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RESEARCH ARTICLE

# Implementation of medication review with follow-up in a Spanish community pharmacy and its achieved outcomes

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**Abstract** *Background* Despite many research studies demonstrating the benefit in clinical, economic, and humanistic outcomes of professional pharmacy services, there is a paucity of evidence when these services become incorporated into the usual practice of a community pharmacy. *Objective* The objective of the present study was to evaluate the clinical, economic, and humanistic impact of a pharmacist-conducted medication review with follow-up following 18 months implementation. *Setting* Community pharmacies in Spain. *Method* The study used an effectiveness-implementation hybrid design. During the follow-up, patients attended the pharmacy on a monthly basis and received the medication review with follow-up service. *Main outcome measure* Economic, clinical, and humanistic measures were used to assess the impact of the service. *Results* 132 patients received the service. During the 18 months of follow-up, 408 negative outcomes related to medicines (which are uncontrolled health problems) were identified, of which 393 were resolved. The average number of medicines used by patients significantly decreased from 6.1 (SD: 2.9) to 3.3 (SD: 2.2). A significant decrease was also observed in hospitalizations [OR = 0.31 (IC 95 % = 0.10–0.99)] and in emergency department visits [OR = 0.16 (IC 95 % = 0.05–0.55); $p = 0.001$]. A general trend to increase all quality of life domains was observed over time. The higher increase was observed in the construct health transition [mean increase: 30.7 (SD: 25.4)], followed by bodily pain [mean increase: 22.3 (SD: 25.4)], and general health [mean increase: 20.7 (SD: 23.7)]. Medication knowledge significantly increased in terms of aggregated domains of dose, frequency, drug indication [from 8.9 (SD: 17.5) to 87.9 (SD: 25.0)], and dose and frequency [from 9.3 (SD: 17.9) to 92.5 (22.1)]. Although a slight improvement was observed in terms of drug indication, this increase was not statistically significant. 68 out of 132 patients (51.5 %) were non-adherent to their treatment. This number decreased to 1 (0.8 %) after the follow-up [OR = 0.007 (IC 95 %: 0.001–0.053) $p < 0.001$]. *Conclusion* A community pharmacy based medication review with follow-up service delivered by a trained pharmacist, has positive effects across clinical, economic, and humanistic outcomes. These results are consistent with previous studies. Incorporating community pharmacists into the multidisciplinary team is a reliable solution to improve health care.

**Keywords** Community pharmacy · Drug-related problems · Implementation research · Medication review · Negative outcomes · Pharmaceutical care · Professional pharmacy services · Spain

## Impacts on practice

- Many research studies have reported positive outcomes associated with medication review with follow-up. However, there is a paucity of evidence when this service becomes incorporated into the usual practice of a community pharmacy.

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- A medication review with follow-up service implemented in a specific community pharmacy setting in Spain over a 18-month period has favorable effects on different outcomes.
- Pharmacists should have a role in usual practice, to provide medication review with follow-up.

## Introduction

The ageing population, the increasing burden of chronic diseases, the development of new drugs, and/or the change of patients' expectations, are some of the major challenges facing health care [1]. The major modality of treatment in modern health care is medication, since it represents a relatively cost-effective mode of treating disease. The therapeutic objective is that medicines should be safe and effective to ensure the quality of use of a cost-effective resource. However drug-related problems are frequent and are usually associated with the suboptimal use of medications through inappropriate prescribing, patient specific iatrogenic reactions or through patient intentional and non-intentional misuse [2]. It has been documented that negative outcomes associated with medication use are a significant public health problem [3, 4]. In order to address the negative issues associated with medication use, various pharmacist-conducted medication review services are currently being implemented in different countries, some with similar objectives, but with different philosophical underpinning, objectives, intensity, definitions, and tools. Examples of these services are medication therapy management (MTM) in the United States of America [5], medicines use review (MUR), new medicine service (NMS), and discharge medicines review in the United Kingdom, MedsCheck, residential medication management review (RMMR) and home medication review (HMR) in Australia [6], MedsCheck in Canada [7] and MUR and adherence support in New Zealand [8].

