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Prescribing error reporting in primary care: a narrative synthesis systematic review

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ABSTRACT

Prescribing errors can cause avoidable harm to patients. Most prescriptions originate in primary care, where medications tend to be self-administered and errors have the most potential to cause harm. Reporting prescribing errors can identify trends and reduce the risk of the reoccurrence of incidents; however, under-reporting is common. The organisation of care and the movement of prescriptions from general practice to community pharmacy may create difficulties for professionals to effectively report errors.

This review aims specifically to identify primary research studies that examine barriers and facilitators to prescription error reporting across primary care. A systematic research of the literature was completed in July 2019. Four databases (PubMed/Medline, Cochrane, CINAHL and Web of Science) were searched for relevant studies. No date or language limits were applied. Eligible studies were critically appraised using the Mixed Methods Appraisal Tool, and data were descriptively and narratively synthesised.

Ten articles were included in the final analysis. Seven studies considered prescription errors and error reporting within general practice and three within a community pharmacy setting. Findings from the included studies are presented across five themes, including definition of an error, prescribing error reporting culture, reporting processes, communication and capacity.

Healthcare professionals appreciate the value of prescription error reporting, but there are key barriers to implementation, including time, fear of reprisal and organisation separation within primary care.

Key messages

What is already known about this subject?
► Of the 80 million prescriptions generated in primary care each month in England, around 5% may include substandard or unsafe prescribing.
► Identifying and learning from errors through reporting is only possible where these are effectively reported.
► Under-reporting of prescribing errors is known to exist in primary care settings.

What does this study add?
► This study is the first to review literature to examine the potential facilitators and barriers to reporting prescribing errors in primary care.
► Healthcare professionals have a poor knowledge of what types of prescribing errors need to be reported and to whom.
► Time, fear of reprisal and poor communication were also barriers to reporting prescribing errors.
► Community pharmacists could play a bigger role in reporting prescribing errors but often lack full insight.
► Organisation separation between general practices and community pharmacies can further create barriers to collaborative working and shared learning from errors.

How might this impact on clinical practice or future developments?
► Further research is needed to discover how prescribing error reporting processes can be optimised to support cross-organisational reporting and learning and improve patient safety.

INTRODUCTION

Medication errors can cause unintentional, avoidable and potentially severe harm to patients,[1–4] with an associated economic burden to healthcare systems worldwide estimated at $42 billion annually.[5] A modelling study[6] in England revealed that approximately 237 million medication errors occur each year; these were described as being able to occur during any aspect of medication use, from prescribing or dispensing to administration and monitoring. While administration errors accounted for 54.5% of all errors, 92.4% of these were classed as having little or no potential for patient harm. Prescribing errors constituted 21.3% of all errors but accounted for 33.9% of all clinically significant errors, with 71% of these occurring in primary care.[6]

Primary care often provides the first point of contact within any healthcare system and includes general practice and community

pharmacy. Most prescriptions in the UK National Health Service (NHS) are generated in primary care, with over 80 million primary care prescription items processed each month in England.[7] It has been estimated that around 5% of these may include substandard or unsafe prescribing, although this figure varies widely.[2 4 8] In secondary care settings, each of the processes associated with medication use mostly takes place within a single organisation such as a hospital trust. However, within primary care, these stages can cross boundaries of care providers and medications tend to be self-administered with fewer interactions with healthcare professionals.[9] This makes tracking and learning from prescribing errors potentially more difficult.

A prescribing error has been defined as a prescribing decision or writing process that causes 'an unintentional significant reduction in the probability of treatment being timely and effective or increase in the risk of harm when compared with generally accepted practice'.[10] There has been some research to date to identify prescribing errors within primary care. This has highlighted trends including increased prevalence of prescribing errors in the elderly,[2 11] children[2 12] and those with polypharmacy.[6 8] Increased errors have also been found when prescribing high-risk medicines[12] or in first-time prescriptions.[13]

Community pharmacists in primary care are in a position to identify prescribing errors and intervene before dispensing medicines to the patient. However, as general practices and community pharmacies are independent contractors, shared learning across these organisations can be limited. Studies attempting to quantify pharmacist prescription interventions have suggested around 1%–2% of all prescriptions require a pharmacist to contact a prescriber for clarifications or corrections.[13] However, community pharmacists have also been found to be unlikely to report patient safety incidents, especially prescribing errors.[14 15]

