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Developing a complex intervention to improve prescribing safety in primary care: mixed methods feasibility and optimisation pilot study

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ABSTRACT

Objectives: (A) To measure the extent to which different candidate outcome measures identified high-risk prescribing that is potentially changeable by the data-driven quality improvement in primary care (DQIP) intervention.(B) To explore the value of reviewing identified high-risk prescribing to clinicians.(C) To optimise the components of the DQIP intervention.

Design: Mixed method study.

Setting: General practices in two Scottish Health boards.

Participants: 4 purposively sampled general practices of varying size and socioeconomic deprivation.

Outcome measures: Prescribing measures targeting (1) high-risk use of the non-steroidal anti-inflammatory drugs (NSAIDs) and antiplatelets; (2) 'Asthma control' and (3) 'Antithrombotics in atrial fibrillation (AF)'.

Intervention: The prescribing measures were used to identify patients for review by general practices. The ability of the measures to identify potentially changeable high-risk prescribing was measured as the proportion of patients reviewed where practices identified a need for action. Field notes were recorded from meetings between researchers and staff and key staff participated in semistructured interviews exploring their experience of the piloted intervention processes.

Results: Practices identified a need for action in 68%, 25% and 18% of patients reviewed for prescribing measures (1), (2) and (3), respectively. General practitioners valued being prompted to review patients, and perceived that (1) 'NSAID and antiplatelet' and (2) 'antithrombotics in AF' were the most important to act on. Barriers to initial and ongoing engagement and to sustaining improvements in prescribing were identified.

Conclusions: 'NSAIDs and antiplatelets' measures were selected as the most suitable outcome measures for the DQIP trial, based on evidence of this prescribing being more easily changeable. In response to the barriers identified, the intervention was designed to include a financial incentive, additional ongoing feedback on progress and reprompting review of patients, whose high-risk prescribing was restarted after a decision to stop.

Trial registration number: Clinicaltrials.gov NCT01425502.

Strengths and limitations of this study

- The key strength of this study was the use of quantitative and qualitative methods to give a greater understanding of how changeable the identified high-risk prescribing was, what the barriers to changing prescribing were and how general practitioners (GPs) valued this work.
- The findings of this pilot study enabled informed choice of outcome measures and optimisation of the intervention to be tested in the DQIP trial.
- The limitation of this study is that changeability of potential outcome measures was tested by measuring GPs intention to change prescribing or conduct further investigation ('action'), rather than quantifying actual changes in prescribing and their clinical implications (although this is being evaluated in an ongoing clusterrandomised controlled trial).

BACKGROUND

The safety of medication use in primary care is a major concern for healthcare systems internationally.[1–4] An estimated 3–4% of unplanned hospital admissions are due to preventable adverse drug events and approximately one-third of these have been attributed to prescribing of drugs to people with risk factors for adverse drug effects and underprescribing of prophylactic treatments (high-risk prescribing).[4]

In the UK, medications may be initiated in primary and secondary care, but general practitioners (GPs) prescribe almost all drugs in the community and have responsibility for reviewing all medications. Previous research has shown that high-risk prescribing in primary care is common and its prevalence varies substantially between practices (after adjusting for case-mix), which indicates scope for improvement.[5–8] Given the current UK policy focus on improving patient safety, there is a need to develop and test interventions to reduce high-risk prescribing.[9 10]

In the UK, the virtually ubiquitous use of electronic medical records (EMRs) in primary care offers opportunities to support quality and safety improvement initiatives. For example, the PINCER (Pharmacist-led Information Technology Intervention for Medication Errors) trial has demonstrated the effectiveness of an intervention, where pharmacists identified patients with high-risk prescribing using data extracted from EMRs, reviewed their records and recommended changes.[11] Similarly, the 'Data-driven quality improvement in primary care' (DQIP) research programme aims to identify patients with high-risk prescribing from EMRs, but in contrast to PINCER, practices are provided with continuous feedback using a web-based informatics tool and financial incentives to motivate practice staff to review patients identified.[12]