In Spain, medication review with follow-up (MRF) is one of three cognitive pharmaceutical services defined in the Spanish National Strategic Consensus for implementation of pharmaceutical care [9]. MRF is characterized as being an ongoing and structured assessment of the patient's pharmacotherapy, aiming at detecting drug-related problems (DRPs) in order to identify, prevent and solve negative outcomes related to medicines (NOMs), which are uncontrolled health problems due to drug use or nonuse. MRF provides a continuous optimization of the pharmacotherapy, focusing not only on ensuring the correct use of medicines but also their expected outcomes in patient's health [10]. It comprises an assessment of the patient's medication through a medication review process, identification of DRPs and NOMs, development of a care plan and continuous monthly follow-up.

Many research studies have demonstrated the benefit in clinical, economic, and humanistic outcomes associated with MRF [11–13]. However, there is a paucity of evidence when this service becomes incorporated into the usual practice of a community pharmacy. It is clear that a particular service will not be able to achieve the health outcomes shown during the evaluation stage of its impact if it never becomes implemented. While the evaluation of the effectiveness of health programs is still considered complete without taking into account the implementation process as a research element, it will be impossible to assess the real impact of designed services [14].

## Aim of the study

The objective of the present study was to evaluate the clinical, economic, and humanistic impact of a pharmacist-conducted MRF in the first 18 months implementation in a specific community pharmacy setting.

### Ethical approval

Approval for the study was given by the Ethics and Research Committee of the Virgen de las Nieves University Hospital (Granada, Spain). A written information sheet was provided and informed consent was obtained.

## Method

### Study design

This paper is part of a larger study that used an effectiveness-implementation hybrid design, which is intended to assess the effectiveness of both an intervention and an implementation strategy [15]. In the present paper, only effectiveness outcomes of the MRF service are reported, evaluated through a pre-post design.

### Setting

The study was undertaken between November 2008 and April 2011 in a community pharmacy of the province of Gipuzkoa, Spain.

### Patients

Patients were recruited in the participant pharmacy. Patients were offered the service when they sought advice, when a drug administration aid was required or when the provision of the service was requested. To be eligible,

patients were required to use or have been prescribed at least one medicine.

### Sample size

Sample size calculation was driven by the capacity and resources provided by the pharmacy owner. It was based on the assumptions that the time needed for doing a MRF was approximately 7 h per patient a year (based on previous studies [16]) and that a community pharmacist in Spain works for 1663 h a year. We estimated that each pharmacist can provide the service to 237 patients a year. Considering that [1] only one pharmacist in the pharmacy delivered the service and [2] since it was not remunerated, the pharmacist would dedicate 50 % of his work time to delivering it, the service was considered implemented if it was delivered to 118 patients.

### Outcome measures

Economic, clinical and humanistic measures described in Table 1 were used to assess the impact of the service.

### Pharmacist-patient intervention

During the 18 months of follow-up, patients attended the pharmacy on a monthly basis and received the MRF service using the Dader method. Patients were required to bring all their medical records, including laboratory test results and hospital discharge summaries when appropriate. MRF commenced with a patient interview, with the objective of gathering information about health problems, medicines, and patient concerns and views of their diseases and medications. The interview was conducted according to the following structure:

1. Information gathering about health conditions. This included an assessment of all the health problems suffered by the patient, verifying his/her degree of concern, starting date, perception of control, perception of severity, lifestyle habits and clinical and biological parameters.
2. Information gathering about medicines. This included an assessment of all medications used by the patient, verifying his/her knowledge about the medications taken, treatment adherence, perception of effectiveness, perception of safety and prescriber.
3. Other information gathering. This included an assessment of health-related quality of life, hospitalizations and emergency department visits.
4. Final review. Conducted in order to verify the information given by the patient and gather further information not revealed during the interview.

