An evaluation of polypharmacy medication reviews in GP practices

Lauren Elizabeth Kerr
Email: laurenkerr433@yahoo.co.uk

Abstract

Polypharmacy, defined as the concurrent use of four or more medications by a single patient, is ever-increasing. It enhances the risk of adverse drug reactions (ADRs) and can represent a huge burden to patients. Medication reviews are the proposed panacea for reducing such problematic polypharmacy. These reviews conducted on patients aged 65 years or over can be aided by activation of the STOPP/START toolkit, an electronic tool that gives alerts, specific to a patient's current medication regime, to recommend that GPs stop and/or start certain medications. Unique to this toolkit, the alerts are significantly associated with the Royal College of General Practitioners (RCGP) prescribing safety indicators – indicators designed to reduce ADRs – and, thus, the toolkit attempts to enhance patient safety. The aim of this study was to determine whether the STOPP/START toolkit improves medication reviews conducted on elderly polypharmacy patients.

Forty patients aged 75 years or over, all of whom were registered with a North Kirklees commissioned GP practice, were currently prescribed ten or more medications, and had received a STOPP/START medication review, formed the study's participant cohort. Recruited patients were asked a series of questions via a retrospective telephone interview to help determine the patient-perceived usefulness of, and satisfaction with, the medication review. Data regarding the number of alerts identical or similar to the RCGP prescribing safety indicators of defined 'high' (level 3) or 'extreme' (level 4) risk that were triggered and resolved during the North Kirklees commissioned STOPP/START medication reviews was also accessed and analysed. This helped to determine whether improved patient safety could be deemed an attribute of STOPP/START.

It was found that 75% of patients believed their medication review was useful, regardless of whether any medications were stopped and/or started. If medications were stopped and/or started, patients felt greater involvement in and heightened satisfaction with the change(s) made if change(s) were based on STOPP/START recommendations ($p<0.1$). Furthermore, in North Kirklees, 388 STOPP/START alerts linked to level 3/4 RCGP indicators were resolved; these resolutions potentially prevented 78 hospital admissions.

This study suggests that the stopping and/or starting of medications is not crucial in establishing overall patient satisfaction in medication reviews. Instead, it would seem that elderly patients merely desire the opportunity to discuss their medications with a healthcare professional. However, the STOPP/START toolkit can help to improve patient safety, and can better engage patients in decisions for medication change(s), heightening patient satisfaction with the change(s). This suggests that activation of the STOPP/START toolkit in polypharmacy medication reviews conducted on the elderly would be beneficial.

Keywords: Polypharmacy; STOPP/START; medication review; adverse drug reactions; elderly; patient safety.

Acknowledgements

I would firstly like to thank Dr Margaret Culshaw for her continuous support; the knowledge I have gained from her has been invaluable. I would also like to thank the Medicines Management Team at North Kirklees Clinical Commissioning Group and the patients who participated in this study.

Introduction

Purpose

Multimorbidity, defined as the co-occurrence of two or more chronic medical conditions in an individual, is ever-increasing (Koné-Pefoyo et al., 2015), with estimates suggesting the applicability of this term to one in six UK patients (Salisbury, Johnson, Purdy, Valderas, & Montgomery, 2011). Most clinical prescribing guidelines are condition specific and so do not view multimorbid patients holistically. This results in complex medication regimes and a consequent increased likelihood of polypharmacy.

In some patient cases, polypharmacy may be beneficial and will enhance the quality of life, termed 'appropriate polypharmacy'. However, polypharmacy can be problematic, as it may present a huge burden to a patient, and/or the intended benefit may not be achieved. Such problems with polypharmacy most often arise when prescribing becomes incremental and more drugs are added to treat side effects of other drugs (Duerden, Avery, & Payne, 2013). These problems are then worsened by a prescriber's reluctance to deprescribe medicines that present a risk outweighing the potential benefit (Reeve, Gnjidic, Long, & Hilmer, 2015).

Inappropriate polypharmacy also enhances the likelihood of hospital admission (Davies & O'Mahony, 2015) owing to the increased potential for drug interactions and the occurrence of adverse effects (Pirmohamed et al., 2004). Hospital admission can cause a deterioration in a patient's overall health and also places more stress on the NHS, as potentially avoidable hospital admissions demand resources.