The Medical Research Council (MRC) framework recommends that complex interventions be modelled before evaluation in a randomised controlled trial in order to optimise the intervention design and its evaluation by defining outcomes and ensuring feasibility.[13 14] In terms of intervention design, the broad shape of the DQIP intervention was defined by the intention that there should be evidence for the effectiveness of its components, that it should be built on existing National Health Service (NHS) information technology and be implementable as an 'enhanced service' (a UK National Health Service mechanism for commissioning general practice care). The intention was therefore to combine an educational intervention,[15 16] audit and feedback,[17] and a financial incentive to review. As a result, a priority was to pilot and optimise these elements in a small number of practices. For evaluating the impact of the intervention, a set of potential prescribing outcome measures had previously been validated using consensus methods[5] but an outstanding question was which of these measures could plausibly be improved by this intervention and therefore used as trial outcome measures.

The specific objectives of this study were to optimise the DQIP intervention and trial evaluation by: (1) identifying which potential outcome measures best identified patients with high-risk prescribing that could potentially be changed; (2) establishing which measures were most valued by practices in terms of improving quality and safety; (3) exploring how best to design and deliver the educational, informatics and financial components of the DQIP intervention to maximise the practice engagement.

METHODS
Settings
We purposively sampled and recruited four general practices, two from each NHS Scotland Health Board where the intervention was to be trialled, aiming to include larger and smaller practices serving populations that varied in socioeconomic deprivation.

Data collection
Data collection was between March 2010 and August 2011.

Quantitative data
In each practice, thematically related prescribing measures ('prescribing topics') that had been identified as priorities for quality and safety improvement[5] were implemented in EMRs to identify patients with potentially suboptimal prescribing for review. These prescribing topics were: (1) high-risk use of non-steroidal anti-inflammatory drugs (NSAIDs) and antiplatelets in patients with gastrointestinal, renal or cardiac risk factors ('NSAIDs and antiplatelets'); (2) underuse of inhaled corticosteroids and high-risk use of β-blockers in asthma ('asthma control') and (3) overuse and underuse of antithrombotic drugs in atrial fibrillation (AF) ('antithrombotics in AF').

Practices received a feedback report for each topic, which summarised the total numbers of patients identified by each measure of high-risk prescribing, listed the patients affected and provided supporting educational material (rationale, current evidence and prescribing guidance).[18] Practices were asked to conduct a record review of all identified patients with face-to-face review if necessary, and to document all decision-making on a structured template (tick boxes for a decision to 'change prescribing', conduct 'further investigation' or 'no action' and free text space to specify the rationale for 'no action'). Our expectation was that clinicians would judge some high-risk prescribing to be appropriate but would identify other patients in whom the prescribing should be stopped. An important aim of the pilot was to estimate how appropriateness and stopping varied across topics, to allow the trial to target prescribing that was more likely to be inappropriate and changeable.

Qualitative data
An initial meeting to explain the study and describe the topics was held in each practice. Practices then worked on one topic at a time, with further meetings held 6–8 weeks after practices had received and acted on the feedback report. The meetings were facilitated by the pharmacist (TD), and observed by AMG who took ethnographical field notes of 18 h of meetings. The whole practice was invited but the meetings were generally attended by the GP(s) most involved and the practice manager and lasted between 30 and 60 min. At these meetings, practices were asked to describe the practice processes to conduct the review work, to report on the complexities of reviewing or changing prescribing and to expand on reasons for 'no action'.

The GPs most involved in the review work and practice managers were invited for individual semistructured interviews in order to explore their perceptions of the value of each prescribing topic and the specific components of the intervention (education, informatics and financial), their experiences of adopting and implementing the intervention in routine practice and to changing prescribing. Eleven interviews were conducted with eight GPs (one GP was interviewed twice) and two practice managers. These interviews were held in the

practices, lasted approximately 1 h, were audiorecorded and transcribed verbatim.

Data analysis

Quantitative analysis (research question (RQ) 1: performance of prescribing measures)

The ability of each measure to identify potentially changeable high-risk prescribing was measured as the proportion of patients reviewed whose prescribing was judged to require action ('change prescribing' or 'further investigation'). Reasons why the measures failed to identify potentially changeable high-risk prescribing in patients were classified into three categories: 'clinical' (prescribing changes were deemed inappropriate or unnecessary given the clinical circumstances), 'technical' (the measure misidentified patients when implemented in live clinical data) and 'other'.