After performing a comprehensive medication review, and once the patient had left the pharmacy, the pharmacist identified NOMs/rNOMs and DRPs. DRPs are process elements defined as 'situations where the process of use of medication causes, or may cause, a negative outcome related to medicines' [9], whereas NOMs are defined as 'uncontrolled health problems that appear due to the use or nonuse of medicines' [9]. Risks of negative outcomes related to medicines (rNOM) are 'situations where the patient is at risk of suffering a negative change in health status. This means the patient is at risk of suffering a NOM (although it is not manifested yet) because at least one DRP is identified' [9]. This methodology focuses on clinical negative outcomes, so DRPs are considered as causes of NOMs/rNOMs. The classification of DRPs and NOMs/rNOMs can be found in Fig. 1.

Following the identification of NOMs/rNOMs and DRPs, an action plan was agreed with the patient, prioritizing the urgency required to intervene with the patient or to communicate with other health professionals. It also described the pharmacist's interventions, with dates and outcomes to be assessed during the follow-up (Fig. 2).

### Statistical analysis

Statistical analyses were performed using SPSS for Windows 15.0 (SPSS Inc, Chicago, IL, USA) and SAS 9.3 (SAS Institute, 2011). A $p$ value $<0.05$ was considered to indicate statistical significance. Quantitative variables were expressed as the mean (standard deviation—SD) and categorical variables were expressed as frequency and percentages. To compare quantitative variables, Student's $t$ test for paired samples was used. McNemar test was performed before and after intragroup comparisons to further measure categorical variables. A multivariate logistic regression analysis was performed to explore the association between study variables and the service received.

## Results

### Study sample

Initially, 140 patients were enrolled in the service, of which two voluntarily withdrew and six died. Therefore 132 patients received MRF during 18 months. The demographic and clinical characteristics of the patients included are shown in Table 2.

The average number of health problems identified at baseline was 4.6 (SD: 2.0). Most of these were related to chronic conditions (60.2 %). Hypertension (14.2 %), stomach function disorder (7.3 %), lipid disorder (7.1 %), diabetes non-insulin dependent (4.8 %) and depression (4.0 %) were the most prevalent.

**Table 1** Measures used to assess the impact of the service

| Outcome | Measure | | Data source |
|---|---|---|---|
| Clinical | Negative outcome related to medicines (NOM) | Health problem that appears due to the use or nonuse of medicines | Pharmacist pharmacotherapy assessment (including patient interview—medication review, medical records, laboratory test results and pharmacist assessment) |
| | Risk of negative outcome related to medicines (rNOM) | Situation where the patient is at risk of suffering a negative outcome related to medicines because at least one drug related problem has been identified | |
| | Drug related problem (DRP) | Situation where the process of use of medication causes, or may cause, a negative outcome related to medicines | |
| Economic | Number of medicines | Number of medicines used by the patient at the time of the medication review | Patient interview (including hospital discharge summary) |
| | Emergency departments visits | Number of visits to emergency departments reported by the patient in the previous 6 months | |
| | Hospitalizations | Number hospitalizations reported by the patient in the previous 6 months | |
| Humanistic | Health-related quality of life | An individual's satisfaction or happiness with domains of life insofar as they affect or are affected by health | Short Form 36 health survey (SF-36). The SF-36 Health Survey is a generic outcome measure designed to examine a person's perceived health status. It has 36 questions and yields an 8-scale profile of functional health and well-being scores as well as psychometrically-based physical and mental health summary measures and a preference-based health utility index [30] |
| | Medication adherence | Extent to which the patient's medication-taking behavior matches the agreed recommendations with the prescriber | Haynes–Sackett method [31]. Through this self-reported adherence assessment method, the patient is presented with the following statement: "People often have difficulty taking their pills for one reason or another. Do you find difficult to take yours?". The patient is then asked whether he/her ever misses his/her pills and, if so, state his/her current prescriptions and the average number of tablets missed per day, week, or month. Good adherence is considered to be when the percentage of doses taken is between 80 and 110 % of the prescribed dose |
| | Patient's medication knowledge | Level of patient's knowledge regarding the dose, frequency and indication of his medications | Composite scores of percentage of correct dose, frequency and indication (DFI) of all the medications used by the patient [32] |
| | Perception of the severity of the health problem | Patient's interpretation of the severity of his disease | Assessed by asking the patient the perception of the severity of his/her illness (from not severe to very severe) and usefulness of treatment (from not helpful at al to very helpful) using a likert scale from 1 to 10 [32] |
| | Perception of the medication Usefulness | Patient's interpretation of the utility and necessity of the medications used | |