The National Patient Safety Agency was formed in 2001 to mobilise the patient safety movement within the NHS. It recommended that significant event analysis (SEA) should be undertaken regularly by primary care teams.[16] This involves an audit of a significant patient safety event in order to ascertain what can be learnt from the incident to improve patient care. It also placed an emphasis on reporting patient safety incidents and launched the National Reporting and Learning System (NRLS), which has improved the frequency and culture of incident reporting year on year,[16] including a 12.3% increase in the number of incidents reported from January to March 2020, when compared with the same period in the previous year.[17] The NRLS enables patient safety incident reports to be added to a central database. Reports can then be analysed to identify and share patterns and contributory factors that can help prevent future medication-related harm. Reporting can take place in bulk using local risk management systems or individually directly to the NRLS website using an 'eForm'.[17–20] Currently, only larger organisations, mostly within secondary care, have purchased a local risk management system, meaning that reporting figures from primary care has remained low in comparison.[20] In 2012, the National Patient Safety Agency (NPSA) became part of NHS Improvement, who continue to operate the NRLS. Work is currently underway on the Development of Patient Safety Incident Management System project, which will eventually replace the NRLS. This will be designed to work more effectively across the whole of the NHS to simplify the reporting of errors across all organisations.[20]

A proactive approach to error reporting has the potential to identify trends and prevent the reoccurrence of incidents that could lead to patient harm,[21 22] and under-reporting of prescribing errors is known to exist in primary care settings.[20 23] In addition, the organisation of care and the movement of prescriptions from general practice to community pharmacy may create difficulties for professionals to make decisions about how reporting should happen when an error is identified. There is a wide body of literature on the identification and reporting of medical errors and medicines optimisation in primary care. This review aims specifically to identify primary research studies that examine barriers and facilitators to prescription error reporting across primary care. It will consider the influence of sociocultural and contextual influences, feedback systems and learning processes as well as key sociotechnical aspects of the use of error reporting technologies.

METHODS

A systematic search of the literature was completed by NH and KB in July 2019 to identify studies of relevance to the research objectives. Databases searched comprised PubMed/Medline, Cochrane, CINAHL and Web of Science. The search strategy was developed and tested in consultation with the review team and was based on predefined eligibility criteria as outlined in table 1. No date or language limits were applied.

Keywords based on the eligibility criteria were identified, and a search syntax was created that was adjusted as appropriate for each database. A full description of the search terms used can be found in online supplemental appendix 1. The grey literature was searched using Google Scholar and key websites from UK based primary care and national healthcare organisations. Reference lists of included studies were manually searched for potentially relevant papers.

Titles and abstracts were initially screened for relevance independently by KB and NH. Agreement from both reviewers was required for full-text review. All discrepancies were resolved by discussion. The eligibility criteria was applied to potentially relevant full texts independently by KB and NH. Papers were excluded if they focused primarily on the identification or classification of prescribing errors or medicines optimisation interventions. Study selection is summarised using a Preferred

Table 1 Literature search eligibility criteria

Criteria	Eligibility criteria
Study participants	Healthcare professionals and key stakeholders within primary care, including general practitioners (GPs), practice nurses, practice administrative staff, community pharmacists and community pharmacy technicians and dispensers.
Setting	Studies from any primary care setting (general practice, community pharmacy and community health) were eligible. No restriction on country was imposed.
Intervention	Studies that addressed any aspect of decision making, sociocultural and contextual influences on prescription error reporting or key sociotechnical aspects of the use of error reporting technologies.
Outcomes	Reporting thresholds, error reporting (beliefs, attitudes and behaviours), use and implementation of reporting systems, feedback and learning, health or economic outcomes.
Design	No restrictions were based on study design. Research using qualitative, quantitative and/or mixed methods approaches were included.

Reporting Items for Systematic Reviews and Meta-Analyses[24] flow diagram (see figure 1)

Each paper was appraised using the Mixed Methods Appraisal Tool (MMAT).[25] The MMAT provides a set of criteria for concomitant appraisal of quantitative, qualitative and mixed methods studies. It includes two initial screening questions, followed by five quality criteria for each study design. Key data, including author, publication date, population and setting, study aims and key findings were extracted from each study using an electronic data extraction form and tabulated to cross-compare learning from the included studies.