Owing to the potential risks of polypharmacy, it is important that GPs have annual appointments with polypharmacy patients specifically to review the medication prescribed. Such an appointment is termed a polypharmacy medication review (PMR). PMRs can be streamlined through the use of tools. One such tool, designed for a population group at high risk of polypharmacy – those aged 65 years or above – is the combined Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP) and the Screening Tool to Alert doctors to Right Treatment (START) (Hamilton, Gallagher, Ryan, Byrne, & O'Mahony, 2011). This tool is being commissioned to supplement PMRs in some primary care settings in England.

Aim

The aim of this study was to determine whether the STOPP/START toolkit improves the medication reviews conducted on elderly polypharmacy patients.

Objectives

These were as follows:

- To determine:
    - The extent of, and reasons for, patient satisfaction with STOPP/START-aided PMRs;
    - Whether STOPP/START-aided PMRs can enhance patient understanding of both the need for and how to take/use their medications;
    - The extent to which patients feel involved in decisions to stop and/or start medications in STOPP/START-aided PMRs;
    - Whether patient-perceived involvement affects patient satisfaction in decisions to stop and/or start medications in STOPP/START-aided PMRs;
    - The extent to which the STOPP/START toolkit can decrease risks of adverse drug reactions (ADRs).
- To give a recommendation on whether the STOPP/START toolkit should be commissioned for use in PMRs.

Literature review

Polypharmacy

Between 2001 and 2010, there was a 53.8% rise in the average number of items prescribed per person per year, with numbers continuing to increase. Subsequently, there is also a rise in polypharmacy (Health and Social Care Information Centre (HSCIC), 2012). A Scottish study provides evidence for an increase in polypharmacy in Great Britain, reporting that the proportion of 310,000 adult patients receiving between five and nine repeat medications increased from 9.7% to 16.3% between 1995 and 2010. Over the same time period, the proportion of the same cohort receiving ten to fourteen medications also increased, from 1.5% to 4.7% (Guthrie, Makubate, Hernandez-Santiago, & Dreischulte, 2015). This increase in polypharmacy prevalence is considered to be due to an increase in diagnosed multimorbidity (Duerden et al., 2013).

Polypharmacy and the elderly

A patient with a diagnosis of two or more conditions is deemed to be multimorbid (Koné-Pefoyo et al., 2015). Multimorbidity prevalence increases with age (Barnett, Obho, & Smith, 2015). When treating conditions, clinicians are encouraged to follow clinical guidelines. These guidelines are, however, non-holistic; thus, in a multimorbid patient, one guideline has to be followed for each condition diagnosed. As multimorbid patients have multiple diagnoses, multiple guidelines are required, each offering multiple drug therapies, and this can quickly result in complex, multi-drug regimes. Owing to this link between multimorbidity, increasing age and polypharmacy, the elderly form the largest proportion of prescribed medication takers (Scholes, Faulding, & Mindell, 2014).

Polypharmacy and poor adherence

NHS England defines medication adherence as an instance in which a patient takes their medication in line with agreed prescriber recommendations. Deviation from this ideal – non-adherence – can be either intentional, for example, deliberate failure to take medication owing to unwanted side effects or personal beliefs, or unintentional, as a result of forgetfulness, uncertainty of the need for a medication, or uncertainty about how and when to take it (NHS England, 2015).

It is estimated that 50% of patients are non-adherent with at least one medication (NHS PrescQIPP, 2013). The Department of Health (DoH) suggests that the more medicines that are concurrently prescribed, the lower the manageability and the greater the patient uncertainty about the medication regime, which causes greater non-adherence, particularly in the elderly (DoH, 2001). This is also supported by findings documented in the report ‘Dispensing Health in Later Life’ (Pharmacy Voice, 2015).

Polypharmacy and adverse drug reactions

Polypharmacy enhances the risk of ADRs (Davies & O’Mahony, 2015). Prybys, Melville, and Hanna (2002) found that the risk of ADRs increases from 13% for a patient taking two regular medications to 58% for a patient taking five regular medications, and to 82% for seven or more regular medications. ADRs enhance the risk of hospital admissions. Pirmohamed et al. (2004) reported on 18,820 admissions, and found that 1,225 (6.5%) of these admissions were ADR related.

