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Making primary care prescribing even safer for patients

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PINCER National Rollout

Progress Report to NHS England and the AHSN Network

July 2020

Prepared by the PRIMIS Team at the University of Nottingham, July 2020

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EXECUTIVE SUMMARY

Introduction

Medication errors in general practice are an important and expensive preventable cause of patient safety incidents associated with morbidity, hospitalisations and deaths. A large-scale 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.

We have developed and tested a pharmacist-led, IT-based intervention (PINCER) to reduce clinically important medication errors in primary care. PINCER involves searching GP clinical systems using computerised prescribing safety indicators to identify patients at risk from their prescriptions, and then acting to correct the problems with pharmacist support. Findings from the PINCER trial, published in the Lancet, demonstrated that PINCER is an effective method for reducing a range of clinically important and commonly made medication errors in primary care and is now incorporated into national guidelines to support medicines optimisation by the National Institute for Health and Care Excellence (NICE).

Prior to nationwide adoption, it is important to assess the effectiveness of any intervention in a large-scale rollout as the conditions in routine care may be different to those in the trial. To do this, we obtained funding from the Health Foundation and East Midlands Academic Health Science Network (AHSN) to evaluate the rollout of PINCER in 370 general practices (94%) across 12 East Midlands Clinical Commissioning Groups (CCGs) between 2015 and 2017. Findings from this evaluation showed a statistically significant reduction in hazardous prescribing with the greatest differences demonstrated for prescribing safety indicators associated with gastrointestinal bleeding. The findings from this study, coupled with further PINCER rollout work in Wessex AHSN, led to the inclusion of PINCER in the national AHSN innovation network programme.

Developing a replication model for the scale and spread of PINCER

Having successfully obtained further funding from the Health Foundation to work with Spring Impact, a non-profit global leader in social replication, the University of Nottingham PINCER Team (including PRIMIS), who led the development and testing of the PINCER intervention, has designed a replication model for PINCER for further scale up using a social franchise approach, whereby the University of Nottingham acts as “Franchisor” and the 15 AHSNs in

England act as “Franchisees”. The replication model includes an AHSN Year 1 Implementation Package, with options to extend for Years 2 and 3 comprising:

- Training and support services for AHSNs and CCGs.
- Access to the National PINCER indicators.
- Access to a comparative analysis service for PINCER (CHART Online comparative analysis service).
- Tools to support AHSN reporting requirements and metrics.
- National communication and promotion of the PINCER intervention.

Since 2018, PRIMIS has been working with Medicines Optimisation Leads from all 15 AHSNs in England to implement PINCER in their localities. As part of the national rollout, information on numbers of patients at risk of potentially hazardous prescribing based on the 13 PINCER prescribing safety indicators has contributed to a national comparative data service. This has provided the ability to monitor changes in numbers of at-risk patients across localities and on a national basis.

Changes in policy over time in relation to PINCER

In recent years, a number of policy changes have happened in England that have been helpful when discussing the place of PINCER with general practices and CCGs.

Firstly, and arguably most importantly, NHS England in early 2019 set out in its long-term plan a commitment for pharmacists to take on an expanded role at the heart of local Primary Care Networks (PCNs) across the country. The new GMS contract set out the ambition for every PCN to have access to a pharmacist. In essence, this ensured that there was a commitment to establishing and expanding the workforce in place capable of carrying out the PINCER intervention in collaboration with CCG teams.

In April 2019, the GMS contract encouraged general practices to “engage with their local AHSNs to use PINCER” as part of the quality improvement domain. Practices were incentivised to demonstrate continuous quality improvement in relation to prescribing safety. And whilst not exclusively directed to PINCER, the PINCER intervention was highlighted as an example: https://www.england.nhs.uk/wp-content/uploads/2019/05/gms-contract-qof-guidance-april-2019.pdf

In July 2019, NHS Improvement published their Patient Safety Strategy. It stated that in its first year, they would “enable case finding in primary care; for example, PINCER, a

pharmacist-led information technology intervention for reducing clinically important errors in general practice prescribing. This will support work to reduce prescribing error rates by 50%, improving safety and reducing costs. AHSN-supported national roll-out will reach at least 40% of general practices by 2020":
https://improvement.nhs.uk/documents/5472/190708_Patient_Safety_Strategy_for_website_v4.pdf

These national policy signals helped local conversations move away from "the data" and how to carry out the searches to more meaningful discussions about how to implement the PINCER intervention and how to replicate the results found in the original PINCER trial.

The purpose of this Progress Report is to give an overview of the first 18 months of the national rollout of PINCER to GP practices in England using a social franchise approach, present early findings in terms of impact, and provide insight into lessons learned from implementing a proven intervention at scale in the primary care setting.

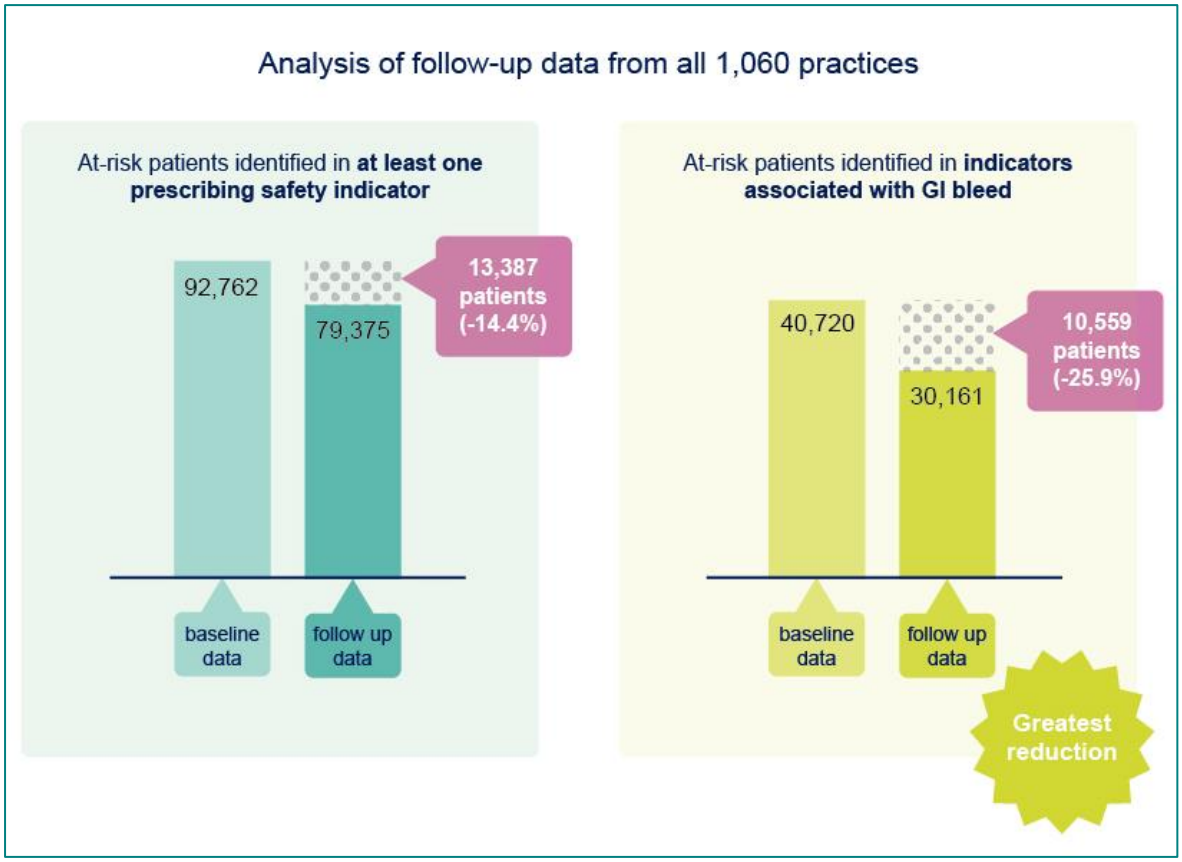
Summary of key findings

In terms of the scale and spread of PINCER, as of 3 April 2020, 130 (68%) CCGs in 14 AHSN localities have engaged in the PINCER rollout. A total of 2,430 general practices (of 7,131 general practices in England) have uploaded baseline data to the national PINCER comparative analysis service showing that a minimum of 23.35 million patient records have been searched to identify instances of potentially hazardous prescribing using 13 evidence-based prescribing safety indicators. In total, 187,534 at-risk patients have been identified in at least one prescribing safety indicator at baseline giving an overall prevalence of 8.03 patients at risk of medication error per 1,000 registered patients.

Of the 2,430 practices that have uploaded baseline data to CHART Online, almost half (1,060) have uploaded follow-up data on at least one occasion. These practices are located within 86 CCGs in 13 AHSN localities. The time between baseline and latest upload for these practices ranges from less than one month to 15.5 months with 916 (86.4%) practices uploading follow-up data at least three months post-baseline.

Analysis of follow-up data from all 1,060 practices shows a reduction in the absolute number of at-risk patients identified in at least one prescribing safety indicator of 13,387 patients (from 92,762 to 79,375 patients; -14.4%). Greatest reductions can be seen for those indicators associated with GI bleed which showed a decrease of 10,559 at-risk patients (from 40,720 to 30,161 patients; -25.9%). These findings are summarised below:

Summary of key findings



Over 1,138 pharmacists (of a total 1,622 individuals) have been trained to deliver the PINCER intervention through a combination of eLearning tools, online resources and face-to-face action learning set sessions. One interesting observation during training sessions is that GPs and pharmacists working in primary care report that these PINCER action learning sets are the first time they have ever done any QI or root cause analysis training. This in an important and worrying finding that warrants further exploration.

Factors for successful implementation of PINCER

The success to date of the national rollout of PINCER has been dependent on a number of factors, including contextual factors, such as NHS England setting out in its long-term plan for pharmacists to take on an expanded role at the heart of local Primary Care Networks. However, five key critical success factors are outlined below.

1. **Evidence-based intervention.** The fact that PINCER is an evidence-based intervention and was included in NICE guidance. The team that developed the intervention were integral to the design and implementation of the replication model and the fact that the

rollout was being led by the University of Nottingham gave added credibility, trust and confidence.

2. **Robust replication model.** The development of a robust replication model which was rigid enough to maintain fidelity to the PINCER intervention, but flexible enough to allow for adaptation for local implementation.
3. **Strong Leadership.** Strong leadership and unwavering support, both from within the PINCER team and from the AHSN Network, was critical in the early stages of the rollout. Building trusted, supportive relationships between PRIMIS, the AHSN Network, policy leads and the localities adopting PINCER, was critical to the success of the programme.
4. **PINCER training provision.** Provision of a comprehensive PINCER training programme using a QI approach, was key to the success of the rollout, both in terms of engaging and supporting primary care pharmacists to deliver the PINCER intervention, but also in terms of engaging AHSNs through the Train-the-Trainer programme.
5. **Local support ("PINCER champions").** The extent to which stakeholders engage with PINCER at different stages of implementation is a crucial factor for PINCER uptake, use and sustainability; as is securing agreement for the allocation of pharmacist resource. In keeping with the research findings, we encouraged the development of a network of "PINCER Champions", to increase levels of engagement and strategic direction at general practice, CCG and AHSN levels.

Challenges

There have been a number of challenges encountered at different stages of implementing PINCER nationally which the team have had to overcome. Key challenges and factors influencing the scale and pace of rollout are summarised below:

1. **Planning and preparation for national scale and spread.** There was a rapid shift from plans for a phased, national scaling over three years to a more rapid adoption of the PINCER intervention over a shorter period. Both the capacity and capability of the PINCER Team and the AHSN Network could perhaps have been reviewed and aligned to match this level of ambition.
2. **The setting of national AHSN targets.** AHSNs were set targets to meet by March 2019 (ahead of the planned rollout). These were based on uptake of the PINCER intervention in at least 40% of general practices within each AHSN territory. This provided a focus and urgency that was very helpful; yet in some instances it also induced behaviours that focused on the means (the target), at the expense of the end (sustainable change in practice).

3. **Ensuring a shared interpretation of the PINCER intervention.** There have been several iterations of the PINCER intervention spanning 15 years, leading to different interpretations of what the PINCER intervention actually comprises. National policy guidance referring to "PINCER or equivalent" raised questions about the "equivalence" of other primary care provider solutions. We recognise that "or equivalent" is driven by a legitimate desire to avoid "lock-in" to a single process innovation, and that it may not be possible for national policy to be specific. However, in the absence of a clear articulation by policy bodies of "equivalence", the result was that a number of adopter communities asserted that their existing processes were "equivalent" when this was not the case. Engaging with such communities was particularly challenging for the AHSNs.
4. **Return on Investment (ROI).** Some AHSNs had a need to develop ROI models as part of their CCG engagement activities. This is very different to the economic analysis that was done as part of the PINCER trial and was not something that the PINCER Team could provide. In some instances, this impacted on CCG ability to release resources for the implementation of PINCER. This was further confounded when PINCER was included in QOF with the perception that CCGs were supporting an initiative that GP practices could be rewarded for undertaking.
5. **Implementation of local solutions in two AHSN regions.** The early decision to implement PINCER using local solutions across the Health Innovation Network and North East and North Cumbria AHSNs, has led to the scale and spread of PINCER using the national model being limited to 13 AHSN localities and this is reflected in the data. However, the PINCER Team are supporting these two AHSNs on their local implementation of PINCER.

Lessons learned

Key lessons learned from the national rollout of PINCER are summarised below:

1. A clear commissioning pathway and agreed milestones and outcomes are required from the outset, with input from all stakeholders.
2. Whichever replication model is used for scale and spread of any intervention, it needs to be flexible to allow for local implementation. It also must be sensitive to the different histories, sets of beliefs and capabilities in the adopting localities.
3. Mechanisms need to be in place to systematically collect qualitative as well as quantitative outcome data.
4. Involvement of the academic team who developed and tested PINCER was crucial to the success of the rollout. Although the academic team were involved in the design of the intervention from the outset, the secondment of a member of the academic team to the

role of PINCER National Programme Manager, did not happen until August 2019, which was a year into the national rollout. Ideally, it would have been beneficial if this appointment had occurred sooner.

Recommendations:

1. There is a need to establish a National Strategic Advisory Group to set the longer-term strategy for the development and continued funding of PINCER. This will help ensure that PINCER retains a high profile within the national patient safety strategy.
2. As AHSN Network support for this work tapers off, there is a need to identify national champions for this work committed to ensuring that a supportive policy context for implementation continues and that the learning from implementation is fed back in order to inform further policy and guidance development.
3. Further work needs to be done to establish whether reducing the risk of medication error translates into actual reduction in non-elective admissions in these patient cohorts. The PINCER Team are currently undertaking an NIHR-funded programme of work to explore this in the East Midlands and opportunities to do this work also exist in localities such as Wessex AHSN where the majority of practices implemented PINCER.
4. The opportunity for PRIMIS to work with national NHS organisations and system suppliers to further improve the accessibility and reporting of the PINCER prescribing indicators to all GP practices in the UK should be provided.
5. The provision of QI training for GPs and pharmacists working in primary care should be increased.
6. Further consideration should be given to the wider use of social franchising as a method for scale and spread of innovation within the NHS setting.