Due to the nature and heterogeneity of the included studies, findings were summarised narratively, using guidance provided by the Economic and Social Research Council Methods Programme.[26] Data specific to prescribing was extracted from the findings. Study findings were grouped into themes in order to describe findings across the research and support final conclusions. Themes were identified independently and subsequently discussed and agreed upon by KB and NH.

Patient and public involvement
It was agreed at the North East Research Design Service consumer panel that due to the nature of the research, patient and public involvement would not be appropriate. Relevant findings will be fed back to an online patient and public involvement reference group using the VOICE platform.

RESULTS
Searches of the online databases identified 972 records. Hand searching of the references listed identified one further study. A search of the grey literature identified a further two reports. A total of 772 articles were screened after removal of duplicates. Screening of title and abstract for relevance and suitability removed 758 articles. Full-text papers were obtained for the remaining 14 articles with four articles reviewed and removed. At full-text review, one article was excluded as it was not conducted in a primary care setting, and three articles were focused

on error frequencies or causative factors, without any reference to the reporting of errors. A summary of the record filtering can be seen figure 1.

Included studies
A total of 10 studies were included in the final analysis; a summary of these can be found in table 2. The results from the critical appraisal of included studies are found in online supplemental appendix 2. Seven studies considered prescription errors and error reporting within general practice[27–33] and three within a community pharmacy setting.[34–36] Four studies took place in the USA and six studies in the UK, with a total of 206 general practices and 121 community pharmacies included across all studies.

A large amount of variability existed between the studies, including: setting, definition and classification of a prescribing error, purpose of data collection and method of data collection. Findings from the included studies are presented across five themes, including definition of an error, prescribing error reporting culture, reporting processes, communication and capacity.

Definition of error
Of the studies that defined a medication or prescription error or significant event or incident, definitions varied and can be found in table 3. Definitions included different levels of specificity and thresholds at which something would be constituted as an 'error'.