Qualitative analysis (RQ2 perceived value of each prescribing topic and RQ3 optimising intervention components)

Interview transcripts and field notes were merged and analysed by emerging themes to identify a coding frame. Data were imported into Nvivo-8 and the coding frame was systematically applied. Subsequent analysis was by the framework technique.[19] Thematic charting facilitated comparing the data by theme, practice and prescribing topic. The data were explored for negative cases.

RESULTS

Practice list-sizes ranged from 3200 to over 10 000, with the percentage of patients living in the most deprived quintile of postcodes ranging from 4% to 46%. All four practices completed the 'NSAID and antiplatelet' and 'asthma control' topics, but only three completed the 'antithrombotics in AF' topic.

Ability of measures to identify patients with potentially changeable high-risk prescribing

Table 1 shows that for the 'NSAID and antiplatelet' topic, practices recorded a need for action in 68% of patients reviewed (change prescribing 35%; further investigation 33%) compared with only 25% of patients reviewed for the 'asthma control' topic (change prescribing 7%; further investigation 18%) and 18% of those reviewed for 'antithrombotics in AF' (change prescribing 1%; further investigation 17%).

Table 2 shows the rationales for no action reported by GPs on templates for each patient reviewed. *Clinical reasons* were most commonly reported for the 'NSAIDs and antiplatelets' topic (67%), but less so for the 'antithrombotics in AF' (36%) and much less for the 'asthma control' (4%) topic. The reasons provided reflected that high-risk prescribing was a trade-off between effectiveness and safety. For 'NSAIDs and antiplatelets', the main reported reason for not changing prescribing was that NSAID use was only 'short term'. For 'antithrombotics

Table 1 Review decisions made by topic

Topic/individual measures implemented (number of reviews)	Number of times the following decisions were made at point of review		
	Change medication	Further investigation	No action
1 NSAIDS and antiplatelets (n=290)	101 (35%)	97 (33%)	92 (32%)
1.1 High-risk use in patients with GI risk factors (n=120)*,†	54 (45%)	21 (18%)	45 (38%)
1.2 High-risk use of NSAIDs in patients with renal risk factors (n=161)‡	44 (27%)	72 (45%)	45 (28%)
1.3 High-risk use of NSAIDs in heart failure (n=9)	3 (33%)	4 (44%)	2 (22%)
2. Asthma (n=148)	10 (7%)	26 (18%)	112 (76%)
2.1 Underuse of inhaled corticosteroids (n=130)§	7 (5%)	23 (18%)	100 (77%)
2.2 High-risk use of β-blockers (n=18)¶	3 (17%)	3 (17%)	12 (67%)
3. Atrial fibrillation (n=201)	3 (1%)	34 (17%)	164 (82%)
3.1 Underuse/low intensity of thromboembolic prophylaxis (n=178)	1 (1%)	34 (19%)	143 (80%)
3.2 High-risk use of oral anticoagulants (n=23)	2 (9%)	0 (0%)	21 (91%)

The data reported on topics 1 (NSAID and antiplatelet) and 2 (asthma) measures are from all four practices and the topic 3 (atrial fibrillation) data are from three of the pilot practices.
*NSAID prescription (in previous 12 weeks) without GI protection to people with at least one of the following risk factors: (i) history of peptic ulcer, (ii) aged ≥75, (iii) aged ≥65 and on aspirin, (iv) aged ≥65 and on warfarin.
†Aspirin prescription (in previous 12 weeks) without GI protection to people with at least one of the following risk factors: (i) history of peptic ulcer, (ii) aged ≥65 and on clopidogrel, (iii) aged ≥65 and on warfarin.
‡NSAID prescription to people with at least one of the following risk factors: (i) CKD stages 3–5, (ii) on ACEI/ARB, (iii) on diuretic, (iv) on combination of ACEI/ARB and diuretic.
§No prescription of inhaled corticosteroid (in previous 12 weeks) in patient with asthma and at least one of the following risk factors: (i) prescription for three or more SABA inhalers in previous 12 weeks, (ii) prescription of LABAs, leukotriene receptor antagonist, theophylline or oral prednisolone in previous 12 weeks.
¶Prescription of any β-blocker if 'active asthma' (prescription of a SABA inhaler in previous 48 weeks) or prescription of a non-cardioselective β-blocker if 'previous asthma' (no prescription of a SABA inhaler in the previous 48 weeks).
ACEI/ARB, ACE inhibitors/angiotensin receptor blocker; CKD, chronic kidney disease; GI, gastrointestinal; LABAs, long-acting β2-agonists; NSAIDs, non-steroidal anti-inflammatory drugs; SABA, short acting β agonists.