Conclusions

PINCER has been widely implemented in general practices across England with reductions in hazardous prescribing, particularly for prescribing safety indicators associated with gastrointestinal bleeding. These early findings demonstrate the impact that PINCER is having in terms of making primary care prescribing even safer for patients and are comparable with findings from the original research study, which we have managed to replicate at scale and pace. The time between baseline and latest upload varies from less than one month to 15.5 months and we know from previous studies that it takes at least 6-12 months for the intervention to bed-in and for maximum impact to be seen. Therefore, we would expect to see even greater impact as the rollout progresses. It also needs to be noted that some AHSNs such as East Midlands AHSN started from a lower baseline prevalence of at-risk

patients than other AHSNs due to having implemented previous iterations of PINCER. The extent to which stakeholders engage with PINCER at different stages of implementation is a crucial factor for PINCER uptake, use and sustainability as is securing agreement for the allocation of pharmacist resource. The intervention is likely to be even more acceptable for wider use in general practice with increased access to adequate resources (particularly time for pharmacists and pharmacy technicians) and more information on the potential for PINCER to provide cost-savings through reductions in hospital admissions.

We now have commitment from the majority of AHSNs for continued rollout of PINCER during 2020 to 2021 and further training sessions are planned. To meet demand for training, we have developed a Train-the-Trainer model to enable AHSN Training Partners and PRIMIS Training Associates to deliver training on our behalf. In response to the COVID-19 pandemic, we have developed a suite of online resources and eLearning tools to enable online provision of training sessions. We continue to monitor the impact of PINCER, as increasing numbers of practices upload their follow-up data to the PINCER national comparative analysis service.

We have identified that in light of the creation of Primary Care Networks (PCNs), coupled with increasing numbers of pharmacists working within these networks, with continued funding PINCER has the potential to become fully embedded into everyday clinical practice in primary care. We have been working with Spring Impact and the Health Foundation to update our replication model in readiness for AHSN Network support tapering off post-March 2021 and look forward to working with national bodies to ensure that this important safety work is embedded in areas yet to take up the intervention, and that it is sustained long-term.

LIST OF ABBREVIATIONS

AHSN	Academic Health Science Network
AKI	Acute Kidney Injury
ALS	Action Learning Set
CCG	Clinical Commissioning Group
CDS	Clinical Decision Support
CHART	Care and Health Analysis in Real Time software
CHART Online	A data storage facility enabling comparative views of submitted practice data via the web, provided by PRIMIS
CSU	Commissioning Support Unit
DHSC	Department of Health and Social Care
DOAC	Direct Oral Anticoagulant
DPA	Data Processing Agreement
DPO	Data Protection Officer
GCP	Good Clinical Practice
GDPR	General Data Protection Regulation
GP	General Practice/Practitioner
IG	Information governance
MMT	Medicines Management Team
MO	Medicines Optimisation

NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NOAC	New oral anticoagulant drug
NSAID	Non-steroidal anti-inflammatory drug
PCN	Primary Care Network
PINCER	Pharmacist-led information technology intervention for reducing clinically important errors in medication management
PINCER Team	The team at the University of Nottingham (including PRIMIS) that led on the development and testing of the PINCER intervention
PPI	Proton pump inhibitor
PRIMIS	A specialist health informatics service of the University of Nottingham
PRoTeCT	Avoiding patient harm through the application of prescribing safety indicators in English general practices
QI	Quality Improvement
RAIDR	Rapid Actionable Insight Driving Reform
RCA	Root Cause Analysis
SMASH	Salford Medication Safety Dashboard
WHO	World Health Organisation

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1. INTRODUCTION

1.1. Background

Medication errors in general practice are an important and expensive preventable cause of safety incidents, illness, hospitalisations and deaths. Medication error, defined as: "a failure in the treatment process that leads to, or has the potential to lead to, harm to the patient"[1] is a significant quality and safety issue that is widely relevant to UK health care. A large-scale study in English general practices identified prescribing errors in 5% of prescription items, with one in 550 items containing a severe (potentially life threatening) error:[2] This equates to approximately 2 million serious prescribing errors in English general practices each year. Further studies have shown hazardous prescribing in general practices to be a contributory cause of around one in 25 hospital admissions,[3] with 12 drug groups identified as accounting for 80% of hospital admissions that are medication-related and preventable. Particular problems with three groups of drugs have been identified which are responsible for over a third of these admissions; anticoagulants, antiplatelets and non-steroidal anti-inflammatory drugs (which all cause gastrointestinal bleeding). An important implication from this study is that reducing hazardous prescribing (prescribing errors) in general practice associated with specific groups of drugs could prevent the majority of medication-related hospital admissions. The prescribing safety indicators that we have developed[4] are designed to address this issue.

Reducing the incidence of avoidable harm is an important priority for the NHS. A recent WHO-commissioned systematic review[5] set out to determine the frequency, burden and preventability of patient safety incidents in primary care, including nine systematic reviews and 100 primary studies. The review highlighted that there have been few large-scale robust studies of the seriousness and avoidability of harm in primary care. Based on existing studies, errors occur in around 2–3% of primary care encounters, and around one in 25 of these errors results in serious harm that has a substantial impact on patients' well-being. The World Health Organisation (WHO) has identified 'Medication Without Harm' as the theme for their third Global Patient Safety Challenge which aims to reduce severe avoidable medication-related harm by 50% globally in the next five years by targeting health care provider's behaviour, systems and practices of medication, medicines, and the public.[6] In response to this challenge, the Department of Health and Social Care (DHSC) commissioned a report on the prevalence and cost of medication errors which reported that an estimated 66 million potentially clinically significant errors occur per year, 71% of which are in primary care.[7] While the majority of these errors are spotted (and corrected) at the point of error, or do not threaten patient safety, a drastic reduction in the number of errors is now being called for. With preventable adverse drug events leading to a hospital admission estimated to cost

£83.7 million and to cause 627 deaths in England each year,[7] there is now, more than ever, the need to develop and implement interventions to reduce medication error associated with avoidable harm.

In response to the WHO challenge to reduce serious harm from medication errors, the NHS Business Services Authority produced a Medication Safety Dashboard drawing on the PINCER indicators for GI bleed and Acute Kidney Injury.[8] The system links prescribing data in primary care to hospital admissions to help the NHS monitor and prevent errors. Also, in response to this challenge, a Short Life Working Group was commissioned by the Secretary of State for Health and one of the main recommendations from this Group was for a national roll-out of PINCER.[9]

1.2. The PINCER intervention

To meet this goal, we have developed and tested a **p**harmacist-led, **I**T-based i**n**tervention to reduce **c**linically important medication **er**rors in primary care (**PINCER**) to reduce hazardous prescribing in general practices. Informed by the Medical Research Council's (MRC) framework for complex interventions,[10] the intervention takes account of human error theory[11] in considering the causes of medication errors in primary care and the approaches that are most likely to reduce error rates.[12] The intervention comprises three core elements:

1. Searching GP computer systems to identify patients at risk of potentially hazardous prescribing using a set of prescribing safety indicators.
2. Pharmacists, specifically trained to deliver the intervention, providing an educational outreach intervention where they meet with GPs and other practice staff to:
   - Discuss the search results and highlight the importance of the hazardous prescribing identified using brief educational materials.
   - Agree an action plan for reviewing patients identified as high risk and improving prescribing and medication monitoring systems using root cause analysis (RCA) to minimise future risk.
3. Pharmacists (and pharmacy technicians) working with, and supporting, general practice staff to implement the agreed action plan.

1.3. The PINCER Trial

The PINCER trial was developed as a randomised controlled study to test whether the PINCER intervention compared with simple feedback could reduce medication error rates within the primary-care setting. The trial involved at-risk patients in 72 general practices who

were being prescribed drugs that are commonly and consistently associated with medication errors, for instance NSAIDs and beta-blockers. Findings from the PINCER trial, published in the Lancet,[13] demonstrated that the PINCER intervention is an effective method for reducing a range of clinically important and commonly made medication errors in primary care. At six months' follow-up, the general practices receiving computerised feedback and pharmacist support had significantly fewer prescribing errors than those that received computerised feedback alone. For example, six months after the intervention the following changes were noted in two of the main outcome measures:

- 44% reduction in the proportion of patients with at least one medication monitoring error, e.g. failure to undertake essential blood tests.
- 29% reduction in the proportion of patients with at least one prescribing error, e.g. prescribing contraindicated medicines to patients.

Embedded qualitative work and analysis of process data demonstrated that both the pharmacists and GPs found the intervention to be acceptable and feasible and that GPs (and their teams) trusted the pharmacists to be able to address the important prescribing and monitoring problems identified.[14,15] This work also demonstrated support for the PINCER intervention from NHS managers. Economic analysis showed the cost-effectiveness of the intervention.[13,16] For example, taking all factors into account (such as the cost of the intervention balanced against reductions in hospital admissions) the analysis demonstrated an overall reduction in costs of £2,679 per practice and an increase in quality of life of patients (0.81 Quality Adjusted Life Years per practice).[16]

1.4. Updating the PINCER prescribing safety indicators and making them available to general practices in England

As a first step towards a rollout of the approach used in the PINCER trial, the Morbidity Information Query and Export Syntax (MIQUEST) computer queries used in the original PINCER trial were updated and made available to general practices in England through the PRIMIS PINCER Query Library Tool. The PINCER Tool was launched in February 2013, comprising eight of the 10 original PINCER indicators (Appendix 1) and was downloaded by over 2,400 practices across 199 CCGs (30% of all practices in England). To support the delivery of the tool, we created an updated version of the evidence-based summaries which provide the clinical evidence base underlying the prescribing safety indicators.

As part of our NIHR SPCR funded Patient Safety Toolkit Project,[17] we started to work with key stakeholders to roll PINCER out in other parts of the country by providing training and access to PINCER resources including Wessex AHSN and Northern Ireland.

We piloted the acceptability, technical feasibility, reliability, and validity of the PINCER 2 Query Library (Appendix 2) and CHART Online views in 15 GP practices in one CCG. In addition, both PINCER 1 and PINCER 2 Query Libraries were piloted in general practices across Wessex AHSN and in 20 general practices in Northern Ireland, with the view to potential further rollout. This involved developing training materials and delivering training sessions to GPs, pharmacists and practice staff in Belfast and Armagh, Northern Ireland (February 2014) and Wessex AHSN in June 2015.

As a result of this pilot and other work,[18] we developed a third set of prescribing safety indicators (Appendix 3) with enhanced CHART Online functionality for the Health Foundation-funded *Scaling Up PINCER* project in the East Midlands and created an updated version of the evidence-based summaries which were embedded in the CHART Online software.

1.5. Scaling Up PINCER in the East Midlands

Having demonstrated its effectiveness in a randomised controlled trial, we then assessed whether PINCER could be 'scaled up' with the same effect. With funding obtained from the Health Foundation (through their *Scaling Up Improvement* Programme) and East Midlands Academic Health Science Network (AHSN), PINCER was "scaled up" to 370 (94%) general practices across 12 East Midlands Clinical Commissioning Groups (CCGs) between September 2015 and April 2017 using an updated set of prescribing safety indicators (Appendix 3).[19] Findings from the evaluation of this rollout identified 22,105 instances of hazardous prescribing in a patient population of 2.97 million and demonstrated statistically significant reductions in numbers of at risk patients at six-months follow-up (17%), particularly in relation to prescribing safety indicators associated with risk of gastrointestinal bleeding (24%).[20] One of the key findings from our analysis was that these findings were maintained at 12 months post-implementation.

1.6. Further scale and spread of PINCER

Reducing the incidence of avoidable harm is an important priority for the NHS. A growing number of people have multi-morbidity where they are living with two or more long-term conditions. Due to being prescribed multiple therapies for their co-morbidities, patients are at

increased risk of healthcare safety failures including the types of prescribing errors identified and corrected by the PINCER intervention.

Although the PINCER intervention[13] was incorporated into national guidelines to support medicines optimisation by NICE[21] in 2015, nevertheless, we were aware that uptake across the NHS had been variable and may have lacked fidelity with important elements of the PINCER intervention.[22] For example in some parts of England we were aware that CCGs were not prepared to commit the pharmacist resource required for the intervention.

The further scale and spread of in intervention such as PINCER has the potential to benefit large numbers of patients in primary care. For example, even if only 10 patients per general practice have prescribing errors corrected, this would mean that almost 42,790 patients would benefit across England (if 60% of GP practices were to implement the intervention).

For this reason, having successfully obtained further funding from the Health Foundation to work with Spring Impact (a non-profit global leader in social replication), we designed a replication model for the national rollout of PINCER using a social franchising approach and as a result of this work, PINCER was identified as one of seven programmes for national rollout during 2018-2020 via the AHSN network: http://www.ahsnnetwork.com/about-academic-health-science-networks/national-programmes-priorities/. This has involved engaging CCGs, Primary Care Networks (PCNs) and general practices and providing training to pharmacists working in primary care to deliver the PINCER intervention.

1.7. Objectives of this report

The purpose of this Progress Report is to give an overview of the national rollout of PINCER to GP practices in England using a social franchise approach, present early findings in terms of impact, and provide insight into lessons learned from implementing a proven intervention at scale in the primary care setting.

2. THE NATIONAL PINCER PRESCRIBING SAFETY INDICATORS

The 13 National PINCER Indicators have been developed over a period of 15 years, with input from clinicians, academics, researchers, pharmacists, health informaticians and statisticians. They are based on 56 RAND approved prescribing safety indicators developed for the Royal College of General Practitioners (RCGP).[4] Members of the PINCER team conducted an E-Delphi exercise to identify potential harm and likelihood of hazardous prescribing for the 56 indicators and identified the most important indicators (in terms of severity and frequency) from this exercise. The team then worked with PRIMIS to turn these prescribing safety indicators into computerised queries.

The PINCER indicators have been designed to identify a limited number of patients at significant clinical risk associated with specific groups of drugs. However, using the principles of root cause analysis and engaging the general practices in quality improvement cycles, the pharmacists are able to identify and take corrective action for hazardous prescribing associated with other drug groups.

As highlighted earlier, there have been several iterations of the PINCER indicators (PINCER 1 is the original set used for the cluster randomised trial in 2012 and PINCER 3 is the updated set used for the Health Foundation *Scaling Up PINCER* project in 2015-2017). For the national rollout of PINCER, a combination of the two sets are being utilised, focusing on both prescribing and monitoring aspects of medication safety. These relate to the following serious harm outcomes:

- Gastrointestinal (GI) bleeding
- Acute exacerbation of asthma
- Stroke
- Heart failure
- Acute kidney injury

In previous iterations of PINCER, we have used the PINCER Query Library Tool to extract data on patients at risk of medication error so that corrective action can be taken to reduce hazardous prescribing. Findings from the evaluation of the Health Foundation *Scaling Up PINCER* Project demonstrated a need to streamline this data extraction process. In response to these findings, PRIMIS has replicated the PINCER prescribing safety indicators into the native GP clinical systems. Not only does this make it easier for pharmacists to identify at-risk patients, but they are also able to utilise the functions within the GP clinical systems that they are familiar with using.

A detailed description of the National PINCER prescribing safety indicators (including descriptions of the denominators as well as the numerators) is shown in Box 1. By implementing this national set of prescribing safety indicators we have been able to:

- Give assurance that the intervention is evidence-based.
- Utilise only those indicators found to be most effective in reducing hazardous prescribing through learning from past PINCER research studies and programmes of work.
- Limit the number of at-risk patients identified by the indicators to a manageable level.
- Ensure that all general practices are adhering to the same validated specification and thus provide data quality assurance; promoting consistency, and, when pulled together into a national database, enable meaningful comparisons to be made at practice, CCG and AHSN levels.