Reporting culture
Healthcare professionals seem to see the benefit of reporting prescribing errors[27 29 32]; however, the literature suggests a poor knowledge of what types of prescribing errors need to be reported and to whom.[28 32–34] GP interviewees in one trial[32] understood that only serious errors would need to be reported to the NRLS. If no or low harm to the patient was caused, there was a tendency to discuss incidents informally with colleagues.[28 32 33] In community pharmacy, despite frequent prescription clarification and intervention, a prescribing error picked up in the
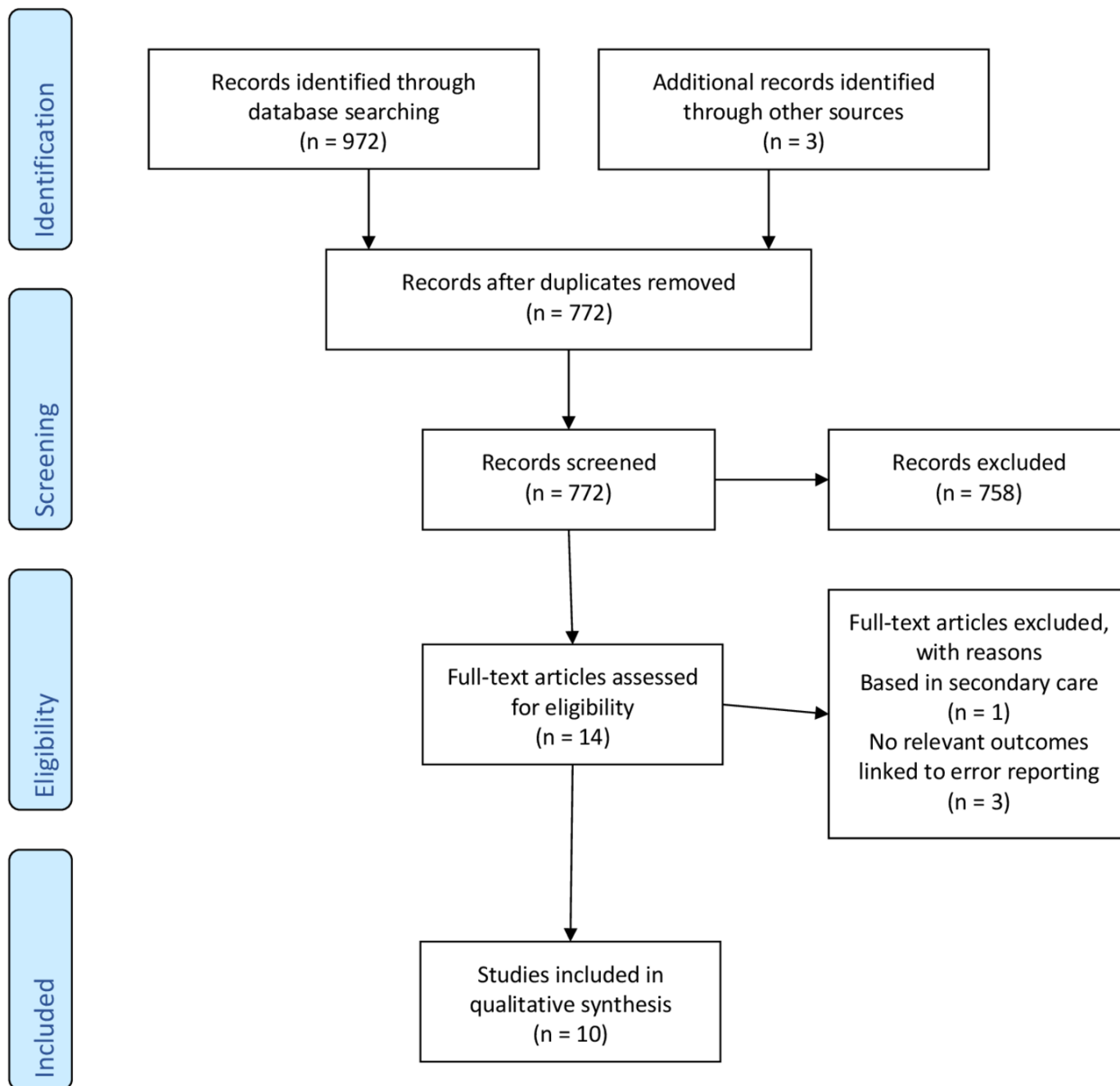
Figure 1 PRISMA[24] flow diagram illustrating the study screening process. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyse.

pharmacy was identified in the study by Kennedy *et al*[35] as unlikely to be reported if it did not reach the patient.

Various studies highlighted that a supportive and open working environment facilitated the reporting and discussion of incidents. Fear of reprisal, blame or litigation were found to act as barriers to honest and open reporting.[28 29 31 32] A pilot study[31] using a novel paper error reporting form found that anonymous reporting made the reporting process feel less punitive and only 8% found the process threatening. One study found that peer-led reporting, and the opportunity to report more informally within a community pharmacy team[35] may support good reporting practices.

Cresswell *et al*[28] identified that success was dependent on key individuals within the practice driving change. Use of formal or informal leaders (a 'champion') or 'huddles' of staff within practices who can lead on reporting processes was suggested by two of the included studies.[28 30]

Several studies examined other social-cultural determinants of reporting. This included resistance to change and sociocultural variations across primary care organisations.[30 33]

Community pharmacists felt reporting prescribing errors may create a tension with GPs and potentially affect their business.[35] Interestingly, GPs also highlighted that the commercial nature of general practice may have