## Clinical impact

After 18 months of follow-up, 408 NOMs [average: 3.1 (SD: 2.5), Necessity (N) = 66 (16.2 %); Effectiveness (E) = 193 (47.3 %); Safety (S) = 149 (36.5 %)] and 185 rNOMs [average: 1.4 (SD: 1.5) N = 24 (13.0 %); E = 65 (35.1 %); S = 96 (51.9 %)] were identified. This implies a total of 593 NOMs/rNOMS, of which 393 (66.2 %) were resolved and 180 (30.3 %) prevented (Table 3).

During the follow-up period, 594 DRPs were identified, with 'adverse effects probability' (21.2 %) being the most common one, followed by 'non-adherence' (15.6 %) and 'inappropriate dose, frequency and/or duration of treatment' (15.5 %) (Table 4).

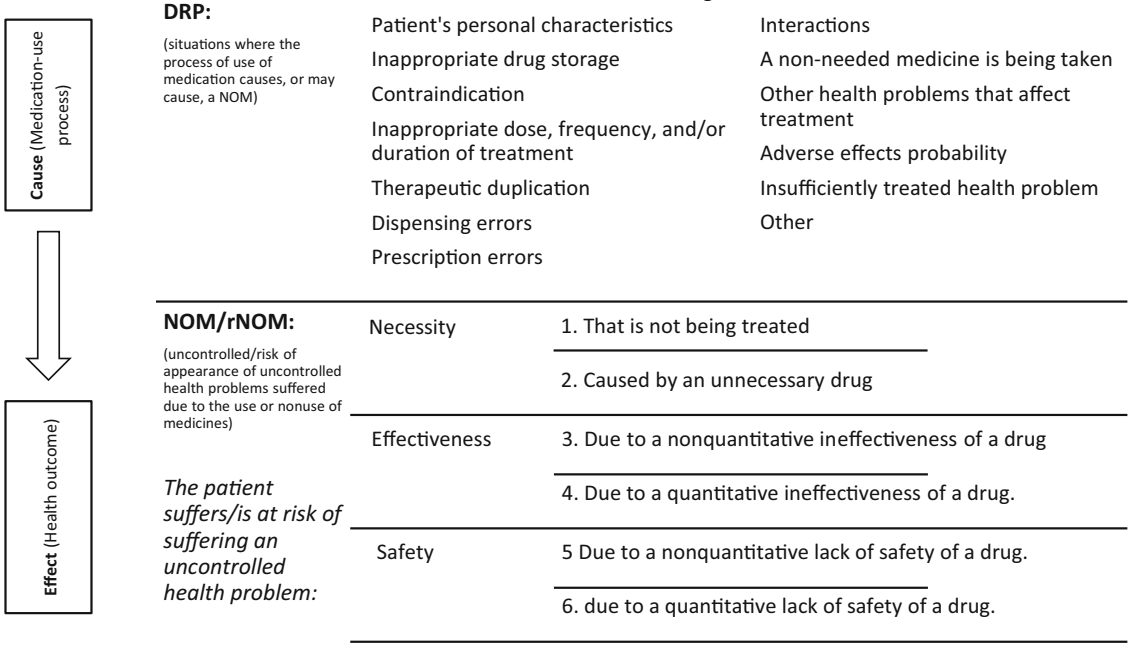


**Fig. 1** Classification of drug-related problems (DRP), negative outcomes related to medicines (NOM) and Risk of negative outcomes related to medicines (rNOM)