To support the delivery of the PINCER intervention, we created an updated version of the PINCER Evidence-Based Summaries Document for the 13 national PINCER prescribing safety indicators. This document presents a brief summary of the supporting research evidence for each indicator and highlights:

- The risk to patients
- Evidence that this pattern of prescribing is harmful
- Evidence for reducing risk for this cohort of patients
- Situations where this pattern of prescribing may be considered appropriate

A copy of this document is available to download from the PINCER Resource Centre on the PRIMIS website: https://www.nottingham.ac.uk/primis/index.aspx

This resource has been found to be very helpful for both PINCER trainers and PINCER pharmacists when discussing with GPs how to address the levels of risk identified by the PINCER searches.

Box 1. National PINCER prescribing safety indicators

QUERY	DESCRIPTION OF INDICATOR	GROUP AT RISK (DENOMINATOR)	GROUP EXPOSED TO HAZARDOUS PRESCRIBING (NUMERATOR)
	OUTCOME: GI BLEED		
A2	Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient aged ≥65 years	Patients aged ≥65 years without co-prescription of an ulcer-healing drug (PPI or H2 antagonist) in the 3 months leading up to the audit date	Patients prescribed an oral NSAID in the 3 months leading up to the audit date
B2	Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient with a history of peptic ulceration	Patients aged ≥18 years with a Read code for peptic ulcer or upper GI bleed at least 3 months before audit date and not prescribed an ulcer healing drug (PPI or H2 antagonist) within the 3 months leading up to the audit date	Patients prescribed an oral NSAID within the 3 months leading up to the audit date
B3	Prescription of an antiplatelet drug without co-prescription of an ulcer-healing drug, to a patient with a history of peptic ulceration	Patients aged ≥18 years with a Read code for peptic ulcer or GI bleed at least 3 months before audit date and not prescribed an ulcer healing drug (PPI or H2 antagonist) within the 3 months leading up to the audit date	Patients prescribed an antiplatelet drug (aspirin or clopidogrel or prasugrel or ticagrelor) within the 3 months leading up to the audit date
C2	Prescription of warfarin or DOAC in combination with an oral NSAID	Patients aged ≥18 years prescribed warfarin or a DOAC (apixaban or dabigatran or rivaroxaban or edoxaban) within the 3 months leading up to the audit date	Patients prescribed an oral NSAID within the 3 months leading up to the audit date
D2	Prescription of warfarin or DOAC and an antiplatelet drug in combination without co-prescription of an ulcer-healing drug	Patients aged ≥18 years prescribed warfarin or DOAC without co-prescription of ulcer-healing drug (PPI or H2 antagonist) within the 3 months leading up to the audit date	Patients prescribed an antiplatelet drug (aspirin or clopidogrel or prasugrel or ticagrelor) within the 3 months leading up to the audit date and within 28 days of the warfarin/ DOAC prescription
E2	Prescription of aspirin in combination with another antiplatelet drug (without co-prescription of an ulcer-healing drug)	Patients aged ≥18 years prescribed aspirin without co-prescription of ulcer-healing drug (PPI or H2 antagonist) within the 3 months leading up to the audit date	Patients prescribed another antiplatelet drug (clopidogrel or prasugrel or ticagrelor) within the 3 months leading up to the audit date and within 28 days of the aspirin prescription
	OUTCOME: HEART FAILURE		
F2	Prescription of an oral NSAID to a patient with heart failure	Patients aged ≥18 years who have a diagnosis of heart failure at least 3 months before the audit date	Patients prescribed an oral NSAID within the 3 months leading up to the audit date
	OUTCOME: ACUTE KIDNEY INJURY		
G2	Prescription of an oral NSAID to a patient with eGFR <45	Patients aged ≥18 years with chronic renal failure: eGFR <45 at least 3 months before the audit date	Patients prescribed an oral NSAID within the 3 months leading up to the audit date
	OUTCOME: EXACERBATION OF ASTHMA		
H2	Prescription of a non-selective beta-blocker to a patient with asthma	Patients aged ≥18 years with a Read code for asthma at least 3 months before audit date and no subsequent asthma resolved code during that time period	Patients prescribed a non-selective β-blocker within the 3 months leading up to the audit date

QUERY	DESCRIPTION OF INDICATOR	GROUP AT RISK (DENOMINATOR)	GROUP EXPOSED TO HAZARDOUS MONITORING (NUMERATOR)
	OUTCOME: MONITORING INDICATORS		
I2	Patients aged 75 years and older who have been prescribed an angiotensin converting enzyme (ACE) inhibitor or a loop diuretic long term who have not had a computer-recorded check of their renal function and electrolytes in the previous 15 months	Patients aged ≥75 years prescribed an ACE inhibitor or a loop diuretic long-term i.e. first prescription for an ACE inhibitor or a loop diuretic at least 15 months prior to the audit date and at least one prescription (for the same drug) in the 6 months leading up to the audit date	Patients who have not had a computer-recorded check of their renal function and electrolytes within the previous 15 months leading up to the audit date
J2 **J3**	Patients receiving methotrexate for at least 3 months who have not had a recorded: • Full blood count (FBC) within the previous 3 months • Liver function test (LFT) within the previous 3 months	Patients aged ≥18 years with one or more prescriptions for methotrexate 3 to 6 months prior to the audit date and in the 3 months leading up to the audit date	**J2.** Patients who have not had a computer-recorded FBC within the 3 months leading up to the audit date **J3.** Patients who had not had a computer-recorded LFT within the 3 months leading up to the audit date
K2	Patients receiving lithium for at least 3 months who have not had a recorded check of their lithium concentrations in the previous 3 months	Patients aged ≥18 years with one or more prescriptions for lithium recorded on computer 3 to 6 months prior to the audit date and in the 3 months leading up to the audit date	Patients who have not had a computer-recorded lithium level within the 3 months leading up to the audit date
L2	Patients receiving amiodarone for at least 6 months who have not had a thyroid function test (TFT) within the previous 6 months	Patients aged ≥18 years with one or more prescriptions for amiodarone 6 to 12 months prior to the audit date and in the 6 months leading up to the audit date	Patients who have not had a computer-recorded TFT within the 6 months leading up to the audit date

2.1. Data specification for the National PINCER Indicators

PRIMIS is responsible for maintaining the data specification for the national PINCER indicators. The specification documents the codes and logical business rules that define each of the indicators. The specification is written in tri-terminology (Read Version 2, Clinical Terms Version 3 and SNOMED CT). It is updated twice-yearly when UK Terminology (NHS Digital) releases new codes. Suppliers seeking to implement the National PINCER Indicators should contact the PINCER Team.

2.2. Options for deploying the National PINCER Indicators

PRIMIS has translated the specification into searches that can be used with each of the GP clinical systems used in England. The searches produce reports in the form of lists of patients potentially at risk of hazardous prescribing for each of the 13 indicators. Practices and pharmacists will be familiar with the search and reporting functions of the GP clinical systems, and other functionality inherent in the system designed to help manage patient care. The searches are freely available from the PINCER Team.

PRIMIS has undertaken a Clinical Safety Case of the PINCER searches (that it has developed) and has concluded that they are safe for deployment. A report outlining the details and outcome of the Clinical Safety Case has been made available to each AHSN PINCER Coordinator.

Alternatively where there has been a software solution in use within a locality in which the National PINCER indicators can be deployed, thereby avoiding the use of the system searches, PRIMIS has worked with suppliers and other interested stakeholders for the purposes of implementing the PINCER national prescribing safety indicators in their software solutions (see Section 2.3).

2.3. Working with third-party suppliers

PRIMIS is responsible for managing and maintaining the National PINCER Data Specification and for making the indicators freely available (in the form of GP system searches and queries) to any practice in England participating in the national rollout of PINCER.

The University of Nottingham has licensed the National PINCER Data Specification to the following partners for the purposes of implementing the PINCER national prescribing safety indicators via their own software (Box 2).

Box 2. List of third-party suppliers licensed to have the National PINCER Data Specification in their own software

	Licensed to use the National Data Specification (until Mar 2021)	For implementation within a decision support tool	For implementation within a data extraction and reporting tool	Successful validation performed	Partner is contributing data to the PINCER Chart Online National Comparative Analysis Service
North of England CSU	✓		✓	pending	✓
First DataBank Optimise Rx	✓	✓			
First DataBank Analyse Rx	✓	✓			
University of Manchester SMASH	✓		✓	pending	✓
Primary Care Pathways	✓	✓			

2.4. Patient identifiable data

The PINCER intervention involves searching GP clinical information systems to identify patients at risk of potentially hazardous prescribing using a set of prescribing safety indicators. Although the indicators can be run using different technical solutions, the output is the same: the generation of a list of patients potentially at risk of hazardous prescribing across each of the 13 indicators. This output, which remains within the GP practice, contains identifiable patient data.

With the permission of the practice, a pharmacist specifically trained in the PINCER intervention reviews the medical records of the patients identified as being potentially at risk. Review of the patient medical record is required to confirm whether the patient is genuinely at risk as well as enable the examination of the probable root cause of the risk.

Recommendations on the use of patient identifiable data for the PINCER intervention:

- Patient identifiable data should never be removed from the practice.

- The pharmacist should gain permission of the practice to review the patient lists, including access to the relevant patient medical records.
- It is best practice for the pharmacist to be allocated their own credentials for use with the GP clinical information system so that there is a full audit trail of activity.
- The pharmacist and practice should agree where the PINCER documentation is to be stored (patient lists, notes, action plans and so on).

2.5. Intellectual Property

All intellectual property rights for the national PINCER Data Specification, PINCER intervention and national PINCER prescribing safety indicators belong to the University of Nottingham.

3. PINCER NATIONAL COMPARATIVE ANALYSIS SERVICE

The provision of a comparative analysis service has been extremely valuable for past PINCER research projects and programmes of work. This has enabled pharmacists, MMTs and general practices to access practice level aggregate data for numbers of patients identified as being at risk of hazardous prescribing, thus enabling localities compare their various levels of risk and therefore prioritise areas for improvement and providing the impetus for change and evaluate the impact of the PINCER implementation. This chapter provides a brief overview of the PINCER Chart Online comparative analysis service and associated governance systems and processes.

Practice summative data is securely transferred to the CHART Online comparative analysis service data facility. CHART Online is a data storage facility allowing comparative views and downloadable reports of submitted data via the web. The facility enables general practices, pharmacists and named individuals at Primary Care Networks (PCNs) and CCGs to access comparative views via the web, including time-trended analyses. The facility also generates average numbers of at-risk patients for CCGs and AHSNs across each of the indicators, and over time, can generate a national picture of medication safety. The key benefit of a national medication safety database is the ability to monitor changes in numbers of at-risk patients across localities and on a national basis.

Anyone involved in the implementation of PINCER can access the CHART Online comparative analysis service data facility provided. However, different levels of access are provided depending on the end user. Once in the CHART Online comparative analysis service, the following data will be on view (Box 3). Further details can be found in Appendix 4.

Box 3. Levels of Access for PINCER Chart Online comparative analysis service

Level of access	Individual or Organisation
Named AHSN level data	All
Named CCG level data	All
Named PCN level data	Only GP practice staff and pharmacists employed by the relevant PCN/CCG only
Named GP practice level data	Only GP practice staff and pharmacists employed by the relevant CCG only
Anonymised GP practice level data	PRIMIS staff and anyone with a legitimate link to the PINCER intervention in that locality

3.1. Sharing practice aggregate data

For the purpose of implementing PINCER, it is proposed that practice data is shared with PRIMIS on a minimum of three occasions; after the first searches have been run in the practice so that baseline data can be captured and approximately six-months later (or whenever is practicable in terms of the practice action plan/QI cycle) and thereafter every 12 months, so that improvements against the baseline data can be measured and demonstrated. Pharmacists and practices also use the practice aggregate data to prioritise areas for improvement and provide the impetus for change.

Only aggregate data are sent to the CHART Online comparative analysis service: not patient level data. For each of the indicators, the follow data are shared:

- Number of patients in each denominator
- Number of patients in each numerator
- Date the system searches were run
- Date the data was shared with the CHART Online comparative analysis service
- Version of the GP clinical information system searches used to generate the data
- GP practice national ID
- Practice list size

PRIMIS undertakes a variety of procedures to ensure that patient and practice confidentiality is safeguarded. This includes exercising strict controls over:

- Receipt of data and access to the database
- The level of aggregation in analyses
- The content and distribution of reports to users of the service
- The content of reports placed in the public domain

The processing of practice aggregate data is governed by a Data Processing Agreement (DPA).

3.2. Data Processing Agreement (DPA)

The PINCER Team has prepared a Data Processing Agreement (DPA) for use with each of the participating practices. PINCER involves the processing of practice aggregate data by PRIMIS, hence the practice acts as the Data Controller and PRIMIS acts as the Data

Processor. As the Data Processor, PRIMIS is required to ensure that it has the permission of the Data Controller to process its data and failure to have in place a suitable DPA outlining these arrangements is a breach of the law under General Data Protection Regulation (GDPR). As part of the implementation of PINCER, PRIMIS requests that the practice information governance lead accepts the DPA. Where unpractical, a GP partner or the practice manager should be asked to accept the DPA. Furthermore, PRIMIS requests that all pharmacists involved in the implementation also accept the DPA.

If using technology provided by PRIMIS, the upload of practice aggregate data is not possible without PRIMIS having a record of acceptance of the DPA by the practice (otherwise the upload procedure fails). If using an alternative supplier to access and use the PINCER indicators, PRIMIS will still request that the DPA be accepted by the participating practice. PRIMIS will also undertake checks to ensure that the alternative supplier has the permission of the practice to share its aggregate practice data with PRIMIS.

Although the DPA is designed to oversee the processing of practice aggregate data by PRIMIS, it also provides confirmation that the practice has been informed and consulted on the activities that the pharmacist will be undertaking as part of the PINCER implementation, which may involve review of patient medical records, subject to agreement by the practice.

The DPA has been reviewed and approved by the PRIMIS Information Governance Sub-Committee, which includes representatives from practices that have been involved in implementation of PINCER.