Table 2 Summary of selected studies

Author (year)	Setting	Participants	Data collection methods	Study aims	Prescribing error reporting focus
Cresswell et al (2012)[28]	34 general practices at two locations in central England, UK	Interviews: 11 GPs, 9 practice managers, 6 GP pharmacists, 2 community pharmacists, 5 nurses and 4 prescribing leads. Focus groups: 10 GPs, 2 nurses, 8 administrative staff, 1 GP trainee, 1 medical student and 6 GP practice pharmacists.	52 semistructured interviews and 6 focus groups were held during the delivery of a 12-week pharmacist-led intervention to reduce medication errors. Further data were collected from feedback meetings within the 34 practices and pharmacist diaries.	Acceptability, impact and strategies for optimising and rolling out a pharmacist led intervention to reduce medication errors.	Prescribing error was included within the definition of medication error and the research considered the role of the pharmacist in identifying and managing errors.
De Wet et al (2010)[34]	111 GP practices based in Glasgow, Scotland, UK.	123 GPs, 76 practice managers, 52 practice nurses, 61 reception staff, 12 district nurses, 12 health visitors and 38 'other'.	Postal questionnaire exploring the knowledge of and attitudes towards significant event reporting and analysis.	Respondent awareness of a recent significant event. Forums for discussing significant events. Attitudes to significant events and their analysis.	Prescribing error was included as a significant event, and the culture around significant event reporting and analysis is relevant when considering prescribing error reporting.
Hickner et al (2010)[29]	24 GP practices in the USA.	110 GPs, 16 nurses, 26 medical assistants, 23 administrative staff and 46 physician assistant/nurse practitioners.	Prescribing errors were documented using a novel error reporting form. All staff were asked to complete a postreporting questionnaire.	Use and acceptability of novel error reporting form. Characteristics of medication event reports.	Prescribing error was included within the definition of medication error and the research included data on prescribing errors.
Kennedy et al (2008)[30]	Seven general practices in Vermont, USA.	31 GPs, 8 nurse practitioners, 2 physician assistants, 26 nurses, 10 medical assistants and 26 administrative staff.	Nurses and office staff across seven general practices reported all communication with pharmacists regarding prescribing errors over a 6-month period. Physicians were encouraged to report their own errors. A questionnaire was used to explore satisfaction with the reporting system.	Characteristics of error reports, including severity, setting, prescription domain and error producing conditions. Satisfaction with error reporting process.	Prescribing error reporting was the focus of this research.
Rea and Griffiths S (2016)[33]	Nine general practices in Wales, UK.	Nine GPs.	Nine interviews with GPs to understand perceptions of the barriers to incident reporting.	Explore attitudes to incident reporting.	Prescribing error reporting was included within incident reporting.
Rubin et al (2003)[32]	Ten general practices in the North East of England, UK.	39 GPs, 20 nurses, 91 administrative staff and 13 allied healthcare professionals.	A novel error reporting form was completed over 2 weeks. A questionnaire was used to explore barriers to error reporting.	Classification of errors. Frequency of errors. Acceptability of the error reporting process.	Prescribing error reporting was included within a wider scope considering error reporting.
West et al (2005)[31]	Two primary care networks in Colorado, USA.	A clinical steering committee included 12 individuals including a healthcare regulator, a patient safety advisor, physicians, pharmacists, nurses and administrative staff. A learning group included practice stakeholders in patient safety/quality improvement. Data were collected at multiple practice sites.	The research team analysed anonymous error data. Observation teams also collected data by passively observing and directly questioning clinicians, nurses and administrative staff, using semistructured interview guides.	Develop an initial framework for depicting specific clinical processes at risk of error. Validate this framework through critical inquiry with practice-based staff. Implement interventions into practices to reduce medical errors.	Prescribing error was included within the definition of medication error and the scope of the research included identifying interventions to improve patient safety.

Continued

Table 2 Continued

Author (year)	Setting	Participants	Data collection methods	Study aims	Prescribing error reporting focus
Chen et al (2005)[37]	Nine community pharmacies in England, UK.	Nine community pharmacists.	Prescribing errors/interventions were documented over a 1-month period. Feedback was presented to local GPs and pharmacists, and responses were qualitatively explored for impact.	Description of prescribing errors and prescribing interventions reported. Discussion of problems and potential strategies from an error prevention perspective.	Prescribing error reporting within community pharmacy was the focus of this research.
Kennedy et al (2006)[35]	45 community pharmacies in Vermont, USA.	45 community pharmacy technicians.	Telephone interviews to discuss opinions and experiences of medication errors and error reporting.	Survey pharmacy technicians to explore opinions and experiences of medication errors.	Prescribing error was included within the definition of medication error and the research discussed prescribing error reporting within community pharmacy.
Phipps et al (2009)[36]	Community pharmacists from the North West of England, UK.	67 community pharmacists.	Ten focus groups on risk management and sociotechnical aspects of medication safety within community pharmacy.	Identify sociotechnical factors encountered in practice and their impact on medication safety.	Prescribing error was included within the definition of medication incident.