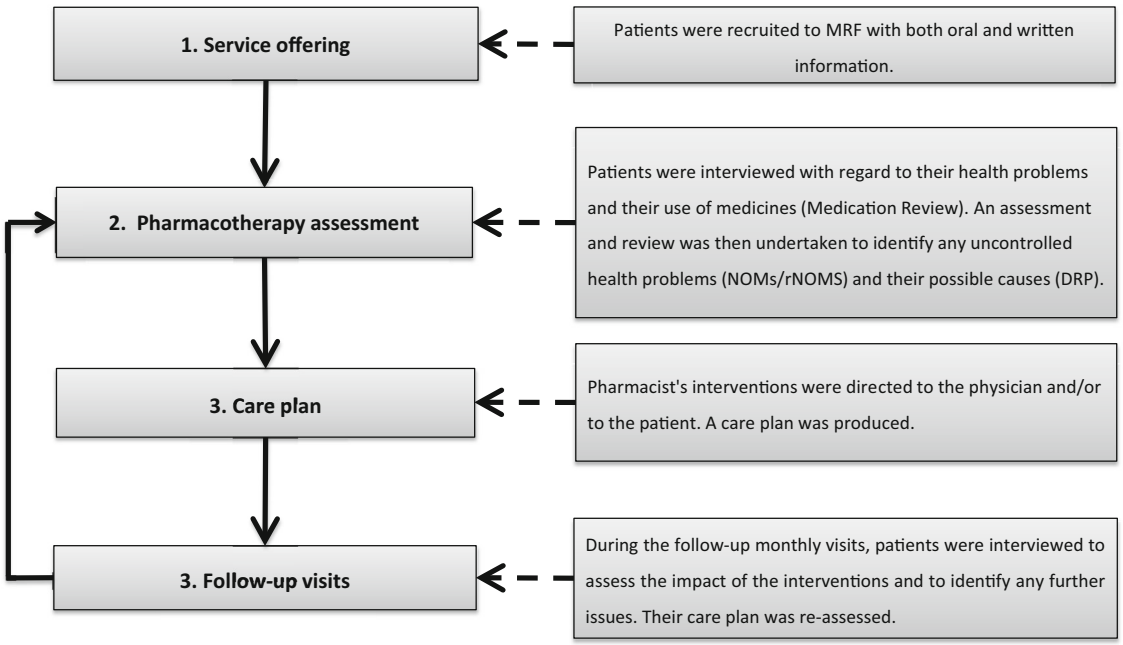


**Fig. 2** Medication review with follow-up process

**Table 2** Baseline characteristics of study patients

| | Total (n = 140) |
|---|---|
| Primary variables | |
| NOMs; mean (SD) | 3.1 (2.5) |
| Risk of NOMs; mean (SD) | 1.4 (1.5) |
| Medicines; mean (SD) | 6.1 (2.9) |
| Visits to emergency departments[a]; n (%) | 17 (12.9) |
| Hospitalizations[a]; n (%) | 12 (9.1) |
| Health-related quality of life | |
| Physical health domain; mean (SD) | 65.8 (20.2) |
| Mental health domain; mean (SD) | 66.2 (18.8) |
| Non-adherence; n (%) | 68 (51.5) |
| Other variables | |
| Male; n (%) | 56 (40.0) |
| Age (years); mean (SD) | 63.1 (13.9) |
| ≥65 years; n (%) | 85 (60.6) |
| Health problems; mean (SD) | 4.6 (2.0) |
| Patients using polypharmacy; n (%) | 91 (68.9) |
| Marital status (with partner); n (%) | 86 (61.4) |
| Level of education | |
| No education; n (%) | 45 (32.1) |
| Primary; n (%) | 58 (41.4) |
| Secondary/vocational education; n (%) | 30 (21.5) |
| University; n (%) | 7 (5.0) |

[a] Data related to 6 months before the beginning of the study

*NOM* negative outcome related to medicines, *SD* standard deviation

**Table 3** Evolution of negative outcomes associated with medicines (uncontrolled health problems) and risks of negative outcomes related to medicines along the 18 months of follow-up (in 132 patients)

| Total number of negative outcomes associated with medicines/risks of negative outcomes related to medicines identified = 593 | n (%) |
|---|---|
| Health problem prevented | 180 (30.3) |
| Health problem solved | 393 (66.2) |
| Health problem stable | 3 (0.5) |
| Improvement | 2 (0.3) |
| Partial improvement | 4 (0.8) |
| Worsen | 10 (1.7) |
| Failure | 1 (0.2) |
| Death | 0 (0.0) |

Adapted from Cipolle's classification [33] [34]

## Economic impact

### *Number of medicines*

The average number of medicines used by patients significantly decreased from 6.1 (SD: 2.9) to 3.3 (SD: 2.2), while the percentage of polypharmacy patients (those using five or more medicines) decreased from 68.9 % (n = 91) to 28 % (n = 37) [OR = 0.18 (IC 95 % = 0.10–0.30); $p < 0.001$].