The Royal College of General Practitioners (RCGP) has recognised that certain prescribing events can enhance the risk of potentially fatal ADRs (Spencer, Bell, Avery, Gookey, & Campbell, 2014). Consequently, it has released 56 prescribing safety indicators (RCGP,

2014), which should be followed by practitioners in primary care in an attempt to decrease ADR risk and consequently increase patient safety. It is of particular importance that these indicators are considered when reviewing polypharmacy patients, as such patients are most at risk of 'unsafe' prescribing.

Managing polypharmacy

It is important that in practice, problematic polypharmacy is identified and rectified. One proposed method to achieve this is the conducting of a medication review (Wallace et al., 2015). According to the National Institute for Health and Care Excellence (NICE), a structured, patient-facing medication review of 20 minutes' duration should be conducted at least once per annum on polypharmacy patients. The aim is for the review to better optimise a patient's medication regime and to enhance patient understanding of the need for, and of how to use, their medicines (NICE, 2015).

As the elderly are more likely to have polypharmacy regimes, a greater demand for effective medication review is required within this patient group. To better streamline the review process of patients aged 65 years or over, GPs are being encouraged to implement the STOPP/START tool. STOPP comprises 65 evidence-based indicators of potentially inappropriate medicines and START consists of 22 evidence-based indicators for prescribing in common long-term health conditions seen in the elderly (Hamilton et al., 2011). Most medicines that appear in the STOPP/START alerts are significantly associated with ADRs, as most alerts are linked with the RCGP prescribing indicators (RCGP, 2014). Reviewing and, where necessary, implementing alert guidance should, therefore, decrease the incidence of potentially avoidable ADR-related hospitalisation (Hamilton et al., 2011).

Patient satisfaction with medication reviews

The White Paper 'Equity and Excellence: Liberating the NHS' (DoH, 2010) formed the basis of the NHS Outcomes Framework. Domain 4 of this framework relates to the assurance that 'people have a positive experience of care', and implies that patients should leave a medication review feeling satisfied (DoH, 2013). It is believed that the greater the level of patient satisfaction following a medication review, the more adherent that patient will be to their medication regime (The Health Foundation, 2012). One literature review identified 'patient-perceived discussion involvement' and 'shared decision-making' to be the most pivotal factors in enhancing patient satisfaction (Suh & Lee, 2010).

Shared decision-making recognises that both clinicians and patients have knowledge regarding medications. Clinicians possess clinical knowledge and are aware of evidence-based prescribing guidelines, whereas patients possess more practical knowledge and will often have personal preferences for certain medications (Butterworth & Campbell, 2014). Shared decision-making deems clinical guidance and patient preference to be of equal importance (Foot et al., 2014), and, in line with recommendations made in the Five Year Forward View (5YFV), it attempts to give patients greater control of their own care (NHS England, 2014). In order for a medication review to be successful, shared decision-making should be practised (NICE, 2009).

Design/methodology/approach

Study design

This study was retrospective in nature and involved two methods of data collection to determine whether the STOPP/START toolkit improves the medication reviews conducted on elderly polypharmacy patients. Firstly, information was retrieved from patients via a telephone interview. All interviews were conducted within a five-month time frame post-PMR, and all interviews followed a standardised framework. The framework comprised a brief, scripted introduction, followed by ten set questions. Eight of these questions were essential

to all interviews conducted, and two were required only if the patient had at least one medication stopped and/or started during their medication review.

Of the ten questions, nine were designed to elicit nominal data, and one Likert-style question was designed to elicit ordinal data. All ten questions were thus suitable for quantitative analysis. Qualitative data was also retrieved, as following three of the questions, participants were asked to give one reason for their answers.

STOPP/START alerts are designed such that some are either identical or similar to RCGP prescribing safety indicators. Therefore, to achieve the objective of determining the extent to which the STOPP/START toolkit can decrease the risk of ADRs, the second aspect of the data collection involved downloading and analysing the number of alerts identical or similar to the RCGP prescribing safety indicators defined as 'high' (level 3) or 'extreme' (level 4) risk that were triggered and resolved during the PMRs in North Kirklees.

Study population and subject definition

North Kirklees Clinical Commissioning Group (NKCCG) commissioned GP practices in North Kirklees to perform a 20-minute STOPP/START-aided PMR on all patients aged 75 years or over, who were co-prescribed ten or more repeat medications. All reviews were conducted between September 2015 and January 2016. These patients formed the study's participant cohort.