in AF', clinical reasons reported were mainly 'unfitness for warfarin' (examples reported in interview included fragility and dementia, heavy alcohol use and previous gastrointestinal bleeding), but also included 'paroxysmal AF' (reflecting a misconception that stroke risk is lower than for patients with chronic AF).[20]

'Technical reasons' accounted for one-third of rationales for no action for the 'NSAID and antiplatelet' topic, and for 47% 'asthma control' and 48% of the 'antithrombotics in AF' topics. For all three topics, technical reasons related to patients no longer being on practice registers and to situations where identified high-

risk prescribing was no longer present at the point of review ('time window of assessment'). For example, for the 'antithrombotics in AF' topic, all practices highlighted in interviews that anticoagulant prescribing intervals often exceeded the 12-week timeframe used by the measures, causing patients to be incorrectly identified as lacking antithrombotic prophylaxis.

Inaccurate disease registers were reported as reasons why 'antithrombotics in AF' and 'asthma control' measures misidentified prescribing as high risk. One practice reported in interview that many patients on their asthma disease register had chronic obstructive pulmonary

Table 2 Reasons stated by clinicians as to why 'no action' was required for patients identified with drug therapy risk(s) by the DQIP measures

Topic (number of reviews)	Number of reviews where stated reason for 'no action' was*		
	'Technical' (count, %) specific reasons (count)	'Clinical' specific reasons (count)	'Other' specific reasons (count)
1. NSAIDS and antiplatelets (n=92)	30 (33%)	62 (67%)	0
1.1 High-risk use in patients with GI risk factors (n=45)	10 (22%) Patient no longer on practice register (5); time window of assessment (3†); disease coding error (2)	35 (78%) Short-term use (21); risk adequately mitigated by low-dose misoprostol (5); high-risk drug 'well tolerated' (9); no effective alternative (5)	0
1.2 High-risk use of NSAIDs in patients with renal risk factors (n=45)	20 (44%) Time window of assessment (15†); patient no longer on practice register (5)	20 (44%) Short-term use (19); no effective alternative (1)	5 (11%) Unspecified (5‡)
1.3 High-risk use of NSAIDs in heart failure (n=2)	0	2 (100%) Short-term use (2)	0
2. Asthma (n=112)	53 (47%)	5 (4%)	54 (48%)
2.1 Underuse of inhaled corticosteroids (n=100)	46 (46%) Time window of assessment (21†); proxies for moderate/ severe asthma failed (13§); disease coding error (10); patient no longer on practice register (2)	0	54 (54%) Needs review but does not attend clinic (29); recently reviewed for QOF (22); patient choice (3)
2.2 High-risk use of β-blockers (n=12)	7 (58%) Disease coding error (7)	5 (42%) β-blocker 'well tolerated' (5)	0
3 AF (n=166)	80 (48%)	59 (36%)	27 (16%)
3.1 Underuse/low intensity of thromboembolic prophylaxis (n=143)	78 (55%) Disease coding error (31); time window of assessment (29†); patient no longer on practice register (18)	42 (29%) Not 'fit' for warfarin (30); paroxysmal AF (7); satisfactory rate control (5)	23 (16%) Patient choice (16); secondary care decision (3); unspecified (4)
3.2 High-risk use of oral anticoagulants (n=21)	2 (10%) Disease coding error (2)	17 (81%) CHADS₂ score judged to underestimate risk (17)	2 (10%) Secondary care decision (2)