GP, general practitioner.

an influence over reporting error rates, if it damages their reputation in a competitive environment.[32]

Reporting processes

Three studies identified that easy reporting mechanisms that fit around daily workload can improve reporting rates.[28 29 31] However, differences in error reporting across primary care can arise due to varying management styles and reporting systems, which was addressed in one study by individualising interventions.[30]

One study considered an electronic reporting system: Medication Error and Adverse Drug Event Reporting System.[28] It demonstrated that a web-based reporting system is a feasible solution for prescribing error reporting in busy primary care environments. The average time spent reporting an event was around 4 min, but time pressure was identified as the main barrier to reporting. Interventions such as incorporating reporting software into a patient's medical record and ongoing reminders to report may improve reporting rates.[28 29] Reporting contemporaneously was found in one study to aid memory recall.[31]

Kennedy et al[30] considered error reporting by other general practice staff members including nurses and administrators and concluded that this can increase reporting rates and take some of the pressure from GPs. Participants found the intervention acceptable, with 90.5% agreeing that it would improve patient care and 90.6% stating the reporting process was not a burden to them. However, the authors also found that no one continued to report incidents after the study had ended. Within community pharmacy, a telephone interview with pharmacy technicians highlighted that while 23.6% of respondents had identified a prescribing error, only 2% had completed a report. The study identified that upskilling pharmacy technicians would allow the responsibility for error reporting to be shared.[34]

Communication

Eight studies highlighted the effect communication had on prescribing errors and error reporting.[27 28 30–32 34–36] Ineffective written and verbal communication was found by study authors to be a frequent contributor to prescribing errors,[28 32 36] which was compounded by community pharmacy staff not having access to enough clinical information, such as indication or blood test results.[36]

Face-to-face communication between GPs and pharmacists was found to improve relationship building and collaborative working.[27] However, conflicting priorities were identified by Phipps et al[36] within the community pharmacy commercial model, with pharmacists keen to protect again substandard prescribing but also relying on general practice for their business. The Applied Strategies for Improving Patient Safety Collaborative[30] developed and implemented quality improvement strategies within general practices to reduce medication errors. Some interventions were based around introducing electronic prescribing into general practices, which has now become more commonplace since the research was

Table 3 Definition of error

Author (year)	Definition
De Wet et al (2010)[34]	Significant event: any event thought by anyone in the primary care team to be significant in the care of patients or the conduct of the practice.
Hickner et al (2010)[29]	Medication error: an error in medication prescribing, dispensing or use that may lead to a preventable adverse drug event.
Kennedy et al (2008)[30]	Prescribing error: any error occurring in the medication use process.
Rea and Griffiths (2016)[33]	Incident or significant event: an event or incident where GPs have acknowledged a risk to patient safety that merits analysis.
Kennedy et al (2006)[35]	Medication error: any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or consumer.

GPs, general practitioners.

conducted in 2005. This study emphasised the benefits of using plain English for prescriptions and providing additional information to community pharmacists, for example, the indication on all prescriptions.

Another study found that a lack of feedback about outcomes from reported prescribing errors was a potential barrier to future reporting.[32]

Capacity

Half of the studies suggested that clinical workload and the associated time constraints had a negative impact on the frequency of prescribing errors and reporting of errors.[27 28 30 32 33] This can be especially problematic for part-time or locum workers, where they have less time to report and also struggle to effectively integrate into the clinical team.[27 32] The Pharmacist-led Information Technology Intervention for Medication Errors or PINCER project[37] in particular highlighted that pharmacists working within general practice who had only a short time frame for delivering the intervention (3 days a week for up to 12 weeks) struggled to develop meaningful clinical relationships and integrate into the practice team.[27]

Non-clinical or community pharmacy based staff may not fully understand the complexities or nuances of an incident and often act as intermediaries without full insight into the outcome.[29] These groups were also found to be missing from SEA discussions.[33] GPs may have a more in-depth knowledge of the patient and are therefore often better informed to report the error[27] but can have increasing time and workload pressures to balance. Therefore, increasing error reporting among non-GP staff may increase overall reporting rates.[27 29]