Some patients within this category were, however, excluded from the study. The exclusion factors were:

- Patients clinically diagnosed with dementia of any form, amnesia, schizophrenia and/or severe depression;
- Patients known to have a poor understanding of English.

Of the 28 NKCCG member practices, ten refused to conduct PMRs, six conducted two or fewer PMRs, six were dominated by patients who had a poor understanding of English and two were inconvenient to visit. Patients at these surgeries were thus not contacted to complete a telephone interview. All telephone interview data was, therefore, retrieved from patients meeting the selection criteria who were registered at the remaining four surgeries.

However, the database containing information regarding the number of alerts identical or similar to the level 3/4 RCGP prescribing safety indicators that were triggered and resolved could not be manipulated to exclude certain patient groups. Therefore, unlike the data retrieved from the patient interviews, RCGP prescribing safety indicator data included all consenting patients who received an NKCCG-commissioned PMR at any of the 28 NKCCG member practices between September 2015 and January 2016.

Subject recruitment

Immediately after the PMR, in abidance with STOPP/START guidance set by the NKCCG Medicines Management Team, GPs were required to ask patients whether they would consent to completing a telephone interview regarding feedback on their review. This was done by most doctors, and if consent had been granted by the patient, the 'provision of patient satisfaction questionnaire' box found in a patient's records was ticked. The status of this box was checked by the interviewer, and only patients with a ticked box were contacted.

Problems arose, however, as some doctors admitted to forgetting to ask for consent. Patients reviewed by these doctors, therefore, appeared to have withheld consent, which limited the number of potential participants. In such cases, the doctors gave permission for patients to be contacted, at which time verbal patient consent was requested over the phone through use of a 'consent script'. These patients were also given the option to receive more

information before making a decision to consent. If requested, a patient information sheet and consent form were posted to the patient's home address.

Ethics

To comply with the University's Code of Practice for Research and the University's Research and Ethics Integrity Policy, ethical approval had to be granted. This is because the study involved potentially vulnerable members of the general public. A protocol was, therefore, submitted to the Ethics Committee. This protocol was approved.

Withdrawal or early termination

All patients were made aware that they did not have to give consent, and that consent could be withdrawn at any time without any repercussions.

Number of subjects

Attempts were made to contact 85 patients; however, only 40 attempts were successful, and so 40 fully completed telephone interviews were retrieved. Of the 40 respondents, 20 did and 20 did not have at least one medication stopped and/or started during their PMR. This equal result (20:20) allowed a fair comparison of the two groups.

Data collection

Data was collected from the consenting polypharmacy patients. The outcomes measured were:

- The extent to which patients felt satisfied with their medication review as a whole;
- The level of understanding possessed by patients regarding their medications pre- and post-review;
- The degree of patient-perceived involvement in decisions to stop and/or start medications;
- The extent to which patients felt satisfied with medication additions and/or omissions, where the GP had deemed such changes necessary;
- The extent to which the STOPP/START toolkit decreases ADR risk.

Confidentiality of subject identity and data

All patient-identifiable features were omitted from this study to ensure all participants remained anonymous.

Data analysis

Responses to each of the ten questions in the telephone interview were analysed. For the quantitative responses, Microsoft Excel was used to create a series of bar charts, and for the qualitative responses, a series of themes were identified. Despite the relatively small sample size, statistical analysis in the form of an independent samples *t*-test (a parametric procedure) and Spearman's Rho correlation analysis (a non-parametric procedure) was also conducted on aspects of the data collected. This was to determine any differences in response, firstly between patients who did and patients who did not have any medications stopped and/or started during their review; and secondly, between patients who had a STOPP/START-initiated change and patients who had a GP-initiated change (i.e. a medicine added and/or omitted independent of a STOPP/START alert). This was achieved using the IBM SPSS Version 22 software. A significance level of 0.1 was used to reduce chances of a type II error, and thus incorrect acceptance of a false null hypothesis, as likelihood of type II error is heightened with small data sets such as the one in the study.

STOPP/START-generated information regarding the triggering and resolution of RCGP prescribing safety indicator linked STOPP/START alerts was also quantitatively analysed.