*The number of specific reasons may exceed the number of reviews when more than one reason was provided per review.
†Refers to situations where a drug that was identified by the searches as 'high-risk' was stopped or a drug identified as 'beneficial' was prescribed between the search date and the review date.
‡The reasons provided referred to coexisting gastrointestinal risk factors.
§The proxies for moderate-to-severe asthma (>3 prescriptions of short-acting β agonists issued over the past 12 weeks; prescription of step 3 drugs) failed in these cases, because patients had mild asthma but were stock-piling inhalers (eg, getting them to have available in multiple locations) or using step 3 drugs for indications other than asthma.
AF, atrial fibrillation; CHADS2, Additive stroke risk score (Cardiac failure (1), Hypertension (1), Age≥75 (1), Diabetes (1), Stroke (2)); DQIP, data-driven quality improvement in primary care; GI, gastrointestinal; NSAIDs, non-steroidal anti-inflammatory drugs; QOF, quality and outcomes framework.

disease and therefore did not have a clear indication for treatment with inhaled corticosteroids. The deprived practices reported that high numbers of short-acting β-agonist prescriptions did not necessarily identify patients with uncontrolled asthma, because patients stockpiled inhalers in multiple locations (eg, home, school or work).

'Other' reasons were not commonly identified for 'NSAIDs and antiplatelets', but accounted for 16% of 'antithrombotics in AF' and for 48% of 'asthma control' reviews where no action was taken. For the latter, GPs reported that patients had recently received an annual quality and outcomes framework (QOF) review, usually from a nurse, and they therefore assumed them to be on optimised asthma treatment. GPs generally felt that changes in prescribing for asthma usually required face-to-face review but patients often did not respond to invitations for review.

Perceived value of each prescribing topic as a target for the DQIP intervention

GPs perceived the pilot intervention-raised awareness of targeted high-risk prescribing, improved prescribing practices and the recording of decision-making rationales, but they did not value each topic equally.

improving prescribing practice, improving our record keeping, improving our knowledge base and if people are on unsafe meds getting them off them and if there are on them carefully considering why and it is not accidental. (GP interview 1)

All GPs interviewed highly valued the process of reviewing patients identified as receiving *high-risk NSAID or antiplatelet* prescriptions.

The topic is, I would go so far as to say, essential. I don't even think you can say it's urgent. It's essential that practices are doing this. They could be killing patients totally unnecessarily and it's not as if it's difficult, because in a lot of circumstances, the vast majority of them are non-steroidals in elderly people. (GP interview 7)

The GPs interviewed perceived that NSAIDs are sometimes initiated with the intention the prescription was a one-off or without full consideration of all risk factors.

I've always thought I've been quite cautious with NSAIDs but then again possibly some of these patients were mine. You know they have been started on NSAID despite them being on ACE inhibitor and a diuretic and you think oh god, that's incredibly embarrassing. (GP interview 6).

Where risk factors were missed or NSAIDs were prescribed for longer than intended, GPs valued a prompt to review. In the interviews, GPs reported changes to the NSAID and antiplatelet prescribing were the least complex decision-making of the topics, although all but one GP (who felt NSAIDs had 'no place' in pain control

and patients should have no choice in whether to use these drugs) highlighted that it is sometimes complicated by patient's choice.

You know it is a compromise—patients like them [NSAIDs] because they're effective, whatever anybody says without a shadow of doubt people with osteoarthritis find them very effective drugs and often find them far more effective … for pain relief and symptom relief in total … than any other medication we've got to give them. (GP Interview 9)

Although the 'antithrombotics in AF' measures led to limited changes in prescribing (3 changes from 201 reviews), two practices perceived the work to be worthwhile and for one it was their most valued prescribing topic, because two patients and the practice were relieved from the burden of unnecessary warfarin therapy. Two practices felt that AF decision-making was often in the hands of consultants, and all GPs reported seeking advice from secondary care regarding the need to initiate or continue warfarin in specific patients. Although GPs reported the notes review work for AF was the most complex, they found validating warfarin prescribing a reassuring process.

the non-steroidal one was great. The atrial fibrillation one was great for a different matter, because [although] you identified quite a lot of patients, at the end of the day, when we looked through them, [we] only identified one that we wanted to chase up. (GP interview 7)

The 'asthma control' topic was perceived as the least important by all GPs, mainly because of overlap with measures in QOF,[21] and because they shared responsibility with practice nurses and were content to leave the decision-making to them.