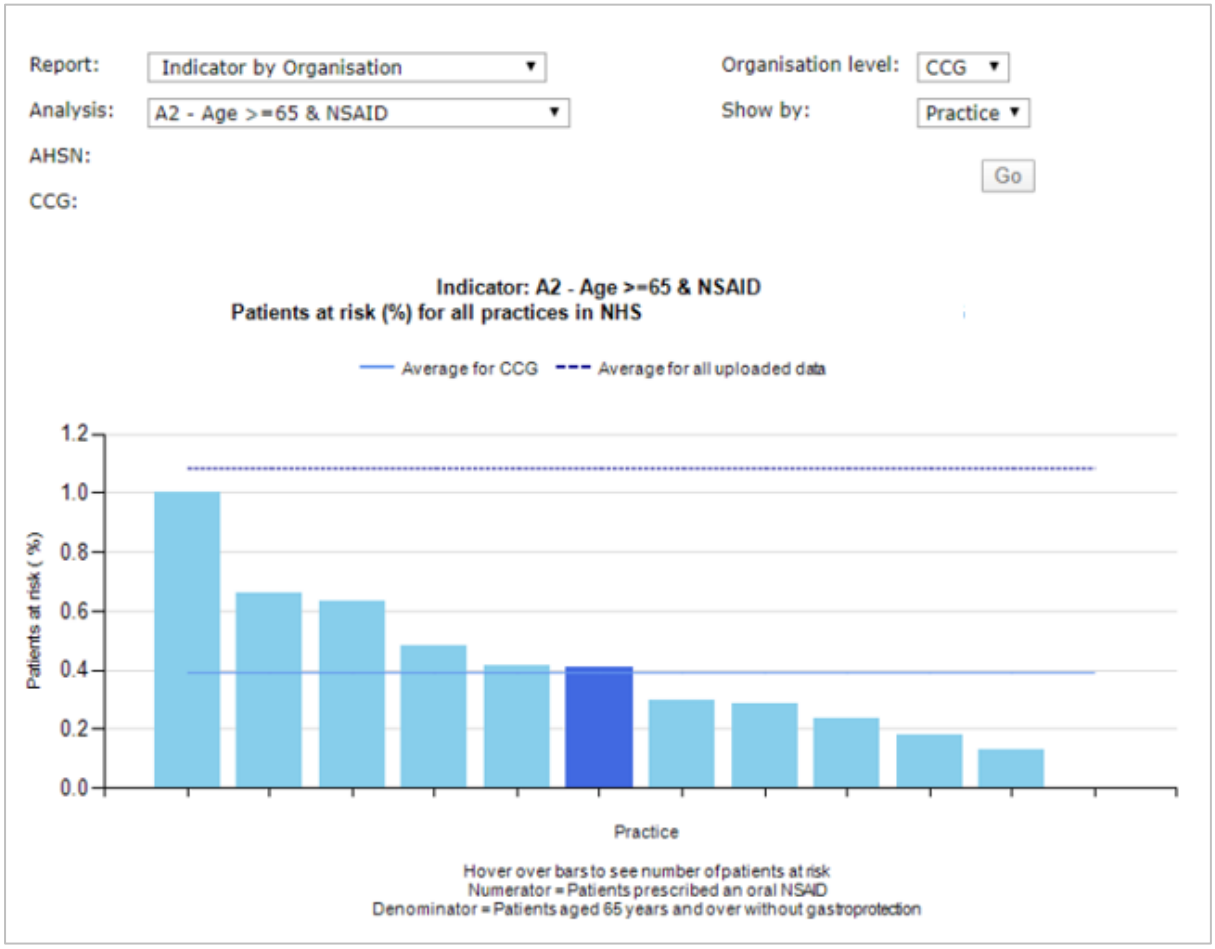
3.3. Comparative analysis

The PINCER Chart Online comparative analysis service enables general practices, pharmacists and named individuals at PCNs and CCGs to access comparative views via the web, including time-trended analyses. Over time, as more and more practices have been participating in the national rollout of PINCER, the facility has been providing a national picture of medication safety (please see Chapter 6: Interim findings). Full details of the range of organisational reports available and related access rights are shown in Appendix 4. A summary is provided below.

3.3.1. Practice level comparisons

The CHART Online comparative analysis service enables practices and pharmacists to compare practice data with other practices in the CCG, and benchmark against CCG and national averages. An anonymised example is shown in Figure 1.

Figure 1. CHART Online practice level comparison



Within the CHART Online service, with the exception of activity reports, only members of the practice and the pharmacists employed by the CCG can identify the practice (the practice will be shown in a darker blue and the national ID will be on show). In all other instances, practices are labelled using an anonymised code. PRIMIS can only identify practices if it has been given permission by the practice to do so.

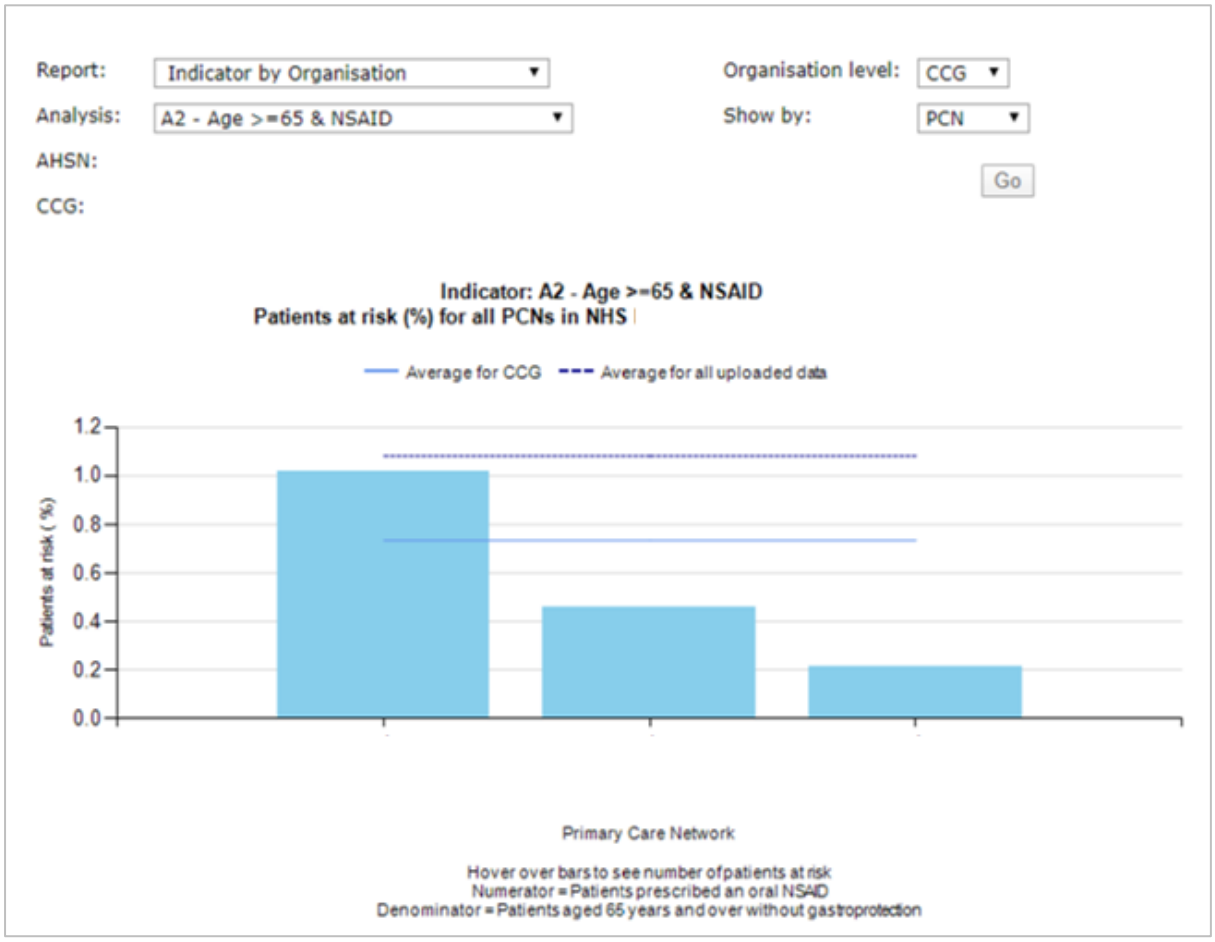
Outside of CHART Online, pharmacists and others working on the PINCER implementation are unable to identify individual GPs or practices in any reports that go outside of the CCG unless the GPs concerned have given their permission.

Where there is a legitimate need for information on individual practices, the purpose for which it is required must be clearly defined, and only be made available to the named individuals known to the GPs concerned.

3.3.2. PCN level comparisons

The CHART Online comparative analysis service enables practices and pharmacists to compare practice data with other practices in the PCN, and benchmark against CCG and national averages. An anonymised example is shown in Figure 2.

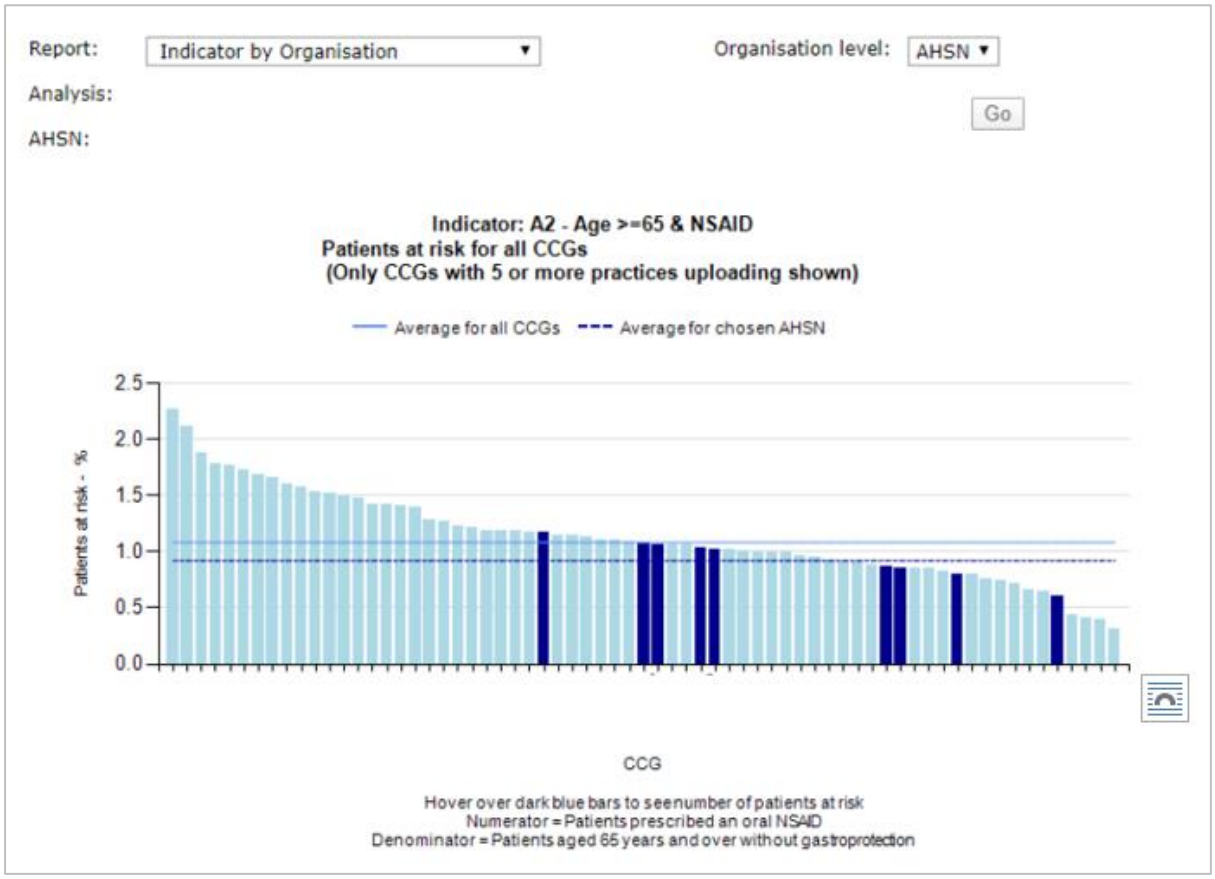
Figure 2. CHART Online PCN level comparison



3.3.3. CCG level comparisons

The CHART Online comparative analysis service enables CCGs to compare their data against other CCGs within the AHSN territory, and benchmark against the national CCG average. The CCG name is displayed to anyone accessing the database and CCGs within one AHSN locality are shown in a darker blue colour (Figure 3).

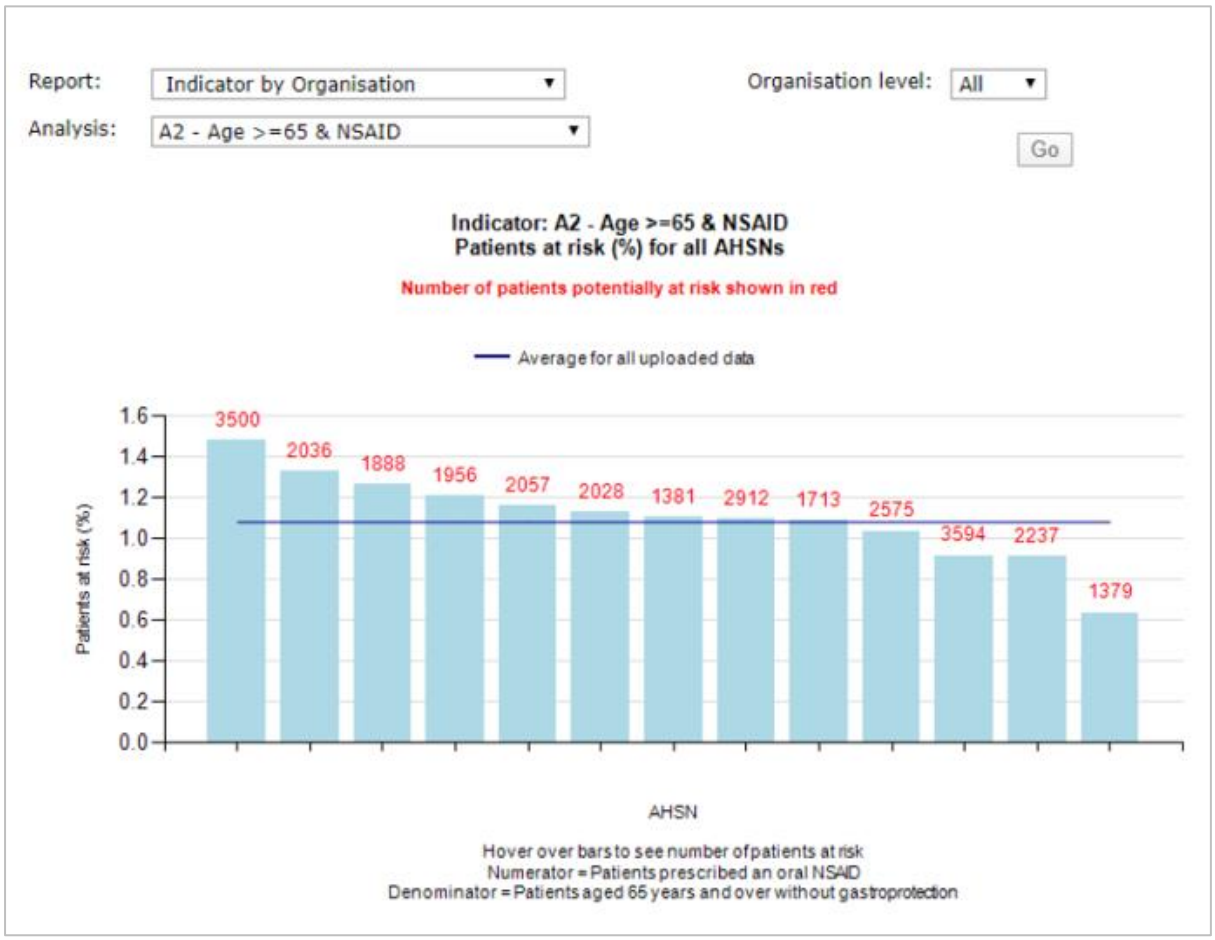
Figure 3. CHART Online CCG level comparison



3.3.4. AHSN level comparisons

The CHART Online comparative analysis service enables AHSNs to understand local levels of uptake as well as compare their data against other AHSNs and benchmark against the national average. The AHSN name is displayed within the database to anyone accessing the database (Figure 4).

Figure 4. CHART Online AHSN level comparison



3.3.5. Time trend analyses

The time trend analyses are available to AHSN, CCG and practice users only and compares data from all practices that have uploaded data at least twice. It compares the latest upload with the baseline upload and provides changes in numbers of at risk patients from baseline. A selection of time tend views are shown in Figure 5 below.