Findings

Patient-perceived usefulness of PMRs

Domain 4 of the NHS Outcomes Framework attempts to ensure that all patients have a positive care experience and leave the care setting satisfied (DoH, 2013). In terms of a PMR undertaken in primary care, patient-perceived usefulness is likely to correlate with patient satisfaction. When asked, 75% (30) of the patients interviewed felt their review was useful and, hence, were likely to have left satisfied, with only a handful stating that they found the review to be of no use (17.5%). There was no significant difference ($p>0.1$) in patient-perceived usefulness between patients who had and patients who had not had at least one medication stopped and/or started during their PMR. This suggests that the main patient-perceived purpose of a PMR is not to amend medicines, and so patient satisfaction cannot be solely attributed to activation of the STOPP/START toolkit.

Three of the patients (7.5%) were undecided on perceived PMR usefulness. This may have been due to poor patient understanding of the purpose of a PMR, as patients cannot determine need fulfilment without first understanding the intended review need. If this is true, more information regarding the review and its purpose may be required by patients before a review is conducted, to ensure that maximum review potential is achieved.

Patients were also asked to give one reason for their perception of PMR usefulness. One clear theme that presented from these qualitative answers was patient gratitude for specific time to discuss medicines, with 41.66% (15) of the 36 'significant' patient responses stating this as their reason for perceiving the PMR to be useful. Results, therefore, support the recommendation that PMR duration should be 20 minutes, despite this being twice the length of an average primary care consultation (NICE, 2015).

Patient understanding of their medications post-PMR

One desired outcome of a PMR, as stated by NICE, is to increase patient understanding with regard to their medication, in the hope that increased understanding will decrease unintentional non-adherence (NICE, 2015). Results indicate that the PMRs achieved this outcome, as 80% (32) of patients reported a better understanding of both what their medicines were for and how to take/use their medicines post-review.

The DoH identified poor patient understanding as a contributing factor in non-adherence, with the inference that the greater the extent of polypharmacy, the greater the patient confusion regarding the regime, and, hence, the poorer the adherence (DoH, 2001). The results, however, showed no significant difference ($p>0.1$) in enhanced patient understanding of both medication indication and administration between patients who had and patients who had not had at least one medication stopped and/or started during their PMR. Therefore, although it is true that with more medicines there is a greater potential for confusion, it seems that patient understanding can be improved without the need for drug elimination. Hence, the results suggest that PMRs can improve patient understanding without activation of the STOPP/START tool.

Shared decision-making

Patient-perceived inclusion in decisions to change medication regimes should enhance patient adherence, and this is a desirable outcome (Suh & Lee, 2010; The Health Foundation, 2012). Of the 20 patients who had at least one medication added and/or omitted during their PMR, only 50% (ten) reported feeling involved in the decision for this change. The remaining 50% (ten) stated that they were not involved in such decision-making. This

suggests that clinicians need more training regarding shared decision-making to improve PMRs.

Interestingly, further analysis of the results uncovered that patients perceived that involvement in decision-making was much more likely if changes were initiated by STOPP/START, as opposed to by GPs, independent of STOPP/START. This difference was deemed significant (p<0.1).

The 20 patients who had at least one medication stopped and/or started during their review were also asked whether they were satisfied with the medication additions and/or omissions. Spearman's Rho correlation analysis uncovered a significant positive correlation between patient-perceived involvement and patient-perceived satisfaction with regard to their medication changes (r=0.905, p<0.1). This correlation illustrates that patient-perceived involvement in decisions to add and/or omit medications enhances the likelihood of patient satisfaction in these changes. The results, therefore, suggest patient involvement to be essential in the achievement of patient satisfaction in medication reviews and, hence, as it enhances patient-perceived inclusion, they also support activation of the STOPP/START toolkit.

Patient safety

RCGP indicators recognise and attempt to lower the risks of ADRs (RCGP, 2014). Of the STOPP/START indicators used locally by NKCCG, 13 correspond with the level 3/4 RCGP indicators. Within the NKCCG-commissioned PMRs conducted between September 2015 and January 2016, these 13 STOPP/START indicators were triggered 913 times. Triggers were resolved in 388 cases, giving an overall percentage resolution of 42.5%.

It is estimated that one in five patients with medication regimes that correspond to RCGP indicators of levels 3 or 4 would require hospital admission over a 12-month period (RCGP, 2014). In accordance with this estimation, the 388 STOPP/START indicators resolved should prevent 78 ADR-related hospital admissions throughout 2016. These results, therefore, illustrate the huge potential for the STOPP/START toolkit to improve patient safety, and so support the use of the STOPP/START toolkit in PMRs.

