majority of patients, up-to-date information on renal function was not directly available in the pharmacy. For only a quarter of the patients (n = 431) renal function was directly available, these patients were slightly older and used more medicines, thus it could be that these patients are at increased risk of renal impairment and are therefore more closely monitored. Upon pharmacy's request, information on renal function was often obtained from the GP, however, in almost one-third of patients the GP did not have recent values either. There seems to be a difference in availability of information on renal function for different drugs, this may be due to underlying indications for use. For example, patients using spironolactone or allopurinol are more likely to have more severe (co-)morbidity (e.g. heart failure and gout). The underlying indication for these drugs is more likely to be associated with renal dysfunction, triggering doctors to monitor renal function in these patients.

Patients with impaired renal function have higher risk of drug related problems [2, 5]. Therefore it is important to have access to this information in the pharmacy. For most patients included in our study, pharmacists did not advice medication changes after retrieval of information on renal function. However, we only included a small sample of pharmacies in the Netherlands (~2 %) and within these pharmacies a small sample of users of a selection of drugs,

Table 2 Information availability per high-risk medicine drug

Type of high-risk drug (n)	Renal function available in pharmacy %	Renal function available after GP request %	Impaired renal function (MDRD <45 ml/min) %
ACE-inhibitors/angiotensin II receptor antagonists (n = 1194)	27.4 (327)	72.7 (868)	14.1 (122)
Metformin (n = 588)	28.7 (169)	78.2 (460)	9.8 (45)
Hydrochlorothiazide (n = 473)	22.0 (104)	71.5 (338)	10.7 (36)
Digoxin (n = 140)	36.4 (51)	73.6 (103)	22.3 (23)
Allopurinol (n = 119)	40.3 (48)	80.7 (96)	30.2 (29)
Spironolactone (n = 117)	39.3 (46)	75.2 (88)	34.1 (30)
Sotalol (n = 115)	27.0 (31)	63.5 (73)	12.3 (9)
Chlorthalidone (n = 66)	18.2 (12)	72.7 (48)	12.5 (6)

thus on a population-based level there might be a considerable proportion of preventable medication errors due to unavailability of laboratory values. The included pharmacies are a good representation of Dutch pharmacies in general [7] and all pharmacies providing internships during the study period participated, thus selection bias seems unlikely.

We focused on use of a single eGFR cut-off value of <45 ml/min and <13 months old, when using more strict criteria, e.g. lower cut-off or necessity for a more recent value, results may change. Most pharmacies in our study mentioned to use a higher cut-off value for the eGFR, thus we may have included the more urgent cases. We used the latest (single) eGFR value available in the pharmacy, as this is also the information used for monitoring in daily practice.

A potential limitation might be that data was collected by different students. However, all students received written instructions on the data collection procedure and used a structured checklist, therefore we assume this limitation will not affect our findings.

Studies have shown high acceptance rates of pharmacist medication recommendations to other medical staff, supporting the important role pharmacists could play in prevention of drug related problems [9–11]. In order to provide medication recommendations, pharmacists need access to clinical information. In the Netherlands, prescribers are obliged to inform the pharmacist about renal function, under the condition that patients approve exchange of information [4], however, we have shown this is frequently not done. This may require a behavioral change at the prescriber level, they need to actively exchange information, by for example noting the renal function on a prescription. As implementation of such actions is likely to be difficult, more efficient exchange of clinical information should be sought [12]. Automatic electronic exchange or shared patient records are needed to facilitate exchange of laboratory data. Currently such technical solutions were available in a small subset of pharmacies.

Conclusion

Information on patient's renal function is often unknown in the community pharmacy, whilst for many patients this information could be obtained from the GP. Exchange of information between doctors and pharmacists should be improved to increase patient's medication safety.

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Conflicts of interest None.

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