I think sometimes we could use the nurses to do some of it…in the future when we do that we would ask our nurse that does the asthma clinic to do that because that would, you know she's the one that's doing the prescribing so that would've been better for her to take control of that. (GP interview 9)

Optimising the intervention
Practice experiences identified some barriers which facilitated optimising the intervention beyond suggestions in the current literature on changing prescribing.

Facilitating engagement
GPs felt prescribing safety was important but that improvement was always in the context of busy workloads. A financial incentive to review was perceived as important to facilitate engagement and to encourage practices to participate in the trial. GPs were asked about how any financial incentive should be structured, and different balances between up-front payments and payment-per-review were discussed. Of the options offered, all GPs and practice managers interviewed were

in agreement that £350 (€411, US$538) upfront and £15 (€18, US$23) per review best struck the balance between gaining attention and incentivising payment-per-review.

> I think £350 up front and £15 per review. The reason for this is that the work is very much about the review and if you pay up-front too much, there is a danger the reviews won't get done as the incentive is small. In fact up-front payment could be less, with more per review, provided you have a mechanism for checking the review has been done properly. (GP Interview 7)

This payment structure mirrors the existing financial incentives for quality in use in the UK general practice, either in the QOF (an explicit pay for performance system) or in enhanced service contracts for work not covered by capitation.[22]

Maintaining engagement
Two practices struggled to embed the work within practice routines and expressed the concern that DQIP work could be sidelined by competing work pressures. In addition to the pay-per-review financial incentive, it was therefore decided that practices should receive regular updates on their progress (or lack of progress) via DQIP newsletters. It was anticipated that to maintain engagement, unnecessary reviews had to be minimised. This led to a change in how patients were identified so that patients whose high-risk prescribing had been reviewed and deemed appropriate would not be reflagged for review for the same type of high-risk prescribing in the next year.

Sustaining improved prescribing
All GPs interviewed valued the data but felt high-risk NSAID prescribing required regular review. GPs perceived this was the prescribing topic where prescribing was likely to be restarted because of continuing patient's demand for analgesia and restarting by other doctors.

> I think, it will always be very difficult, you will always get colleagues that will go back to prescribing it again and what was interesting was when you were re-running the searches, what was actually happening with that. Looking at what we were doing, because sometimes Dr X would say, 'Crikey look at that! (Practice manager interview 2)

It was decided that the DQIP informatics tool would need to reflag patients for review, where high-risk prescribing was restarted after a decision to stop, and provide run charts to allow practices to monitor high-risk prescribing trends over time.

DISCUSSION
Summary of main findings
All topics examined in this study had previously been identified as priorities for improvement in primary care.[5] GP review of the targeted prescribing revealed that measures for each topic varied in their ability to identify changeable high-risk prescribing and in their perceived importance. The NSAID and antiplatelet measures performed the best in identifying potentially changeable high-risk prescribing (68% of patients required action vs 25% for the 'asthma control' and 18% of 'antithrombotics in AF') and were the most valued. Although the 'antithrombotics in AF' topic generated considerable work for little change, it was highly valued by two practices because it identified a small number of patients who could stop warfarin, which mattered given the treatment and monitoring burden this drug imposes on patients and practices. The asthma topic was the least valued due to overlaps with QOF reviews and technical problems in accurately identifying patients with poor asthma control from EMRs. These findings demonstrate the importance of testing potential outcome measures prior to trialling complex interventions in order to ensure they are changeable by the intervention to be evaluated.[23–25] Although practices mentioned improving prescribing safety was important, a number of barriers to engagement, maintenance of effort and sustaining improved prescribing were identified which informed the intervention design[24 26] and ensured sensitivity to practices' needs.[25] These barriers were addressed through financial incentives per patient reviewed, and the informatics component would provide continuous measurement and feedback, supplemented by monthly update newsletters.