DISCUSSION

This review is the first to review literature to examine the potential facilitators and barriers to reporting prescribing errors within primary care. We found that there was no standardised definition of a prescribing error or incident used in the literature, and this has previously been identified as a factor for under reporting.[2 10] In England, all errors should be reported to the NRLS[18]; guidance from

the NHS suggests that this should include those errors that cause no harm to the patient as well as those that do. For example, a prescription error identified by a community pharmacist before it was dispensed to a patient should still be reported. There is also evidence to suggest that error reporting thresholds differ between different healthcare professionals and individuals make their own interpretations about what, when and how to report a prescribing error.[15 28 38–41] This includes lowering the priority for those which resulted in no harm to the patient or near miss incidents,[41] especially those that could be resolved through communication with the prescriber, pharmacist and patient.[15] This was also identified with hospital pharmacists, where the severity of the medication error was a major factor in deciding to report.[42] Other evidence suggests individuals and organisations may not use the same scale to measure patient harm.[12 22 43] Recurrent training and feedback is therefore essential to ensure that any intervention that aims to improve reporting are using a consistent approach.[41 42]

Workload in general practice is increasing due to growing numbers of patients and increasing complexity of healthcare needs.[44 45] This review identified that these increasing demands within primary care can lead to conflicting priorities with clinical workflow and a reduction in prescribing error reporting.[27 28 30 32 33] Furthermore, primary care organisations are more likely to use varying reporting software that does not link directly to the NRLS and currently requires an additional 'eForm' to be completed.[20] The Royal College of General Practitioners described pharmacists as a 'hidden army' to support general practice[45]; practice pharmacists as part of the multidisciplinary team may help resolve prescription queries, reduce prescribing errors[46] and increase reporting rates.[29] Initial work on the PINCER intervention concluded that introducing pharmacists into general practice teams was a credible solution to identify and reducing prescription errors in general practice.[37]

Community pharmacists are seen as a safety net for prescription errors,[15] and this improves patient well-being and reduces the risk of harm. Price Waterhouse

Cooper estimated that community pharmacist clarification of prescriptions and resolving prescribing errors saves the NHS an estimated £468.2 million and contributed £552.6 million to wider society.[47] This financial value comes from a range of sources, including reduced GP appointments and hospital admissions, reduced medication waste and reduced risk of litigation.

However, the reporting of prescribing errors is more difficult for community pharmacists than practice-based staff, with little incentive for pharmacists to report externally.[14] Community pharmacists may not have a sufficient knowledge of the patient or the prescribing incident to report and worry that reporting will create a tension with local prescribers.[35] There are also established challenges in the transition from traditional dispensing to extended clinical roles.[48]

Communication between community pharmacies and general practices can also be problematic. A community pharmacist clarifying a prescription will likely contact administrative staff who may refer the issue to the GP after the telephone conversation and around other clinical workload. This limits peer discussion of the error between the GP and the community pharmacist.[30] Face-to-face and regular interaction between pharmacists and GPs has been highlighted as important to develop and sustain meaningful clinical relationships[27]; however, a study in this review found that community pharmacy staff are rarely included in significant event meetings.[33]

Having a 'champion' to assure the implementation of any patient safety intervention and ensure buy-in from key stakeholders could improve success rates. The role of the medication safety officer (MSO) was introduced in 2014 in order to increase medication error reporting within an organisation, including NHS Trusts and large community pharmacy multiples.[49] Clinical commissioning groups, who commission primary care services, were invited to nominate an MSO but uptake at the time was low.[50] At a practice level, individuals, for example, practice managers or practice pharmacists, can create momentum for change and galvanise the wider team.[27 30]

Learning from errors and improving the safety of healthcare systems is only possible where patient safety incidents are effectively reported and promptly analysed and disseminated across organisations. However, the volume of reports, free-text content and reporting time lag poses a challenge,[51 52] with systems such as NRLS becoming limited in its capacity.[11] Using automated technology for classifying and analysing error reports can increase the ability to spot and share trends early and is a current focus within the Development of the Patient Safety Incident Management System (DPSIMS) project in.[11 53 54]

This review has some important limitations. While the search methodology included 'incident reporting' and 'error reporting', some evidence on 'reporting' that included relevant evidence on prescribing errors may have been excluded. We relied on authors' own definitions of a prescribing error and did not specifically search for papers focused on prescribing medicines for higher risk populations, or poor practice prescribing, for example. Our search aimed to identify papers where prescribing error reporting was a feature. We may have missed some papers that contained information on influences on prescribing error reporting in the text that was not highlighted as a key issue or defined as such. Most of the studies included did not only examine influences on prescribing errors, so data needed to be extracted at a broader medication error level. This means that some of the conclusions from studies may not have been specifically applicable to prescribing errors. However, as reporting systems are usually the same for all types of errors, most of the findings are likely to be transferable to a prescribing error.