Research limitations/implications

Limitations

The telephone interview approach to data collection was flawed. Firstly, attempts to contact patients were unsuccessful in 31 patient cases, as the number was either unrecognised, or patients failed to answer. In addition, over the telephone it was difficult to identify which patients were 'well' enough to complete the interview. Four of the patients contacted displayed obvious signs of confusion, with one explaining that they had recently had a stroke and so found remembering difficult. In these cases, interviews could not be completed. As with all interviews, there was also the possibility of patient dishonesty, as despite being informed otherwise, patients may have believed that their responses would be fed back to the doctor. This may have caused enhanced result positivity.

The study was also weak in that the participant sample was not wholly representative of all patients in North Kirklees aged 75 years or above who are prescribed ten or more repeat medications: the target population. This is because the study excluded all patients diagnosed with dementia, amnesia, schizophrenia and/or severe depression. Owing to the lack of a language interpreter, all patients with a poor understanding of English were also excluded. Arguably, the patients excluded from the study are those most in need of a PMR. Results may, therefore, be skewed and may not be applicable to the whole population.

The retrospective nature of the study also emerged as a barrier to attaining reliable results, as some patients, when contacted, said they were unable to remember the review well enough to answer the questions. This highlights a need for a reduced time frame between the carrying out of the medication review and the follow-up interview, should a similar study be conducted in the future.

Future research

It would be useful to understand a GP's perception of the STOPP/START toolkit, as ultimately, GPs are using the tool and are responsible for accepting or rejecting alerts. More research could, therefore, be conducted focusing solely on clinician opinions on the success of the STOPP/START tool in PMRs. It may also be interesting to trial the use of the STOPP/START toolkit by other healthcare professionals (HCPs), such as pharmacists, who conduct medication reviews (Royal Pharmaceutical Society, 2016). Subsequent research into their opinion on the toolkit may also be beneficial.

In addition, as this study was specific to the North Kirklees region, it may be beneficial to conduct research on patients located in other areas of the United Kingdom. This would improve the generalisability of the findings.

Practical implications

PMRs and the need for STOPP/START

From the results, it is evident that the vast majority of polypharmacy patients aged 75 years or over deem PMRs to be useful and, hence, leave feeling satisfied. The results also identify that PMRs are an ideal opportunity to increase patient understanding with regard to their medication, a factor that has the potential to improve patient adherence. The findings, therefore, support continued commissioning of annual medication reviews on polypharmacy patients.

Although it would seem that PMRs are useful as a stand-alone entity, the results of the study suggest that PMR outcome can be benefited by activation of the STOPP/START toolkit. This is because it has been found that patients perceive greater inclusion in decisions regarding the stopping and/or starting of medications if these decisions are responsive to a STOPP/START alert. Increased decision inclusion enhances patient satisfaction in the changes made. Furthermore, as STOPP/START alerts are linked with RCGP prescribing safety indicators, resolution of these alerts has significant potential to decrease the risk of ADRs. This should, in turn, decrease hospital admissions, thus increasing patient safety and decreasing the financial burden on the NHS. Based on these advantages, activation of STOPP/START should be continued in future PMRs.

Shared decision-making

A strong association was found in this research project between patient-perceived inclusion in decisions and patient satisfaction. This suggests a need for the adoption of a shared decision-making approach by clinicians, not only in PMRs, but also in other consultations.

Despite there being a clear need for shared decision-making, it would appear that this is not common practice for GPs, as only half of the patients interviewed stated that they feel involved in medication change decisions. It may, therefore, be beneficial for HCPs, in particular HCPs in primary care, to be offered training regarding this consultation style.

Location and occupation

It was evident from the results that patients valued time to focus solely on their medicines. PMRs should, therefore, continue to be of 20 minutes' duration, despite this being double the

length of a normal routine consultation. In the current health economy, GPs are, however, restricted in their time availability and so such a long duration may be impractical. A potential solution to this could be to trial the conduction of STOPP/START-aided PMRs by other HCPs, for example, community and hospital pharmacists and nurses, and hospital clinicians.