### *Emergency departments visits and hospitalizations*

At baseline, 9.1 % of patients (n = 12) reported having being hospitalized in the previous 6 months, whereas 12.9 % (n = 17) reported having attended emergency departments. After the follow-up 3.0 % of patients (n = 4) reported having been hospitalized [OR = 0.31 (IC 95 % = 0.10–0.99); $p = 0.039$] and 2.3 % (n = 3) reported having attended emergency departments in the previous 6 months [OR = 0.16 (IC 95 % = 0.05–0.55); $p = 0.001$].

## Humanistic impact

### *Health-related quality of life*

A general trend to increase all quality of life domains over time was observed. The higher increase was observed in the construct health transition [mean increase: 30.7 (SD: 25.4)], followed by bodily pain [mean increase: 22.3 (SD: 25.4)], and general health [mean increase: 20.7 (SD: 23.7)] (Table 5). Both physical and mental health summary scales improved, increasing from 65.8 and 66.2 ($p < 0.001$) to 82.7 and 81.1 ($p < 0.001$) respectively.

### *Medication adherence*

At baseline, 68 out of 132 patients (51.5 %) were non adherent to their treatment. This number decreased to 1 (0.8 %) after the 18 months of follow-up [OR = 0.007 (IC 95 %: 0.001–0.053) $p < 0.001$].

### *Patient's medication knowledge*

Medication knowledge significantly increased in terms of aggregated domains of dose, frequency, drug indication [mean percentage knowledge score raised from 8.9 (SD: 17.5) to 87.9 (SD: 25.0), $p < 0.001$], and dose and frequency [mean percentage knowledge score raised from 9.3 (SD: 17.9) to 92.5 (22.1), $p < 0.001$]. Although a slight improvement was observed in terms of drug indication, this increase was not statistically significant (mean percentage score difference 4.6, $p = 0.092$) (Table 6).

### *Perception of the severity of the health problem and medication usefulness*

At baseline, patients rated the severity of the health problem that worried them the most with a mean of 8.9 points (SD: 1.2), with no change at the end of the follow-up ($p = 0.896$). The mean score for the perception of the usefulness of

**Table 4** Drug related problems (DRP) identified along the 18 months of follow-up (in 132 patients)

| Total number of drug related problems identified = 594 | n (%) |
|---|---|
| Erroneous administration of the drug | 83 (14.0) |
| Patient's personal characteristics | 23 (3.9) |
| Inappropriate drug storage | 2 (0.3) |
| Contraindication | 7 (1.2) |
| Inappropriate dose, frequency and/or duration of treatment | 92 (15.5) |
| Therapeutic duplication | 18 (3.0) |
| Dispensing errors | 1 (0.2) |
| Prescription errors | 17 (2.9) |
| Non-adherence | 93 (15.6) |
| Interactions | 21 (3.5) |
| A non-needed medicine is being taken | 23 (3.9) |
| Other health problems that affect treatment | 19 (3.2) |
| Adverse effects probability | 126 (21.2) |
| Insufficiently treated health problem | 62 (10.4) |
| Others | 7 (1.2) |

Classification based on the Spanish Pharmaceutical Care Forum. Expert panel. Consensus document [9]