Figure 5. CHART Online Time trend analyses

Report: Time trend all CCGs one Indicator

Analysis: A2 - Age >=65 & NSAID

AHSN:

Organisation level: AHSN

Min interval: Any

Exclude mergers: No

Go

CCG	Number of practices	Baseline		Latest		Change from baseline	
		Number at risk	% at risk	Number at risk	% at risk	Number at risk	% at risk
	10	51	1.12	32	0.72	-19	-0.40
	17	197	1.34	127	0.87	-70	-0.47
	12	100	2.70	50	1.36	-50	-1.33
	8	74	1.97	56	1.49	-18	-0.48
	15	133	1.05	78	0.62	-55	-0.43
	8	86	1.97	64	1.47	-22	-0.50
	9	33	0.98	18	0.51	-15	-0.47
Total for AHSN	**79**	**674**	**1.43**	**425**	**0.91**	**-249**	**-0.53**
Total for all data			**1.38**		**0.88**		**-0.49**

Please note that only CCGs with 5 or more practices uploading twice are included in the results.

Report: Time trend all Indicators one CCG

AHSN:

CCG:

Organisation level: CCG

Indicator type: Single

Min interval: Any

Exclude mergers: No

Go

Number of Practices uploading twice: 17	Baseline		Latest		Change from baseline	
Analysis	Number at risk	% at risk	Number at risk	% at risk	Number at risk	% at risk
A2 - Age >=65 & NSAID	197	1.3	127	0.9	-70	-0.47
B2 - PU & NSAID	10	0.9	7	0.7	-3	-0.26
B3 - PU & antiplatelet	71	6.7	35	3.4	-36	-3.28
C2 - Warfarin/DOAC & NSAID	30	1.3	27	1.1	-3	-0.13
D2 - Warfarin/DOAC & antiplatelet	55	4.3	21	1.7	-34	-2.66
E2 - Aspirin & other antiplatelet	78	4.5	32	2.0	-46	-2.50
F2 - HF & NSAID	14	1.6	13	1.4	-1	-0.17
G2 - CRF & NSAID	19	1.2	28	1.8	9	0.60
H2 - Asthma and beta-blocker	152	1.2	162	1.3	10	0.07
I2 - ACEI or loop diuretic, no blood tests	360	7.9	203	4.5	-157	-3.40
J2 - Methotrexate and no FBC	49	29.0	45	24.9	-4	-4.13
J3 - Methotrexate and no LFTs	56	33.1	53	29.3	-3	-3.85
K2 - Lithium and no level recording	47	46.5	31	33.0	-16	-13.56
L2 - Amiodarone and no TFT	25	28.1	22	28.2	-3	0.12
Number of patients with at least one indicator	**1068**	**7.1**	**740**	**4.9**	**-328**	**-2.20**

Report: Time trend all Practices one Indicator

Organisation level: CCG

Analysis: A2 - Age >=65 & NSAID

Go

AHSN:

CCG:

	Baseline			Latest			Change from baseline			
Practice	Upload date	Num at risk	% at risk	Upload date	Num at risk	% at risk	Interval (months)	Num at risk	% at risk	Popn % change
P_01679		20	2.0		14	1.4		-6	-0.59	
P_01698		3	0.5		5	0.8		2	0.35	
P_01700		3	0.7		5	1.3		2	0.51	
P_01866		6	1.2		2	0.4		-4	-0.82	
P_01869		39	2.6		33	2.2		-6	-0.39	
P_01934		18	1.0		7	0.4		-11	-0.58	
P_03339		8	1.4		4	0.7		-4	-0.70	
P_02136		9	2.9		1	0.3		-8	-2.58	
P_02583		21	1.5		19	1.3		-2	-0.12	
P_02588		9	2.6		2	0.6		-7	-2.02	
P_03124		6	0.7		8	0.9		2	0.24	
P_02635		13	1.5		3	0.4		-10	-1.16	
P_02637		7	1.8		5	1.3		-2	-0.54	
P_02685		17	2.0		12	1.5		-5	-0.56	
P_02684		1	0.1		2	0.2		1	0.11	
P_02134		9	1.2		4	0.5		-5	-0.64	
P_01756		8	0.5		1	0.1		-7	-0.46	
	Total	197	1.3		127	0.9		-70	-0.47	

For rows where the Practice name is anonymised, the Upload date and Interval cells are intentionally blank.

3.4. PRIMIS data governance arrangements

PRIMIS has the following ISO certifications which are externally assessed and verified by the British Standards Institute (BSI):

- ISO9001 2015: Quality Management System (QMS). Certificate no. FS 508928.
- ISO27001 2013: Information Security Management System (ISMS). Certificate no. IS 96078.

In addition, PRIMIS has completed NHS Digital's Data Security and Protection (DSP) Toolkit.

PRIMIS's IT servers are located in a secure environment on the University of Nottingham's main University Park campus (Nottingham).

3.5. Management arrangements

Prior to commencement of the PINCER implementation, it is a pre-requisite that data collection and reporting arrangements are discussed and approved by the relevant information governance committee(s) in the locality. It is recommended that nominated representatives from the participating practices plus any other officers of the CCG with a direct interest in the processing and use of data relating to the PINCER implementation are involved in these discussions.

3.6. Technical Helpdesk Service

PRIMIS provides a technical helpdesk, designed to support pharmacists and practices with the technological aspects of implementing PINCER. This includes help and support on accessing and using the PINCER system searches, upload of aggregate data to PRIMIS and access to the online views and reports in the CHART Online comparative analysis service. However, PRIMIS is unable to provide technical support where an alternative supplier has been commissioned to provide the PINCER indicators.

4. TRAINING TO DELIVER THE PINCER INTERVENTION

Implementing the PINCER intervention requires a multidisciplinary approach in order to achieve reductions in numbers of patients at risk of medication error. Although it is pharmacist-led, the pharmacist acts as a "change agent" working not only with the whole primary care team, but also with health care professionals from secondary care and community settings. Using the principles of root cause analysis, the pharmacist identifies areas for improvement that might include changes to systems and processes within the GP practice, requiring a whole practice approach to patient safety. It also highlights where there might be a need for clinician and patient education to improve prescribing safety. By implementing PINCER, discussions around potentially difficult subject areas are initiated, and feedback suggests that this leads to a more open patient safety culture within the practice.

This chapter gives an overview of the comprehensive training programme taking place to support the national rollout of PINCER. It also highlights some of the challenges faced in terms of service provision and the steps taken by the PRIMIS team to mitigate these.

4.1. Developing the PINCER Training materials

In order for pharmacists to deliver the PINCER intervention, the PINCER Team updated and adapted the training materials developed as part of the PINCER trial[13,23] and Health Foundation *Scaling Up PINCER* project in the East Midlands.[20] For the PINCER trial, pharmacists were recruited from a range of backgrounds including community and secondary care. There was therefore a need to provide detailed training on the use of GP clinical systems and the coding structures used within primary care e.g. Read version 2 codes. However, in the case of the *Scaling Up PINCER* project, the pharmacists delivering the intervention were already working in general practices and were conversant with the different clinical systems and coding schemes. Therefore, training was delivered to members of the Medicines Management Teams in participating CCGs and comprised training on the PINCER intervention (half-day) and CHART software (half-day) delivered over one full day (or two half days).

For the national rollout, the PRIMIS team had the opportunity to further develop the PINCER training materials, taking into account findings from the evaluation of the *Scaling Up PINCER* project, and the teams' experience in providing training on quality improvement (QI) tools. Working closely with the Clinical Lead from Wessex AHSN, where PINCER had been being implemented for a number of years prior to the national rollout, we adapted the PINCER training to draw more heavily on QI methodology, with a focus on using data to enable localities

to prioritise areas for improvement and provide the impetus for change. As a result, we tailored the PINCER training more towards:

- Quality Improvement methodology (Plan/Do/Study/Act)
- The use of the PINCER CHART Online comparative analysis service
- The clinical evidence base underlying the prescribing safety indicators

Experience from previous iterations of PINCER and in particular, the implementation of PINCER in Wessex AHSN, has demonstrated that it takes at least six months to complete one QI cycle within a practice and at least two or three QI cycles to embed the intervention and achieve the full benefit in terms of impact. This local work also demonstrated the importance of CCG engagement and timing of cycles to fit in with and established timetable for prescribing incentive schemes.

4.2. Action Learning Set approach

The PINCER training programme is based on an Action Learning Set (ALS) approach that involves a small group working on real problems, taking action, and learning as individuals and as a group by a process of shared experiences. The sets comprise mostly of pharmacists, but other members of the primary care team are encouraged to attend. This approach is further enhanced by the AHSNs who encourage a similar ethos by regularly holding sharing days to extend learning across multiple sites. This approach to training not only facilitates collaborative working across general practices, PCNs and CCGs but also provides the opportunity for pharmacists with differing roles within these settings to work together to improve patient safety.

There is no single definition of what an ALS is though there are some general principles:

- An ALS is a group of people who are usually peers or at a similar level of responsibility and experience; in this case, pharmacists supporting the implementation of PINCER.
- The group agrees to meet regularly over a fixed period. They come together to find practical ways of addressing the 'real life' challenges they face, and to support their own learning and development. Our model is based on three meetings per ALS.
- Set members are encouraged to find their own solutions to challenges and issues through a structured process of reflection, combined with a balance of support and challenge from the group. The process is led by a member of the PINCER Team experienced in the implementation of PINCER. Group members are provided with a reflective diary to support this process.

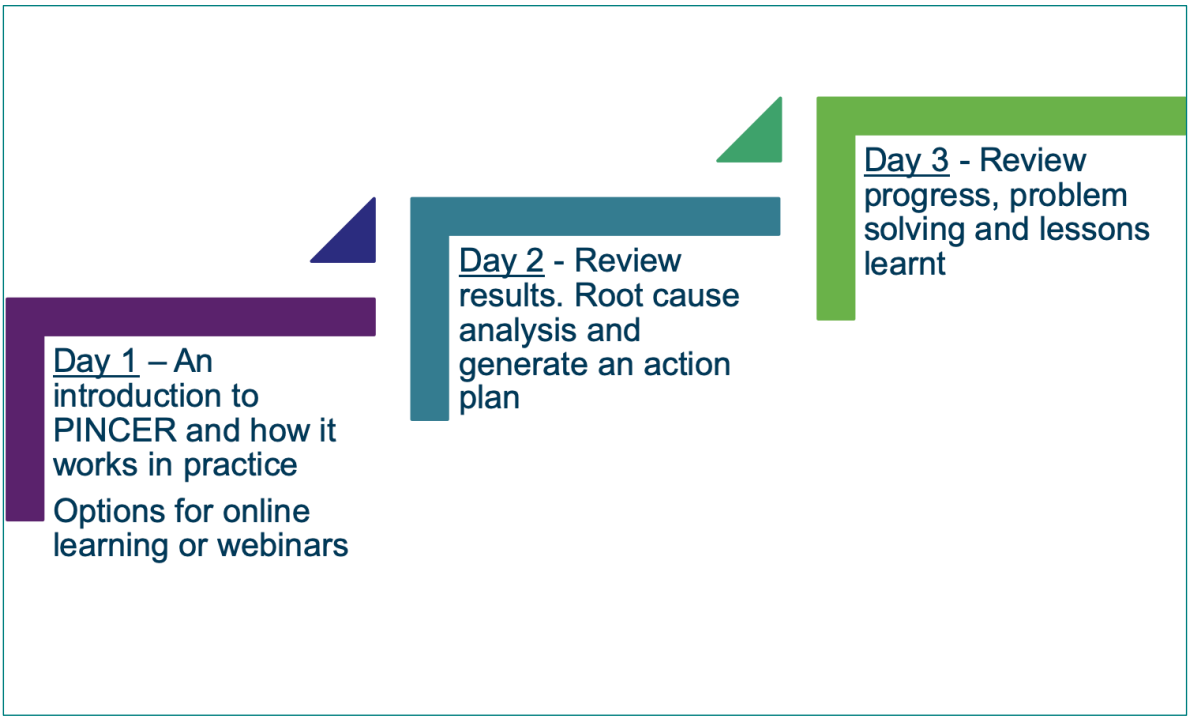
4.3. Training content

Each ALS meets on three occasions, focusing on the following topics:

1. An introduction to PINCER and how it works in practice.
2. Reviewing the outputs of the National PINCER indicators.
3. Reviewing progress, problem solving and lessons learnt.

An overview of the three ALS training sessions is shown in Figure 6.

Figure 6. Overview of PINCER Training sessions



At the end of each meeting, participants are able to construct a plan of action. During Day 2 and Day 3, participants are asked to reflect on the activities undertaken since the last meeting and encouraged to talk about their experiences. The group is invited to discuss practical ways of addressing any challenges and sharing how they have overcome similar issues in their own experience of implementing of PINCER.

4.4. Training delivery

The ALS meetings have been taking place at a venue organised by the implementing AHSN or CCG and participants register to attend training using Eventbrite. Initially training was

delivered face-to-face by a member of the PINCER Team. However, as the rollout progressed, in response to an increased demand for training, we have taken the following action:

- Developed a Train-the-Trainer model to enable AHSN Training Partners and University contracted Training Associates to deliver training on our behalf
- Developed a suite of online resources and eLearning tools (ALS1)

We now have commitment from the majority of AHSNs for continued rollout of PINCER during 2020 to 2021 and further training (and Train-the-Trainer) sessions are planned, including the training of PCN pharmacists, many of whom are new to primary care. AHSNs have reported that PINCER training has been a springboard for other local quality improvement initiatives.

4.5. Additional training and support services

AHSNs and CCGs have commissioned additional training and support services from PRIMIS over and above those included in the national rollout of PINCER charged at the PRIMIS commercial rate. For example, as a result of staff turnover, repeat training for pharmacists has been required.

4.6. Evaluation of training

Individuals attending the training sessions (whether face-to-face or online) are encouraged to complete an evaluation form. This is an electronic form and can be found by clicking on the link below:

https://forms.office.com/Pages/ResponsePage.aspx?id=7qe9Z4D970GskTWEGCkKHl-TXnFBq2pIimJp-oswq1BUMTA5UkM2SVJWM0o1SVdLQlZWNDRXQ0xXSi4u

5. BUILDING A REPLICATION MODEL FOR FURTHER SCALE AND SPREAD

Having described the different components that comprise the PINCER intervention, this chapter provides a brief insight into the development of the replication model for the further scale and spread of PINCER and highlights some of the challenges faced in the early implementation of the model.

5.1. Introduction to social franchising and licensing

Having completed the *Scaling Up PINCER* project in the East Midlands in 2017, the PINCER Team were one of four teams funded by the Health Foundation to work with Spring Impact, (https://www.springimpact.org/), a non-profit global leader in social replication, to explore whether social franchising could successfully further scale and spread the PINCER intervention. Social franchising involves enabling another team or organisation to deliver a proven intervention to agreed standards under a franchise agreement, with the primary aim of maximising social benefit, which is what distinguishes them from the commercial use of franchising.