Social implications

Patient education

Within the study, a large proportion of patients reported improved understanding of both the need for and how to take/use their medication post-PMR. As such improvements were reported, this firstly highlights a need for improved medication education amongst elderly patients, and secondly volunteers PMRs as a successful method for achieving this required education. By improving patient understanding regarding medication, PMRs also have the potential to decrease unintentional non-adherence, a significant problem associated with polypharmacy (NHS England, 2015).

In addition, some patients within the study were unable to answer the question regarding perceived PMR usefulness. This may be due to a lack of patient understanding of the purpose of a PMR. This subsequently indicates a need for better patient information regarding the review and its purpose before PMR conduction, to ensure patients gain full benefit from the review.

Patient safety

As was demonstrated by the study's findings, resolution of STOPP/START triggers decreases the risk of ADRs and, consequently, should decrease potentially avoidable ADR-related hospital admissions. Admission to hospital is associated with infection risk and burden on the NHS (Pirmohamed et al., 2004). If STOPP/START-aided PMRs continue to be commissioned, as is recommended by this study, there should be both improved patient safety and decreased demand on secondary care resources.

Originality/value

This paper has allowed assessment of the opinions of polypharmacy patients aged 75 years or over regarding their PMR. Analysis of the RCGP indicator linked STOPP/START triggers has also enabled insight into the extent to which the STOPP/START toolkit can potentially improve patient safety.

Overall, this paper provides support for both PMRs and the STOPP/START toolkit. It does, however, also highlight issues associated with the conduct of PMRs, and attempts to offer some solutions to such problems, for example, a training focus on shared decision-making to improve PMR outcomes. This paper also encourages further research.

References

Barnett, N., Obho, L., & Smith, K. (2015). *Seven steps to managing polypharmacy*. *NHS Specialist Pharmacy Service, Medicines Use and Safety*. Retrieved from http://www.nhsiq.nhs.uk/media/2612222/polypharmacy_and_medication_review_-_seven_steps_-_vs2_jan_2015__nb_.pdf

Butterworth, J.E., & Campbell, J.L. (2014). Older patients and their GPs: shared decision making in enhancing trust. *British Journal of General Practice*, *64*(628), e709-e718. http://dx.doi.org/10.3399/bjgp14X682297

Davies, E.A., & O'Mahony, M.S. (2015). Adverse drug reactions in special populations – the elderly. *British Journal of Clinical Pharmacology, 80*(4), 796–807. http://dx.doi.org/10.1111/bcp.12596

Department of Health (DoH). (2001). *Older People.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198033/National_Service_Framework_for_Older_People.pdf

Department of Health (DoH). (2010). *Equity and Excellence: Liberating the NHS.* London: The Stationery Office Limited. ISBN: 9780101788120 [Booklet].

Department of Health (DoH). (2013). *The NHS Outcomes Framework 2014/15*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/256456/NHS_outcomes.pdf

Duerden, M., Avery, T., & Payne, R. (2013). *Polypharmacy and medicines optimisation. Making it safe and sound*. London: The King's Fund. ISBN: 978 1 909029 18 7 [Booklet].

Foot, C., Gilburt, H., Dunn, P., Jabbal, J., Seale, B., Goodrich, J... Taylor, J. (2014). *People in control of their own health and care.* London: The King's Fund. ISBN: 978 1 909029 40 8 [Booklet].

Guthrie, B., Makubate, B., Hernandez-Santiago, V., & Dreischulte, T. (2015). The rising tide of polypharmacy and drug-drug interactions: Population database analysis 1995-2010. *BMC Medicine, 13*(1). http://dx.doi.org/10.1186/s12916-015-0322-7

Hamilton, H., Gallagher, P., Ryan, C., Byrne, S., & O'Mahony, D. (2011). Potentially inappropriate medications defined by STOPP criteria and the risk of adverse drug events in older hospitalized patients. *Journal of the American Medical Association (JAMA): The Archives of Internal Medicine, 171*(11), 1013-1019. http://dx.doi.org/10.1001/archinternmed.2011.215

Health and Social Care Information Centre (HSCIC). (2012). *Prescriptions Dispensed in the Community: England, Statistics for 2001 to 2011.* Retrieved from: http://content.digital.nhs.uk/catalogue/PUB06941/pres-disp-com-eng-2001-11-rep.pdf