**Table 5** Health-related quality of life (132 patients)

| | Baseline mean (SD) | Final mean (SD) | Difference mean (SD) | *p* value |
|---|---|---|---|---|
| Physical functioning | 79.2 (24.0) | 89.1 (19.4) | 9.81 (19.2) | <0.001 |
| Role physical | 69.7 (22.0) | 84.4 (20.2) | 14.7 (18.9) | <0.001 |
| Bodily pain | 65.3 (25.0) | 87.6 (19.8) | 22.3 (25.4) | <0.001 |
| General health | 48.8 (22.0) | 69.5 (20.0) | 20.7 (23.7) | <0.001 |
| Vitality | 56.3 (17.9) | 71.1 (16.0) | 14.8 (17.1) | <0.001 |
| Social functioning | 70.4 (24.2) | 85.7 (21.5) | 15.3 (23.5) | <0.001 |
| Role emotional | 73.9 (23.6) | 85.2 (20.5) | 11.3 (18.2) | <0.001 |
| Mental health | 64.2 (18.5) | 82.4 (14.9) | 18.2 (18.0) | <0.001 |
| Health transition | 40.0 (19.0) | 70.64 (20.1) | 30.7 (25.4) | <0.001 |

*SD* standard deviation

medication treating their health problems significantly increased from 6.3 out of 10 (SD: 2.2) to 8.3 (SD: 2.3), ($p < 0.001$) after the follow-up.

### Pharmacist's interventions

During the follow-up, 622 pharmacist interventions were delivered. Most of them were targeted at physicians, either recommending to add, to stop or to change a medication (50.8 %) or suggesting a change in the dose, in the quantity or in the frequency of a medication (12.9 %). The remaining were educational interventions targeted at patients (36.3 %).

## Discussion

The provision of a medication review with follow-up service implemented in a specific community pharmacy setting over a 18-month period, resulted in significant positive impact on patient's clinical, economic, and humanistic outcomes. Concerning the clinical impact, a significant reduction in uncontrolled health problems was achieved (driven by the number of NOMs resolved). Regarding the

**Table 6** Patient medication knowledge for all medications used (132 patients)

| | Baseline mean % (SD) | Final mean % (SD) | *p* value |
|---|---|---|---|
| DFI | 8.9 (17.5) | 87.9 (25.0) | <0.001 |
| DF | 9.3 (17.9) | 92.5 (22.1) | <0.001 |
| I | 86.1 (20.8) | 90.7 (24.0) | 0.092 |

Scores for each dimension for each patient were calculated as follows:

% Correct DFI = number of medications for which dose, frequency and indication is known/total number of medications used × 100

% Correct DF = number of medications for which dose and frequency is known/total number of medications used × 100

% Correct I = number of medications for which indication is known/total number of medications used × 100

*DFI* composite dose, frequency and indication score; *DF* composite dose and frequency; *I* indication

economic impact, a significant reduction in the number of medicines, hospitalizations, and emergency departments visits was observed. These outcomes were obtained significantly improving medication adherence, medication knowledge and the quality of life at the same time.

The level of the clinical benefit observed in the present study, was mainly evident by the prevention and resolution of uncontrolled health problems. This clinical benefit is rarely reported in other studies and is probably determined by the conceptual basis of MRF. Although the need to use clinical indicators to assess the effectiveness of interventions has been widely discussed in health services research [17], a recent systematic review of systematic reviews, concluded that there were no systematic data available addressing the impact of pharmacy services on the control of health problems [18]. These results may be attributed to the fact that the services included in the systematic reviews were more focused on the use of medicines rather than on the patient's clinical outcomes. However, other systematic reviews differ in their conclusion [17, 19, 20]. As previously mentioned, the characteristics of the MRF service itself, which unlike other medication review services, is focused on patients' outcomes rather than on the medication use process, could have driven the positive results in terms of uncontrolled problems obtained. In this sense, two rigorous studies conducted in Spain have reported positive results after using MRF. On one hand the EMDADER-CV showed an improvement in blood pressure and cholesterol levels in patients with cardiovascular disease and/or high or intermediate cardiovascular risk attending community pharmacies [21]. On the other hand, the conSIGUE program, a recent study targeting aged polypharmacy patients (aged 65 or more), has shown similar results regarding the improvement of health problems, although not of the same magnitude [16]. This national study was conducted using the same MRF service as the one used in the present study and was targeted to aged polypharmacy patients. Although patient's age was not an inclusion criterion in our study, it should be noted that more than 60 % of our population was aged 65 or more. While medicines are the most widely used technology to treat health problems, the large number of NOMs identified highlights medicines were not being used neither in an effective nor in a safe manner in a high percentage of our population. The high resolution of NOMs/rNOMs after the pharmacist's intervention supports that pharmacy services such as MRF can assist patients and doctors to achieve a safe and effective pharmacotherapy.