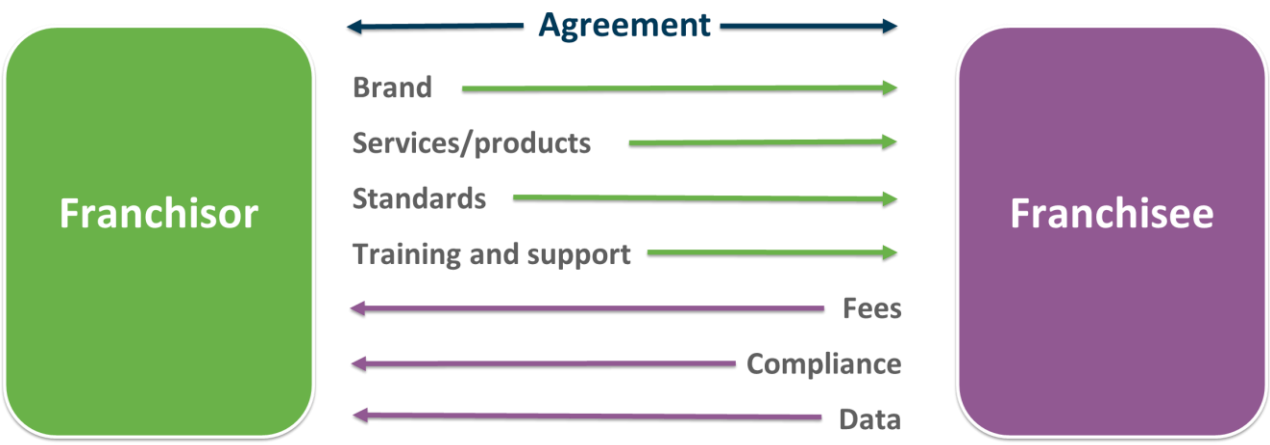
The intervention is packaged up for franchisees to replicate, usually in the form of a manual, accompanied by training and support. In return, the franchisee pays a fee to cover the costs of the franchise operation and shares data and other information with the franchisor (Figure 2). The intervention manual usually sets out the essential components of the intervention, while permitting appropriate local flexibility where this is required for successful implementation. Social franchising tackles the question of scale from the perspective of impact, rather than only reach. It has two distinctive features:

- Identifying and replicating an initiative's core elements
- Being selective about who can adopt the initiative

Its benefits include:

- Offering greater levels of support to implementers adopting an intervention than other methods of scaling by providing ongoing training and support
- Helping to create a financially sustainable model for scale
- Offering a balance between achieving quality and fidelity, and local flexibility in implementation

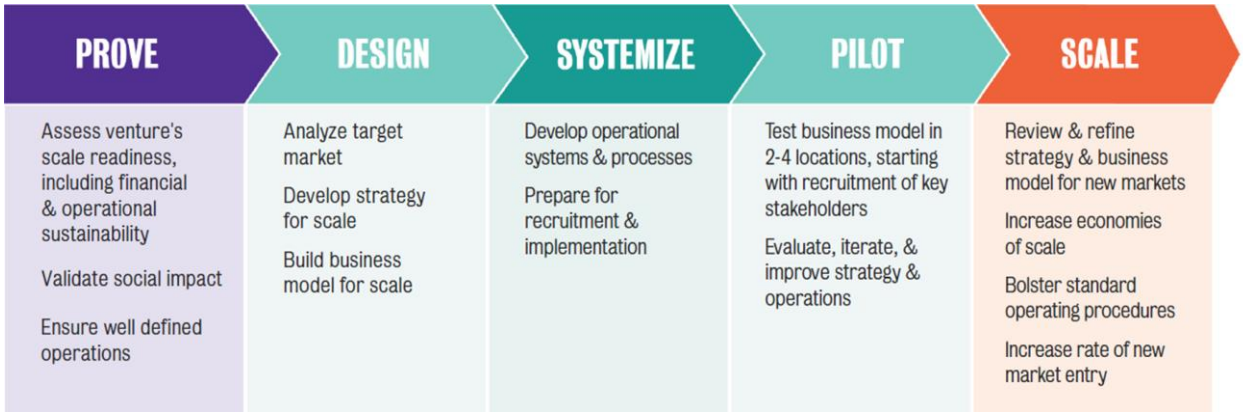
Figure 7. Social franchising



5.2. Replication model for the scale and spread of PINCER

In order to design a replication model for the scale and spread of PINCER, we worked closely with colleagues from Spring Impact to implement their systematic five stage process (Figure 8).

Figure 8. Spring Impact's Five Stages of Scale



Source: https://www.springimpact.org/how-we-work/our-methodology/

This involved attending regular workshops with colleagues from Spring Impact to explore how the intervention could be scaled and implemented effectively using a social franchising approach, both in the short-term and also enabling ongoing sustainability in the long term. A formal evaluation of this work by Cordis Bright has been commissioned by the Health Foundation due for completion July 2020. This chapter summarises some of the key steps

involved and highlights some of the challenges encountered in the scale and spread of PINCER.

5.2.1. Design stage

One of the first step in terms of designing the replication model using a social franchise approach was to think about potential key organisations that we could partner with to maximise the scale and pace of the PINCER rollout. While the PINCER team did have the necessary expertise and experience to support CCGs, it lacked sufficient capacity to provide support to all 195 CCGs (2018) in England directly in order to scale PINCER nationally.

At the time, the Academic Health Science Network (AHSN) in England, comprising 15 regional AHSNs, had just been relicensed for a second five year period. The aim of the AHSNs is to link industry, academia and the NHS to spread innovation at pace and scale - making them the ideal “franchisee” organisations to partner with. AHSNs as part of their relicensing process had committed to running a national innovation network to drive selected innovations at scale across England. PINCER was selected to be such an innovation based on the work already done in East Midlands and Wessex AHSNs.

Previous experience had shown that robust initial training and extensive ongoing support and engagement for CCGs, practices and primary care pharmacists were essential to ensure effective implementation of PINCER and to embed the intervention into every day practice, rather than being seen as a one-off piece of work. However, while AHSNs were a potential source of funding and support for the scale-up in the short-term, the team recognised the fact that they were not necessarily well-placed to deliver all of the required support to CCGs and pharmacists, given the level of expertise and technical knowledge necessary to do this. It was also clear that some may have also lacked staff capacity or willingness to deliver such extensive support. As for longer-term sustainability, challenges remained around funding. Given the remit of the AHSNs, they would not be able to provide funding beyond the initial rollout period, and so scale-up would not be able to rely on this source of funding permanently.

To address these challenges, the PINCER team and Spring Impact worked together to explore how the intervention could be scaled and implemented effectively through AHSNs in the short-term, whilst also enabling ongoing sustainability once AHSN funding was no longer available. At the same time, the PINCER Team worked closely with colleagues from Wessex AHSN (Clare Howard, Clinical Lead and Bill Gillespie, Chief Executive) to further develop the replication model and engage key stakeholders from the AHSN Network and NHS

England/Improvement to seek support, including financial support for the national rollout of PINCER.

As a result of many meetings and discussions, funding via the AHSN Network and NHS England was agreed and the PINCER Team finalised the design of the replication model for the national rollout of PINCER, whereby PRIMIS, University of Nottingham acts as "Franchisor" and the 15 Academic Health Science Networks (AHSNs) in England act as "Franchisees", with oversight provided by the medicine optimisation leadership team at the AHSN Network. Although funding was secured in the short term, some uncertainty remained around the longer-term model, in that we knew AHSNs would stop or play a reduced role in supporting CCGs to implement PINCER after three years. However, we hoped that the data collected on impact achieved through scale would help unlock other funding sources for the future.

Developing the business model

The business model was based on the rollout of PINCER over a five year period and took into consideration the capacity of the PRIMIS team to deliver services, including training provision. It was anticipated that Year 1 would comprise ongoing support to two existing implementer sites (Wessex and East Midlands AHSNs) with rollout to four new early adopter sites. The remaining AHSNs would then come on board in a phased manner over the subsequent two years, with each AHSN retained over a three year period only.

In terms of costs, it was calculated that AHSNs would need to pay a flat fee of £40,000 upfront and then £10,000 per year for two years to cover the PINCER team's support and access to the programme, by which time it was anticipated that plans for the sustainability of the PINCER implementation would be in place. Additional income from NHS England to support the development and maintenance of the IT solution, including conversion of the PINCER data specification into SNOMED CT, were also included in the model. Assumptions were based on an average AHSN with 13 CCGs in their area. The PINCER team expected AHSNs to support at least 60% of these (approximately 8) to implement PINCER during the three-year franchise period. AHSNs were expected to recruit 4 CCGs in the first year and 4 in the second year. A summary of the figures on which the business model was based can be seen in Table 1.

Table 1. Estimation of rollout figures on which the PINCER business model was based

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
AHSNs, CCGs & GP practices supported					
New AHSNs supported	4	5	4	0	0
Existing AHSNs supported	2	4	9	9	4
Total AHSNs supported annually	6	9	13	9	4
Cumulative number of AHSNs reached	6	11	15	15	15
Total CCGs supported annually	16	52	88	72	32
Cumulative number of CCGs reached	16	52	88	104	104
Total GP practices supported annually	320	1,280	2,588	2,340	1,168
Cumulative number of GP practices reached	320	1,280	2,588	3,508	3,796

The PINCER "offer"

Based on our understanding of what stakeholders would deem attractive, we set out the franchise offers for AHSNs and CCGs as follows.

AHSN offer:

- "PINCER on a plate": access to an established, evidence-based intervention with clear support for implementation to meet AHSNs' big-ticket obligations to NHS England
- Likely cost savings to health economy through reduced hospital admissions
- Improved intelligence/data for patient safety across the region
- Help to meet goals on introducing innovation to health care
- Support to foster stronger relationships with CCGs which may provide a springboard for new ways of working
- Raised profile of AHSNs among CCGs and GPs
- Opportunity to influence future indicator development

CCG offer:

- Help to meet national agenda regarding pharmacists in practice and prescribing safety
- Likely cost savings to health economy through reduced hospital admissions
- Opportunity to make use of appropriate pharmacist skills
- Training and support from the PINCER team
- Improved relationships with GPs through impact on patient care

- Benchmarking data to understand performance relative to other CCGs
- Funding from AHSN for training and support

The intention was that the PINCER team would hold a three-year franchise relationship with AHSNs, providing them with the necessary training, support and materials to develop relationships with CCGs in their area, coordinate their training, and conduct quality checks to manage performance at CCG and GP practice level. Medicines Management pharmacists from each CCG would be responsible for working with GP practices to implement the PINCER intervention. Each AHSN would be accountable for the quality of implementation at the CCGs in their area, to prevent all risk of poor performance falling on the PINCER team.

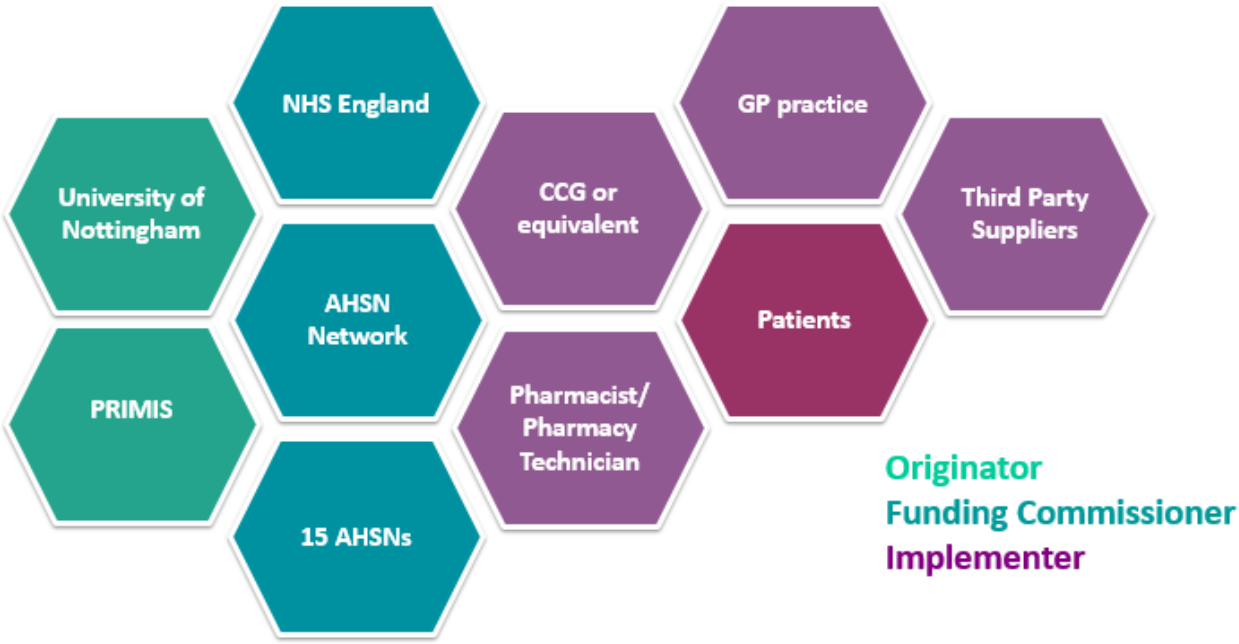
The relationship between AHSNs and CCGs would be supported by the franchise agreement. To ensure that the necessary expertise and knowledge would be transferred to CCGs and their pharmacists, and that the important concept of PINCER as an ongoing intervention embedded from the outset, the PINCER team at the University of Nottingham and PRIMIS would provide some direct training and support to CCGs. By maintaining responsibility for initial training, the PINCER team also intended to avoid overburdening AHSNs, who would also be providing funding for the franchise model. Overall, we recognised that the value proposition to the AHSN was stronger than for CCGs. However, if NHS England were to mandate the delivery of PINCER we realised that this could support increased up-take among CCGs.

The PINCER offer was explored further with potential franchisees during market research and was found to be attractive.

5.2.2. Systemise stage

Having identified AHSNs as implementation partners (or “franchisees”) for the national rollout of PINCER and developed the business model, the next major step in building the replication model was to put together a package to include all the training, support and materials required for the AHSNs to begin fulfilling its franchisee roles and responsibilities, taking account of all the key stakeholders involved in the implementation of PINCER (Figure 9).

Figure 9. Key stakeholders involved in the implementation of PINCER



PINCER Implementation Package

Central to this stage was the development of the PINCER implementation package containing all of the tools and services required for a successful PINCER implementation (systemise phase). Details of the Year 1 implementation package can be found in Box 4.

Box 4. AHSN Year 1 Implementation Package for PINCER

- **Permission to utilise the University of Nottingham's PINCER model**
- **Training for AHSN staff on the implementation of PINCER (up to 1.5 days)**
- **Project management and support (up to 12 days) including:**
  - **A named Business Implementation Lead**
  - **Quarterly meetings and regular phone calls**
  - **Setting up of participants on the central database**
  - **Administration of the Data Processing Agreement with practices and pharmacists**
  - **Providing regular updates on project set-up and other operational activity**
  - **Support for discussions concerning the deployment of the National PINCER Indicators**
- **Access to tools to support the implementation of PINCER:**
  - **Self-Assessment Readiness Tool***
  - **CCG Engagement Event presentation***
  - **PINCER Handbook***
  - **Data Processing Agreement***
  - **PINCER Evidence Based Summaries***
  - **AHSN training materials***
  - **Technical instructions***
  - **Template certificate for pharmacist training***
  - **Access to an online resource area**
  - **Participate in local engagement events (up to 5 days)**
  - **Training for pharmacists and other relevant staff (up to 9 days), delivered using an Action Learning Set approach**
  - **Technical helpdesk service available Mon-Fri 9am-5pm on University of Nottingham working days**

**Materials available on request*

Operational systems and processes

In addition to developing the Year 1 Implementation Package, the PINCER Team also developed all the internal operational systems and processes necessary for the implementation of PINCER.

In order to maintain fidelity to the PINCER intervention, the AHSNs need to adhere to a core set of principles detailed in the PINCER Handbook (available on request) and while there are various quality controls in place to ensure this occurs, the model enables each AHSN to take into consideration existing systems and resource implications when designing their unique approach to their implementation of PINCER. PRIMS developed a PINCER readiness checklist to enable AHSNs to gauge the readiness of their various CCGs to engage with the PINCER intervention.

The PINCER Team also provide support to the AHSNs in terms of their reporting requirements and metrics through:

- AHSN access to the CHART Online comparative analysis service, providing online views and downloadable reports on:
    - The number of general practices within the AHSN territory that have uploaded data to the service
    - The national, AHSN and CCG average for each of the National PINCER Indicators (based on baseline and latest upload data)
    - Administrative data concerning the number of general practices that have accepted the Data Processing Agreement

- Scheduling regular meetings with key AHSN staff to discuss progress. A reporting template has been provided in the PINCER Handbook and can be used to support the AHSN with any internal or external reporting requirements.