Koné-Pefoyo, A.J., Bronskill, S.E., Gruneir, A., Calzavara, A., Thavorn, K., Petrosyan, Y... & Wodchis, W.P. (2015). The increasing burden and complexity of multi-morbidity. *BMC Public Health, 13*(3), 33. http://dx.doi.org/10.1186/s12889-015-1733-2

NHS England. (2014). *Five Year Forward View*. Retrieved from https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf

NHS England. (2015). *Pharmaceutical waste reduction in the NHS*. Retrieved from https://www.england.nhs.uk/wp-content/uploads/2015/06/pharmaceutical-waste-reduction.pdf

NHS PrescQIPP. (2013). *Optimising Safe and Appropriate Medicines Use – Briefing*. Retrieved from: https://www.prescqipp.info/safe-appropriate-medicines-use-polypharmacy/send/68-safe-and-appropriate-medicines-use/159-safe-and-appropriate-medicines-use

NICE. (2009). *Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence.* Clinical guideline [CG76]. Retrieved from https://www.nice.org.uk/guidance/cg76/chapter/1-guidance

NICE. (2015). *NICE Guidelines [NG5]. Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes.* NICE guideline [NG5]. Retrieved from https://www.nice.org.uk/guidance/ng5

Pharmacy Voice. (2015). *Dispensing Health in Later Life.* Retrieved from http://www.dispensinghealth.org/wp-content/uploads/2015/10/Dispensing-Health-In-Later-Life-ONLINE-FINAL-REPORT-30-10-15.pdf

Pirmohamed, M., James, S., Meakin, S., Green, C., Scott, A.K., Walley, T.J... Breckenridge, A.M. (2004). Adverse drug reactions as cause of admission to hospital: prospective analysis of 18 820 patients, *British Medical Journal, 329*(15). http://dx.doi.org/10.1136/bmj.329.7456.15

Prybys, K.M., Melville, K.A., & Hanna, J.R. (2002). Polypharmacy in the elderly: Clinical challenges in emergency practice. *Emergency Medicine Reports, 23*(1), 145-153.

RCGP. (2014). *Prescribing Safety Indicators.* Retrieved from http://www.rcgp.org.uk/clinical-and-research/toolkits/~/media/AE7188D93B974E0A8DAA3F3FFE710B02.ashx

Reeve, E., Gnjidic, D., Long, J., & Hilmer, S. (2015). A systematic review of the emerging definition of 'deprescribing' with network analysis: implications for future research and clinical practice. *British Journal of Clinical Pharmacology, 80*(6), 1254-1268. http://dx.doi.org/10.1111/bcp.12732

Royal Pharmaceutical Society. (2016). *Pharmacists and GP Surgeries*. Retrieved from http://www.rpharms.com/policy-pdfs/pharmacists-and-gp-surgeries.pdf

Salisbury, C., Johnson, L., Purdy, S., Valderas, J.M., & Montgomery, A.A. (2011). Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. *British Journal of General Practice, 61*(582), e12-e21. http://dx.doi.org/10.3399/bjgp11X548929

Scholes, S., Faulding, S., & Mindell, J. (2014). *Health Survey England 2013: Volume 1, Chapter 5. The Health and Social Care Information Centre.* Retrieved from http://www.hscic.gov.uk/catalogue/PUB16076/HSE2013-Ch5-pres-meds.pdf

Spencer, R., Bell, B., Avery, A.J., Gookey, G., & Campbell, S.M. (2014). Identification of an updated set of prescribing-safety indicators for GPs. *British Journal of General Practice, 64*(621), e181-e190. http://dx.doi.org/10.3399/bjgp14X677806

Suh, W.S., & Lee, C.K. (2010). Impact of Shared-Decision Making on Patient Satisfaction. *Journal of Preventative Medicine and Public Health, 43*(1), 26-34. http://dx.doi.org/10.3961/jpmph.2010.43.1.26

The Health Foundation. (2012). *Helping people share decision making*. Retrieved from http://www.health.org.uk/sites/health/files/HelpingPeopleShareDecisionMaking.pdf

Wallace, E., Salisbury, C., Guthrie, B., Lewis, C., Fahey, T., & Smith, S.M. (2015). Managing patients with multimorbidity in primary care. *British Medical Journal, 350*, 176. http://dx.doi.org/10.1136/bmj.h176