There is limited research that is focused on the culture of prescribing error reporting within primary care, with more emphasis on the prevalence and nature of prescribing errors. More research is needed to consider the influences of sociocultural and contextual factors on prescription error reporting within primary care. Future research should also address the technical aspects of error reporting technologies, including feedback processes that may increase reporting rates.

CONCLUSION

This review has highlighted that although healthcare professionals appreciate the value of prescription error reporting, there are key barriers to implementation. There is not a clear definition of a prescription error nor understanding of what to report. Organisation separation between general practices and community pharmacies can further create barriers to collaborative working and shared learning from errors. Further research is needed to discover how prescribing error reporting processes can be optimised to support learning and improve patient safety.

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Appendices

Appendix 1: Search strategy

Relevant scientific evidence was identified using online databases (Pubmed, Medline, Cinahl, Cochrane, Web of Science). A search for grey literature was also completed to identify studies not included in the databases above and using online tools and websites (e.g. google scholar, NHS.uk, gov.uk) as well via direct contact with key contacts/researchers in this area. Search terms: (prescriber OR prescribing OR prescription*) AND (error* OR mistake* OR incident* OR "adverse event*" OR "near miss" OR "near-miss" OR lapse*)) AND ("primary health care" OR "primary care" OR "general practice" OR GP OR "general practitioner" OR "family practice" OR "family practitioner" OR "social care" OR "community care" OR "community pharmacy" OR "nurse practitioner") AND (report* OR learn* OR identif* OR mitigate OR investigat* OR threshold* OR facilitate OR improve)

Appendix 2: Assessment of study quality

Qualitative studies

Author (year)	Is the qualitative approach appropriate to answer the research question?	Are the qualitative data collection methods adequate to address the research question?	Are the findings adequately derived from the data?	Is the interpretation of results sufficiently substantiated by data?	Is there coherence between qualitative data sources, collection, analysis and interpretation?
Cresswell et al (2012) (23)	Yes	Yes	Yes	Yes	Yes
Phipps et al (2009) (31)	Yes	Yes	Yes	Yes	Yes
Rea D and Griffiths S (2016) (28)	Yes	Yes	Yes	Yes	Yes

Quantitative descriptive studies

Author (year)	Is the sampling strategy relevant to address the research question?	Is the sample representative of the target population?	Are the measurements appropriate?	Is the risk of nonresponse bias low?	Is the statistical analysis appropriate to answer the research question?
Chen et al (2005) (32)	Yes	Yes Although participants from one geographical area, they included a representative	Yes	No Pharmacies declined to participate due to heavy workload/lack of interest, which	Yes

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		range of the target population.		may have affected responses	
De Wet et al (2010) (29)	Yes.	Yes Although participants from one geographical area, they included a representative range of the target population.	Yes	Yes	Yes
Kennedy et al (2006) (30)	Yes	Yes	No Standardised interview schedule limited measurement of some variables.	No Some technicians excluded as pharmacist manager refused.	No
Kennedy et al (2008) (25)	Yes	Yes	Yes	Yes	No None completed.
Rubin G et al (2003) (27)	Yes	Yes Although participants from one geographical area, they included a representative range of the target population.	Yes	No Nine practices declined to participate due to workload or lack of interest, which may have affected responses	No None completed.

Mixed methods

Author (year)	Is there an adequate rationale for using a mixed method design to address the research question?	Are the different components of the study effectively integrated to answer the research question?	Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved
Hickner et al, 2010 (24)	Yes	Yes	Yes	Yes	No Qualitative data was extracted verbatim from open-ended questionnaire responses.
West et al, 2005 (26)	Yes	Yes	Yes	Yes	Yes