5.2.3. Pilot stage

We planned to pilot our replication model with one or two early adopter sites in the first instance, and then work with three or four AHSNs per year over a three-year period. Not only was our financial model based on this plan, but also, in terms of capacity of the team, we felt that this was achievable.

Early in this process it became clear that AHSNs were reluctant to sign a social franchise agreement. Some of the language of social franchising alienated AHSNs and the NHS legal and ethical environment made it difficult for a pure social franchising approach to be delivered (e.g. it would be ethically difficult to apply contractual sanctions to franchisees who do not comply). In terms of accountability, AHSNs do not have a formal contractual relationship with CCGs and therefore could not be held accountable for uptake of the intervention.

With only minor adjustments, we therefore adapted the standard PRIMIS Framework Services Agreement and developed an accompanying Memorandum of Understanding to replace the franchise agreement whereby AHSNs were to encourage and “make best endeavours” to influence the uptake of PINCER within their locality to secure the highest levels of engagement and support.

Having commenced rollout in both Oxford and Yorkshire & Humber AHSNs, in addition to providing ongoing support to two existing implementer sites (Wessex and East Midlands AHSNs) several key factors influenced the scale and pace of the national rollout and these are shown in Box 5 below.

Box 5. Key factors influencing the scale and pace of the national rollout of PINCER

Factors	Impact
NHSE national AHSN targets	AHSNs were set targets to meet by March 2019 (ahead of the planned rollout). These were based on uptake of the PINCER intervention in at least 40% of general practices within each AHSN territory. This provided a focus and urgency that was very helpful; yet in some instances it also induced behaviours that focused on the means (the target), at the expense of the end (sustainable change in practice).
PINCER in Quality and Outcomes Framework 2019	In January 2019, NHS England published "Investment and evolution: A five-year framework for GP Contract Reform to implement the NHS Long Term Plan". Prescribing safety became a quality improvement domain in the contract, with the average size practice potentially earning up to £6,500 if they achieved this domain. The Framework states (section 3.16, page 22) "the nationally-backed rollout of the pharmacist-led information technology intervention for medical errors (PINCER or equivalent) by the AHSNs" as one of four key areas for Quality Improvement. PINCER provided a mechanism for practices to achieve this, as well as providing CCGs with a process for verifying GP practice achievement. Although this had the positive effect of increasing engagement with GP practices, due to its time-limited nature this also resulted in an increased demand for the rollout of PINCER in AHSN localities over and above those included in Year 1 plans.
University of Manchester Medication Safety Dashboard (SMASH)	PINCER was developed by academics from the Universities of Nottingham and Manchester and there has been a close working relationship between the two organisations ever since. As part of this collaboration, academics from the Greater Manchester Patient Safety Translational Research Centre have developed the Salford Medication Safety Dashboard (SMASH) based on the PINCER intervention to reduce medication error in general practices in Salford.[24,25] An early decision was made to implement SMASH to CCGs and practices across the Manchester Health Innovation Network AHSN region, thereby limiting the scale and spread of PINCER using the national model in this locality, as reflected in the data. A Framework Services Agreement (FSA) has been signed and the PINCER national indicators are now embedded in SMASH under a License Agreement.
The use of RAIDR in North East & North Cumbria AHSN	North East and North Cumbria AHSN intend to implement PINCER using their local Commissioning Support Unit solution, Rapid Actionable Insight Driving Reform (RAIDR). A FSA has been signed and the PINCER national indicators are embedded in RAIDR under a License Agreement. Although there have been delays in terms of the implementation of the RAIDR solution, activity is due to commence shortly.

In addition to the factors influencing the scale and pace of the national rollout outlined in Box 5 above, PRIMIS had to address a number of other challenges which are summarised in Box 6.

Box 6. Key challenges influencing the scale and pace of the national rollout of PINCER

Challenges	Impact
Planning and preparation for national scale and spread	While there was collective thinking around the planning, prioritising and purchasing of services to meet the original planned scale and pace of the rollout, there were challenges associated with developing capacity of the PINCER Team quickly enough to support the increased demand, given the previously agreed financial envelope. Since PINCER is a complex intervention, aspects of service delivery particularly in relation to training provision, technical support and administrative processes had to be revised e.g. the move to eLearning and development of the Train-the-Trainer programme. This was further confounded by having to manage the expectations of the AHSNs who were keen to commence the rollout of PINCER in their localities as soon as possible.
Shared interpretation of the PINCER intervention	There have been several iterations of the PINCER intervention spanning 15 years, leading to different interpretations of what the PINCER intervention actually comprises. National policy guidance referring to "PINCER or equivalent" raised questions about the "equivalence" of other primary care provider solutions. We recognise that "or equivalent" is driven by a legitimate desire to avoid "lock-in" to a single process innovation, and that it may not be possible for national policy to be specific. However, in the absence of a clear articulation by policy bodies of "equivalence", the result was that a number of adopter communities asserted that their existing processes were "equivalent" when this was not the case. Engaging with such communities was particularly challenging for the AHSNs.
Return on Investment (ROI)	Some AHSNs had a need to develop ROI models as part of their CCG engagement activities. This is very different to the economic analysis that was done as part of the PINCER Trial and was not something that the PINCER Team could provide. In some instances, this impacted on CCG ability to release resources for the implementation of PINCER. This was further confounded when PINCER was included in QOF with the perception that CCGs were supporting an initiative that GP practices could be rewarded for undertaking.
Level of support needed by AHSNs	Despite having responsibility for engagement activities, some AHSNs needed greater support than anticipated in terms of communicating about PINCER and engaging CCGs. This was particularly the case for those individuals for whom this was their first experience of supporting implementation of a national project such as PINCER. In many instances, support was provided by members of the PRIMIS Team by facilitating or running webinars (n=4), engagement events (n=10) and attending meetings. This had a direct impact on capacity of the team to provide core services and other forms of support.
Information Governance concerns	In terms of Information Governance (IG), when using the PINCER system searches, patient level data remains within the practice. Practice summative data (in the form of denominator and numerator numbers) are sent to PRIMIS for inclusion in the CHART Online national comparative data analysis service (baseline and post-implementation) and this is covered by a Data Processing Agreement (DPA). The IG Lead for each practice is required to sign a DPA with PRIMIS before running the searches and uploading the results to CHART Online. This

	is a standard agreement and many practices will have signed something similar with PRIMIS previously. However, there were initial IG concerns from practices, particularly practices who hadn't worked with PRIMIS in the past and these had to be addressed, either by email or through phone calls with individuals or Local Medical Committee (LMC) Leads. Due to the volume of queries, this was a resource-intensive process.
Rollout happening ahead of Spring Impact timescales	In the early stages of the rollout, the increased demand for PINCER and the time pressures put on PRIMIS to deliver services, meant that the work being done with Spring Impact on the social franchise model was lagging behind what was happening on the ground with the result that the team were constantly playing "catch-up", particularly during the systemise phase.
AHSN/CCG staff changeover	AHSN/CGG staff changeover, particularly attrition of PINCER trained pharmacists, for some AHSNs led to delays and may have had a detrimental effect in terms of the efficacy of the intervention as shown in the findings.
Volume of queries	By the end of Year 1, PRIMIS had contracts in place with 14 of the 15 AHSNs (as opposed to 4 AHSNs as planned). This had consequences in terms of capacity of the team to keep up with demand e.g. in terms of providing pharmacist training and answering queries/providing help-desk support (over 3,000 calls in Y1)

5.2.4. Scale stage

Despite facing a number of challenges, the PRIMIS Team, in collaboration with the AHSN Network has worked hard to overcome many of the initial “teething” issues to develop and maintain good working relationships with key stakeholders at individual AHSN, CCG and GP practice level, and also with individual pharmacists delivering the intervention. We now have a signed contract in place with all 15 AHSNs and have also worked hard to streamline in-house systems and processes to facilitate the spread of PINCER at a national level. With funding from the Health Foundation we were able to increase the capacity of the PRIMIS team through an 18 month secondment of Dr Sarah Rodgers from her role as Principal Research Fellow in the Division of Primary Care, University of Nottingham to PINCER National Programme Manager (August 2019 to January 2021). We were also able to increase training capacity by developing a Train-the-Trainer model and by creating a PINCER eLearning package for ALS1 which was released on 1 October 2019, with plans in place to develop further PINCER eLearning modules and online training.

Our vision from the outset was to make primary care prescribing even safer for patients by implementing PINCER in at least 60% of general practices in England to achieve a sustained reduction in high-risk prescribing by 2023. This target was set during workshops with the PRIMIS team in 2018, with input from patients, pharmacists, the Health Foundation and Spring Impact who are experts in the field of social franchising. The targets were approved by the PRIMIS Board, including the Dean of the School of Medicine at the UoN.

6. INTERIM FINDINGS

Since September 2018, we have been rolling PINCER out to general practices in England using 13 evidence-based prescribing safety indicators. Practices implementing PINCER have been encouraged to upload their data to the CHART Online PINCER national comparative analysis service, prior to commencing the intervention (baseline) and again once they have completed each QI cycle (approximately six-monthly). Some practices have completed multiple QI cycles and so have uploaded data on more than two occasions. For the purposes of this report, the baseline and latest data uploaded to CHART Online will be presented. This chapter presents the interim findings as of 3 April 2020.

6.1. Scale and spread

In terms of the scale and spread of PINCER, as of 3 April 2020, 130 (68%) CCGs in 14 AHSN Localities have engaged in the PINCER rollout. A total of 2,430 general practices (of 7,131 general practices in England) have uploaded baseline data to the national PINCER comparative analysis service (Table 2) showing that a minimum of 23.35 million patient records have been searched to identify instances of potentially hazardous prescribing using 13 evidence-based prescribing safety indicators.

In total, 187,534 at-risk patients have been identified in at least one prescribing safety indicator at baseline giving an overall prevalence of 8.03 patients at risk of medication error per 1,000 registered patients (Table 3).

Table 2. Practice baseline upload activity by quarter (AHSN Level)

AHSN name	Number of practices (n)									
	Number of CCGs (n)	Jul-Sept 2018/19 Q2	Oct-Dec 2018/19 Q3	Jan-Mar 2018/19 Q4	Apr-Jun 2019/20 Q1	Jul-Sept 2019/20 Q2	Oct-Dec 2019/20 Q3	Jan-Mar 2019/20 Q4	Total (n)	Percentage (%)
East Midlands	15	3		84	19	56	26	16	204	36.9
Eastern	11	1				46	16	53	116	24.7
Health Innovation Manchester	1					4			4	0.8
Health Innovation Network	11	1			100	49	31	30	211	49.5
Imperial College Health Partners	8	1		14	2	27	123	35	202	54.7
Innovation Agency	8					13	59	81	153	26.1
Kent Surrey Sussex	14					38	55	26	119	22.7
Oxford	4		17	7	138	22	15	5	204	82.6
South West	3			1		47	34	17	99	37.4
UCL Partners	12				36	65	77	61	239	31.5
Wessex	9				103	101	23	7	234	86.3
West Midlands	14	4					127	121	252	30.4
West of England	4			13	31	81	39	12	176	67.9
Yorkshire & Humber	16			131	25	13	14	34	217	32.2
Total	**130**	**10**	**17**	**250**	**454**	**562**	**639**	**498**	**2,430**	**34.1**

Table 3. Number of at-risk patients identified at baseline (AHSN Level)

AHSN name	Number of CCGs (n)	Number practices uploading to COL (n)	Number at-risk patients baseline (n)	Total practice population (n)	Prevalence per 1,000 registered patients (n)	Mean number of patients per practice (n)
East Midlands	15	204	11,800	1,833,712	6.44	57.8
Eastern	11	116	12,140	1,495,135	8.12	104.7
Health Innovation Manchester	1	4	229	27,109	8.45	57.3
Health Innovation Network	11	211	10,987	2,111,582	5.20	52.1
Imperial College Health Partners	8	202	8,596	1,496,066	5.75	42.6
Innovation Agency	8	153	12,775	1,210,980	10.55	83.5
Kent Surrey Sussex	14	119	11,444	1,247,611	9.17	96.2
Oxford	4	204	18,570	2,266,584	8.19	91.0
South West	3	99	11,412	1,033,696	11.04	115.3
UCL Partners	12	239	12,136	2,123,566	5.71	50.8
Wessex	9	234	28,623	2,652,721	10.79	122.3
West Midlands	14	252	16,717	2,068,728	8.08	66.3
West of England	4	176	15,180	1,873,604	8.10	86.3
Yorkshire & Humber	16	217	16,925	1,909,602	8.86	78.0
Total	**130**	**2,430**	**187,534**	**23,350,696**	**8.03**	**77.2**

6.2. Impact

Of the 2,430 practices that have uploaded baseline data to CHART Online, almost half (1,060) have uploaded follow-up data on at least one occasion. These practices are located within 86 CCGs in 13 AHSN localities. The time between baseline and latest upload for these practices ranges from less than one month to 15.5 months with 916 (86.4%) practices uploading follow-up data at least three months post-baseline.

6.2.1. Composite indicators (overall summary)

Analysis of follow-up data from all 1,060 practices shows an absolute reduction of 13,387 at-risk patients identified in at least one prescribing safety indicator (from 92,762 to 79,375; -14.4%). Greatest reductions can be seen for those indicators associated with GI bleed which showed an absolute reduction of 10,559 at-risk patients (from 40,720 to 30,161; -25.9%). There was a slight increase in total practice population between baseline and latest uploads (1.25%). These findings are summarised below and further details are provided in Table 4.

