Improving medication safety in general practices in the East Midlands through the PINCER intervention:

Scaling Up PINCER

Evaluation Report for the Health Foundation

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Competing interests:

None

EXECUTIVE SUMMARY

Title

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Background

Medication errors in general practice are an important and expensive preventable cause of patient safety incidents associated with morbidity, hospitalisations and deaths. A recent study in English general practices identified errors in 5% of prescription items, with one in 550 items containing a potentially life-threatening error. Given the prevalence of medication errors, and the severity of harm associated with these, there is an urgent need to implement interventions known to correct these errors. A pharmacist-led information technology intervention for medication errors in general practice ('PINCER') was found, in a cluster randomised controlled trial, to be acceptable, effective and cost-effective in reducing rates of hazardous prescribing. The PINCER intervention involves searching GP clinical systems using automated computerised prescribing safety indicators to identify patients at risk from their prescriptions, and then acting to correct the problems with pharmacist support. Prior to nationwide adoption, it is important to assess the effectiveness of the PINCER intervention in a large-scale rollout as the conditions in routine care may be different to those in the trial. The aim of this evaluation was therefore to determine whether PINCER is effective at reducing rates of hazardous prescribing when rolled out at scale, understand how and why the intended change did or did not occur, and to identify any unintended consequences of the intervention.

Methods

A Quality Improvement Collaborative (QIC) approach was used to implement the PINCER intervention whereby an expert team, using structured activities, engaged clinicians and pharmacy teams to effect improvement in specific areas of practice. The QIC design was based on a logic model and programme theory. Support was provided in the form of education, feedback and opportunities for shared learning. Eleven prescribing safety indicators were used in the PINCER implementation, and these differed from those used in the original trial. They focused on types of hazardous prescribing associated with serious harm outcomes such as gastrointestinal bleeding, exacerbation of asthma, exacerbation of heart failure, stroke in patients with dementia, and acute kidney injury.

We employed a mixed-methods approach. Quantitative methods were used to investigate what, if any, changes occurred in potentially hazardous prescribing over time, before, during and after the intervention was introduced in participating CCG practices. Qualitative methods were used to explore contextual factors for implementation of PINCER, assess its acceptability and feasibility in a range of settings and determine what organisational factors (at CCG or practice level) enhanced its effects.

Improvement was measured using anonymised routinely recorded data from general practices collected retrospectively, at three monthly time points over a four-year period from two years prior to the intervention starting in any of the practices to after the intervention completing in all practices. The main outcome measure was changes in the proportion of patients with at least one type of potentially hazardous prescribing. Changes in rates of potentially hazardous prescribing for 11 prescribing safety indicators were also described. The data were modelled using multilevel logistic regression with practices and repeated measurements adjusted for as random-effects. Multilevel logistic regression models adjusting for secular trends were also fitted. Interrupted time series analysis was undertaken to investigate changes in rates of potentially hazardous prescribing in the lead up to the PINCER intervention, in the first quarter following the anticipated start of the intervention, and the period after this.

The participants for the qualitative evaluation included members of the implementation team, external strategic leaders, CCG pharmacists and practice staff. Participant recruitment employed the use of representative and purposive sampling, the latter being achieved through desk-based profiling using available data to produce typology frameworks. Drawing on concepts within Implementation Science, such as Damschroder et

al.'s consolidated framework, data were collected through semi-structured interviews, focus groups and an observation of a meeting of CCG pharmacy leads. Analysis of the themes within the data identified lessons about the implementation of PINCER across the East Midlands at 'scale and pace', including barriers and facilitators, timeliness, fidelity and transferability. As part of the qualitative evaluation, PINCER leads and members of the implementation team were invited to attend a half-day workshop for the development of a study logic model. The outcome of the workshop was the creation of an updated logic model for the project which was used to refine the appraisal design and provide formative feedback to local stakeholders.

Results

Twelve Clinical Commissioning Groups (CCGs) implemented the PINCER intervention in 370 general practices between September 2015 and April 2017. A total of 2.97 million patient records were searched and 22,105 instances of potentially hazardous prescribing were identified. Quarterly retrospective data were collected at 16 time points from 343 general practices commencing 30 November 2013 and ending 31 August 2017.

Statistical process control charts showed reductions in rates of hazardous prescribing over the duration of the study for most of the CCGs in particular for prescribing safety indicators associated with gastrointestinal bleeding and prescription of non-steroidal anti-inflammatory drugs (NSAIDs) to patients with chronic kidney disease.

Multilevel logistic regression analysis, taking account of clustering by practices, indicated that the PINCER intervention was associated with a reduction of around 24% in the proportion of patients exposed to at least one type of hazardous prescribing (Odds ratio 0.756, 95% CI: 0.749, 0.763). The figure was reduced to around 10% after taking account of secular trends, CCG, deprivation and list size (Odds ratio 0.902, 95% CI: 0.890, 0.914). Reductions in hazardous prescribing were most notable in relation to prescribing safety indicators associated with risk of gastrointestinal bleeding, where the overall reduction was around 31% (Odds ratio 0.682, 95% CI: 0.661, 0.704), and 14% after taking account of secular trends and additional confounders (Odds ratio 0.859, 95% CI: 0.834, 0.884). The interrupted time series analysis showed that (after controlling for baseline level and trend) there were reductions in hazardous prescribing for five of the 11 prescribing safety indicators including those associated with risk of gastrointestinal bleeding, and the prescription of oral NSAIDs in patients with either heart failure or chronic kidney disease (a

statistically significant reduction in hazardous prescribing for three of the indicators, and a borderline statistically significant reduction for two of the indicators).

Thirty-five participants took part in an interview (n=19), focus groups (n=10) or were observed (n=6) as part of a meeting of CCG pharmacist leads. All the CCG interviews were with pharmacists. The practice interviews comprised four GPs, one pharmacist who was solely based in practice (some pharmacists had practice and CCG roles) and one practice manager.

The qualitative analysis showed that the engagement of different groups of stakeholders, at different points in the implementation of the PINCER intervention, was crucial to the success of the implementation. Different aspects of the PINCER intervention, and the participants' perceived need of the intervention, response to peer pressure, safety culture and a strong desire to engage in patient safety initiatives, were favourable factors for the implementation of PINCER. Where PINCER was implemented, the resulting impact was not only in identifying and resolving instances of hazardous prescribing, but also in bringing about changes in systems and processes within practices and CCGs.

Implementation was threatened, and at times halted, when resource pressure and cost-saving initiatives dominated. Availability of adequate resources such as staff time and/or availability and a simplified way of identifying at risk patients were put forward as important considerations for the long term sustainability of the PINCER intervention. Furthermore, some modifications to the PINCER intervention in terms of improving the specificity and variety of indicators available was suggested by participants.

Conclusions

PINCER has been widely implemented across general practices in the East Midlands with modest reductions in hazardous prescribing, with the greatest differences demonstrated for prescribing safety indicators associated with gastrointestinal bleeding. The extent to which stakeholders engage with PINCER at different stages of implementation is a crucial factor for PINCER uptake, use and sustainability. The intervention is likely to be even more acceptable for wider use in general practice with some modifications to IT making it easier to identify at risk patients; having access to adequate resources (particularly time for pharmacists), and more information on the potential for PINCER to provide cost-savings through reductions in hospital admissions.