Strengths and limitations
A strength of this study was the use of quantitative and qualitative methods to give a broader understanding of how changeable this high-risk prescribing was, what the barriers to changing prescribing were and how GPs valued this work, which enabled informed choice of outcome measures and optimisation of the intervention.[24 26 27] In addition, the findings supported the design of the trial process evaluation[28 29] along with the main trial design. The main limitation of this study is that changeability of potential outcome measures was tested by measuring GPs' intention to change prescribing or conduct further investigation ('action'), rather than quantifying actual changes in prescribing and their clinical implications. This did, however, allow the identification of plausible high-risk prescribing to use as an outcome measure in the trial which will evaluate the ability of the intervention to actually change prescribing. It is worth noting that although the AF and asthma measures examined were found to be less suitable, this was partly because of technical problems of operationalising them in routine data, and optimising the technical properties of the measures (eg, by extending the time window for warfarin prescriptions in order to reduce the number of patients falsely identified as lacking antithrombotic prophylaxis) may improve their performance. A second limitation of this study was the small number of general practices and reviewing clinicians included, and the four practices involved were of course all

volunteers, who may not be representative of all practices. This is inevitable in small pilot studies though, and the main trial will evaluate the effectiveness in a wider range of practices with a parallel process evaluation to examine whether and how practices implement the intervention.

Comparison with existing literature

Although there are many examples of studies developing prescribing measures and establishing their face and content validity,[5] [30–33] few have reported the extent to which such measures can identify actual opportunities for improvement.[34] [35] A Dutch study found that patients identified by a measure-targeting underuse of inhaled corticosteroids in asthma (using prescriptions of short-acting β agonists as a proxy for uncontrolled asthma), 46% were candidates for inhaled steroids after a face-to-face review by a clinician, compared with 25% at best (assuming all 'further investigations' would confirm the need for inhaled steroids). The much lower proportion found here suggests that estimates of changeability are likely to be context specific (eg, depending on the accuracy of data sources used) and may also depend on the gold standard against which the performance of prescribing measures is compared. When selecting outcome measures for a trial, findings from previous studies conducted in different healthcare settings may therefore be of limited value.

Some of the prescribing measures evaluated here targeted prescribing patterns similar to those used as primary outcome measures in the PINCER trial.[11] At 6 months of follow-up, the PINCER trial found a significant reduction in β-blocker prescribing in asthma and NSAID prescribing (without use of gastroprotection in patients with a history of peptic ulcer).[36] However, part of the improvement in high-risk NSAID prescribing was lost by 12 months of follow-up, which is consistent with concerns expressed by GPs in this study that NSAIDs may be restarted due to patient demand or lack of communication between GPs. The DQIP trial and parallel process evaluations will establish to which extent the strategies used in the DQIP intervention to avoid such relapse (continuous feedback, paying per review and regular letters highlighting progress) is successful.

Our finding that changing prescribing of antithrombotics in AF is difficult to change is consistent with large surveys conducted over the last 10–15 years, demonstrating little improvement in the uptake of anticoagulants in patients with AF at high risk of stroke.[37–39] Similar to our study, a systematic review exploring barriers to prescribing anticoagulants for AF found that the main reasons not to prescribe anticoagulants were advanced patient's age and perceived risk of bleeding events.[40] A lower uptake of anticoagulants in paroxysmal AF has also previously been reported, consistent with GPs reporting paroxysmal AF as a reason not to prescribe AF in this study, although stroke risk is as high as in chronic AF.[37] This does not mean that such prescribing could not be improved, but may indicate that more attention would need to be paid to persuading GPs of the benefits and risks of antithrombotic use in people with AF, before interventions like this one which prompt review. For the 'Asthma control' topic, some of the interviewed GPs appeared to show complacency (eg, the assumption that if patients have had a QOF asthma review they would be on optimal treatment) and it is possible that where this is the case, then more intensive educational or change facilitating interventions may be required.

CONCLUSION

Although several studies using the RAND appropriateness method have identified sets of 'valid' indicators, their value and feasibility for change is not usually assessed in terms of the extent to which they identify patients with actual inappropriate prescribing.[33] [41] This study shows their perceived value and feasibility may vary by prescribing topic,[34] [42] and any research or NHS use of prescribing indicators for improvement would therefore benefit from piloting and evaluation. Some prescribing topics, such as NSAIDs, may be suitable for low-intensity interventions based on repeated feedback using existing electronic data, simple education and possibly small financial incentives but other prescribing topics, such as 'asthma control' and 'antithrombotics in AF' may require prior work to clean electronic data and refine measures, or more intensive educational work to persuade practices what is being measured is important, or more intensive facilitation of change. Safer prescribing is an important aim for policy and commissioners, but there may not be a 'one size fits all' intervention to deliver it.

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