The main economic impact of the service was the significant reduction in the number of medicines, close to 3. It is interesting that services such as interventions to improve adherence, clinical interventions and prescription services have shown to have a positive effect in reducing the number of medicines, while medication review services and participation of pharmacists in therapeutic decisions have provided inconsistent results [18]. In Spain, MRF has shown to be effective in reducing the number of medicines, but with a smaller effect [16]. The lack of an electronic prescription system at the time the study was conducted, presumed to reduce duplicate medications, may have contributed to the differences of our results with the national study. Moreover, the reduction in the number of medicines observed, lead to a decrease in the percentage of polypharmacy patients. It is known that the higher the number of medicines per patient, the higher the risk of adverse drug reactions (ADR) with higher health care costs associated [22].

We also observed a positive trend on other economic indicators, such as emergency department visits and hospitalizations. However, the small sample size and the lack of a cause and effect analysis restrict the generalization of the results. Nevertheless, these results show a similar trend to the one reported in a recent meta-analysis, which found a significant reduction in the number of hospitalizations in patients aged 65 or over receiving pharmacist care [23]. The same impact was found in Spain after the provision of MRF [24]. Considering that more that 30 % of the emergency department visits are associated with the use of medicines [25, 26], and that between 81 [25] and 73 % [26] are preventable, pharmacists can contribute to the sustainability and optimization of the health care system through the provision of MRF and early identification of NOMs/rNOMs.

The main humanistic benefit seen in the present study was an increase in the patients' quality of life. Taking into account Hepler and Strand's definition of pharmaceutical care, described as *the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life* [27], the service provided clearly achieved the objectives of pharmaceutical care. It seems reasonable that as patient's health status and process of use of medicines (measured through adherence and medication knowledge) improve, so does his quality of life. Additionally, the frequent and close contacts between the pharmacist and the patient, not likely to occur during usual care, could have influenced these positive results.

We would like to acknowledge some limitations of the present study, mainly arising from the effectiveness-implementation hybrid design used. Firstly, the longitudinal analysis of patients with no randomization or control group, together with the presence of only one trained pharmacist delivering the service, limit the extrapolation of the results. Some of the economic and humanistic outcomes evaluated were patient-reported. Therefore, participants may have chosen to give social desirable responses, increasing the risk bias of the results. Finally, more complex economic evaluations, such as cost-effectiveness analysis, had not been

considered by the time the study was designed, and therefore could not be performed. This would have allowed the evaluation and comparison of the costs and health effects of MRF, in order to determine the efficiency of the service. Taking into account these limitations, it is important to highlight that many interventions found to be effective in health services research studies fail to translate into meaningful patient care outcomes across multiple contexts [28]. It is recommended that if the service is finally implemented in routine practice, monitoring and longer follow-up should be conducted to evaluate whether the impact observed in the evaluation trial is replicated, and whether benefits inferred from surrogate outcomes in the original study do in fact occur [29]. Bearing all these in mind it is important to note that there appears to be little variability in the results obtained as compared to the more rigorous scientific methodology applied in previous national studies. Although this study was carried out in a single pharmacy, it shows the potential role of the pharmacists if MRF is adopted as the usual practice. The research question is whether the results in this pharmacy are reproducible across the pharmacy population.

## Conclusion

A MRF service implemented in a specific community pharmacy setting over a 18-month period and delivered by a specially trained pharmacist, has favourable effects across clinical, economic, and humanistic outcomes. These results, derived from a single pharmacy adopting MRF as usual practice, are consistent with previous studies. Incorporating community pharmacists into the multidisciplinary team is a reliable solution to improve health care.

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**Conflicts of interest** All the authors have declared that they have no conflict of interest.

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