Figure 10. Summary of key findings

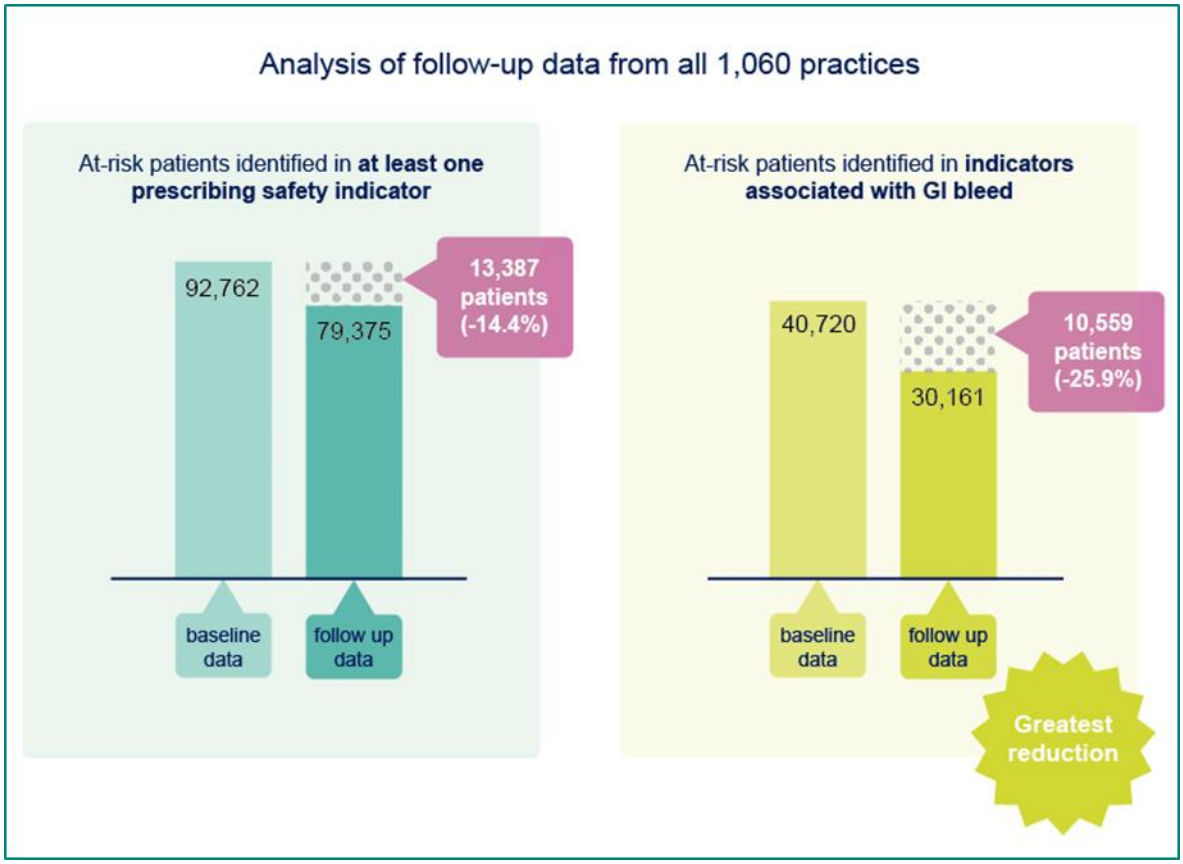


Table 4. Change in number of at-risk patients identified in the composite indicators for 1,060 practices that have uploaded data at least twice to CHART Online

Indicator	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
	Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
Number of at-risk patients identified in at least one GI Bleed indicator	40,720	3.73	30,161	2.73	-10,559	-25.9	-1.00
Number of at-risk patients identified in at least one monitoring indicator	35,002	3.21	31,558	2.86	-3,444	-9.8	-0.35
Number of at risk patients identified in at least one other indicator (heart failure, AKI or exacerbation of asthma)	18,459	1.69	18,261	1.65	-198	-1.1	-0.04
Number of at-risk patients identified in at least one indicator (all indicators)	92,762	8.51	79,375	7.19	-13,387	-14.4	-1.32

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

6.2.2. Composite indicators (AHSN Level)

Analysis of follow-up data from 1,060 practices for the composite indicators for each AHSN are shown in Tables 5, 6, 7 and 8. It can be seen that although there is variation between AHSNs in terms of the reductions in numbers of at-risk patients identified at latest upload, greatest reductions for all AHSNs can be seen for those indicators associated with GI bleed.

Table 5. Change in number of at-risk patients identified in at least one GI Bleed indicator for 1,060 practices that have uploaded data at least twice to CHART Online (AHSN Level)

AHSN	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
East Midlands	109	2,270	2.49	1,701	1.86	-569	-25.1	-0.63
Eastern	50	2,053	3.85	1,609	3.00	-444	-21.6	-0.85
Health Innovation Network	78	1,775	2.06	1,258	1.43	-517	-29.1	-0.63
Imperial College Health Partners	45	706	2.18	537	1.65	-169	-23.9	-0.53
Innovation Agency	37	1,219	4.41	967	3.68	-252	-20.7	-0.73
Kent Surrey Sussex	43	1,920	4.20	1,427	3.07	-493	-25.7	-1.13
Oxford	133	5,950	3.80	4,131	2.57	-1,819	-30.6	-1.23
South West	54	3,637	6.07	2,393	3.98	-1,244	-34.2	-2.09
UCL Partners	83	1,487	2.29	1,001	1.52	-486	-32.7	-0.77
Wessex	202	10,042	4.30	7,232	3.05	-2,810	-28.0	-1.25
West Midlands	16	430	3.02	322	2.25	-108	-25.1	-0.77
West of England	153	6,675	4.01	5,149	3.03	-1,526	-22.9	-0.98
Yorkshire & Humber	57	2,556	4.42	2,434	4.19	-122	-4.8	-0.23
Total	**1,060**	**40,720**	**3.73**	**30,161**	**2.73**	**-10,559**	**-25.9**	**-1.00**

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

Table 6. Change in number of at-risk patients identified in at least one monitoring indicator for 1,060 practices that have uploaded data at least twice to CHART Online (AHSN Level)

AHSN	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
East Midlands	109	1,827	2.01	1,701	1.86	-126	-6.9	-0.15
Eastern	50	1,623	3.05	1,483	2.77	-140	-8.6	-0.28
Health Innovation Network	78	1,677	1.94	1,459	1.66	-218	-13.0	-0.28
Imperial College Health Partners	45	700	2.16	597	1.83	-103	-14.7	-0.33
Innovation Agency	37	816	2.95	683	2.60	-133	-16.3	-0.35
Kent Surrey Sussex	43	1,946	4.25	1,646	3.54	-300	-15.4	-0.71
Oxford	133	4,591	2.93	4,000	2.49	-591	-12.9	-0.44
South West	54	2,001	3.34	1,748	2.90	-253	-12.6	-0.44
UCL Partners	83	2,020	3.11	1,712	2.60	-308	-15.2	-0.51
Wessex	202	11,481	4.91	10,594	4.47	-887	-7.7	-0.44
West Midlands	16	406	2.85	382	2.67	-24	-5.9	-0.18
West of England	153	4,557	2.73	4,125	2.43	-432	-9.5	-0.30
Yorkshire & Humber	57	1,357	2.35	1,428	2.46	71	5.2	0.11
Total	**1,060**	**35,002**	**3.21**	**31,558**	**2.86**	**-3,444**	**-9.8**	**-0.35**

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

Table 7. Change in number of at-risk patients identified in at least one other indicator (heart failure, AKI or exacerbation of asthma) for 1,060 practices that have uploaded data at least twice to CHART Online (AHSN Level)

AHSN	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
East Midlands	109	1,447	1.59	1,428	1.56	-19	-1.3	-0.03
Eastern	50	992	1.86	952	1.78	-40	-4.0	-0.08
Health Innovation Network	78	886	1.03	924	1.05	38	4.3	0.02
Imperial College Health Partners	45	370	1.14	387	1.19	17	4.6	0.05
Innovation Agency	37	699	2.53	586	2.23	-113	-16.2	-0.30
Kent Surrey Sussex	43	959	2.10	914	1.97	-45	-4.7	-0.13
Oxford	133	2,490	1.59	2,449	1.52	-41	-1.6	-0.07
South West	54	1,353	2.26	1,300	2.16	-53	-3.9	-0.10
UCL Partners	83	678	1.04	673	1.02	-5	-0.7	-0.02
Wessex	202	4,773	2.04	4,849	2.05	76	1.6	0.01
West Midlands	16	195	1.37	183	1.28	-12	-6.2	-0.09
West of England	153	2,604	1.56	2,542	1.50	-62	-2.4	-0.06
Yorkshire & Humber	57	1,013	1.75	1,074	1.85	61	6.0	0.10
Total	**1,060**	**18,459**	**1.69**	**18,261**	**1.65**	**-198**	**-1.1**	**-0.04**

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

Table 8. Change in number of at-risk patients identified in at least one indicator (all indicators) for 1,060 practices that have uploaded data at least twice to CHART Online (AHSN Level)

AHSN	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
East Midlands	109	6,179	6.78	5,627	6.14	-552	-8.9	-0.64
Eastern	50	4,570	8.58	3,954	7.38	-616	-13.5	-1.20
Health Innovation Network	78	4,262	4.94	3,595	4.10	-667	-15.6	-0.84
Imperial College Health Partners	45	1,734	5.35	1,484	4.55	-250	-14.4	-0.80
Innovation Agency	37	2,672	9.67	2,188	8.32	-484	-18.1	-1.35
Kent Surrey Sussex	43	4,713	10.30	3,917	8.42	-796	-16.9	-1.88
Oxford	133	12,709	8.11	10,371	6.45	-2,338	-18.4	-1.66
South West	54	6,843	11.43	5,359	8.90	-1,484	-21.7	-2.53
UCL Partners	83	4,094	6.29	3,338	5.07	-756	-18.5	-1.22
Wessex	202	25,663	10.98	22,222	9.38	-3,441	-13.4	-1.60
West Midlands	16	1,016	7.14	878	6.14	-138	-13.6	-1.00
West of England	153	13,473	8.08	11,590	6.83	-1,883	-14.0	-1.25
Yorkshire & Humber	57	4834	8.36	4852	8.35	18	0.4	-0.01
Total	**1060**	**92,762**	**8.51**	**79,375**	**7.19**	**-13,387**	**-14.4**	**-1.32**

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

6.2.3. Composite indicators (CCG Level)

Analysis of follow-up data from 1,060 practices for the composite indicators for each CCG within the 13 AHSN localities is shown in Table 9. There is variation between CCGs at latest upload: although a small number of CCGs showed an increase in absolute numbers of at-risk patients identified in at least one indicator (n=10), the majority showed a reduction in numbers of at-risk patients, with 11 CCGs showing reductions in the percentage of at-risk patients of over 30%.

Table 9. Change in number of at-risk patients identified in at least one indicator (all indicators) for 1,060 practices that have uploaded data at least twice to CHART Online (CCG Level)

AHSN/CCG	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
EAST MIDLANDS								
NHS Derby and Derbyshire	12	617	6.18	615	6.16	-2	-0.3	-0.02
NHS Mansfield and Ashfield	26	1,446	7.36	1,209	6.14	-237	-16.4	-1.22
NHS Nene	4	1,007	30.88	1,136	34.68	129	12.8	3.80
NHS Newark & Sherwood	8	548	7.58	421	5.86	-127	-23.2	-1.72
NHS Nottingham City	24	920	4.85	813	4.24	-107	-11.6	-0.61
NHS Nottingham N & E	12	533	5.41	465	4.68	-68	-12.8	-0.73
NHS Nottingham West	11	515	5.52	443	4.74	-72	-14.0	-0.78
NHS Rushcliffe	12	593	4.61	525	4.04	-68	-11.5	-0.57
East Midlands Total	***109***	***6,179***	***6.78***	***5,627***	***6.14***	***-552***	***-8.9***	***-0.64***
EASTERN								
NHS Bedfordshire	42	3,755	8.76	3,272	7.57	-483	-12.9	-1.19
NHS Cambridgeshire & Peterborough	6	584	6.87	511	6.03	-73	-12.5	-0.84
NHS Ipswich & East Suffolk	1	122	12.54	99	10.15	-23	-18.9	-2.39
NHS West Suffolk	1	109	11.87	72	7.86	-37	-33.9	-4.01
Eastern Total	***50***	***4,570***	***8.58***	***3,954***	***7.38***	***-616***	***-13.5***	***-1.20***
HEALTH INNOVATION NETWORK								
NHS Bromley	2	75	4.67	58	3.53	-17	-22.7	-1.14
NHS Kingston	3	234	6.70	229	6.47	-5	-2.1	-0.23
NHS Lambeth	20	808	3.64	697	3.11	-111	-13.7	-0.53
NHS Lewisham	8	289	4.27	257	3.42	-32	-11.1	-0.85
NHS Merton	1	153	5.13	125	4.17	-28	-18.3	-0.96
NHS Richmond	2	141	7.60	95	5.10	-46	-32.6	-2.50
NHS Southwark	15	743	3.97	639	3.37	-104	-14.0	-0.60
NHS Sutton	15	1,072	7.76	917	6.57	-155	-14.5	-1.19
NHS Wandsworth	12	747	5.01	578	3.88	-169	-22.6	-1.13
Health Innovation Network Total	***78***	***4,262***	***4.94***	***3,595***	***4.10***	***-667***	***-15.6***	***-0.84***

AHSN/CCG	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
IMPERIAL COLLEGE HEALTH PARTNERS								
NHS Brent	15	698	5.81	551	4.57	-147	-21.1	-1.24
NHS Central London	2	51	2.83	43	2.45	-8	-15.7	-0.38
NHS Ealing	7	265	5.22	268	5.19	3	1.1	-0.03
NHS Hammersmith & Fulham	3	91	4.17	92	4.15	1	1.1	-0.02
NHS Harrow	7	238	5.78	197	4.77	-41	-17.2	-1.01
NHS Hillingdon	4	167	7.19	122	5.22	-45	-26.9	-1.97
NHS Hounslow	3	124	5.87	117	5.52	-7	-5.6	-0.35
NHS West London	4	100	3.60	94	3.35	-6	-6.0	-0.25
Imperial College Health Partners Total	***45***	***1,734***	***5.35***	***1,484***	***4.55***	***-250***	***-14.4***	***-0.80***
INNOVATION AGENCY								
NHS Chorley & South Ribble	2	176	10.19	178	10.29	2	1.1	0.10
NHS Greater Preston	1	111	6.00	111	6.03	0	0.0	0.03
NHS Knowsley	6	260	8.49	173	5.55	-87	-33.5	-2.94
NHS Morecambe Bay	11	778	9.11	712	8.34	-66	-8.5	-0.77
NHS Warrington	1	39	6.97	20	7.34	-19	-48.7	0.37
NHS West Lancashire	10	837	9.92	716	8.47	-121	-14.5	-1.45
NHS Wirral	6	471	13.60	278	11.86	-193	-41.0	-1.74
Innovation Agency Total	***37***	***2,672***	***9.67***	***2,188***	***8.32***	***-484***	***-18.1***	***-1.35***
KENT SURREY SUSSEX								
NHS Brighton & Hove	8	488	6.62	408	5.50	-80	-16.4	-1.12
NHS East Surrey	2	196	8.43	186	6.36	-10	-5.1	-2.07
NHS Eastbourne, Hailsham & Seaford	14	1,760	12.74	1,493	10.80	-267	-15.2	-1.94
NHS Hastings & Rother	5	874	16.21	559	10.34	-315	-36.0	-5.87
NHS North West Surrey	6	392	6.72	366	6.20	-26	-6.6	-0.52
NHS Surrey Downs	1	65	5.42	64	5.36	-1	-1.5	-0.06
NHS Surrey Heath	7	938	9.55	841	8.55	-97	-10.3	-1.00
Kent Surrey Sussex Total	***43***	***4,713***	***10.30***	***3,917***	***8.42***	***-796***	***-16.9***	***-1.88***

AHSN/CCG	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
OXFORD								
NHS Berkshire West	16	2,093	9.14	1,809	7.54	-284	-13.6	-1.60
NHS Buckinghamshire	32	3,409	8.75	2,724	6.95	-685	-20.1	-1.80
NHS East Berkshire	37	2,955	7.56	2,361	5.97	-594	-20.1	-1.59
NHS Oxfordshire	48	4,252	7.61	3,477	5.99	-775	-18.2	-1.62
Oxford Total	***133***	***12,709***	***8.11***	***10,371***	***6.45***	***-2,338***	***-18.4***	-1.66
SOUTH WEST								
NHS Devon	38	4,326	10.85	3,527	8.78	-799	-18.5	-2.07
NHS Kernow	16	2,517	12.56	1,832	9.16	-685	-27.2	-3.40
South West Total	***54***	***6,843***	***11.43***	***5,359***	***8.90***	***-1,484***	***-21.7***	***-2.53***
UCL PARTNERS								
NHS Barking & Dagenham	10	494	6.86	461	6.38	-33	-6.7	-0.48
NHS Barnet	17	1,068	7.12	740	4.92	-328	-30.7	-2.20
NHS Camden	1	77	6.44	71	5.94	-6	-7.8	-0.50
NHS City & Hackney	12	331	4.14	268	3.32	-63	-19.0	-0.82
NHS Enfield	1	151	11.22	97	7.23	-54	-35.8	-3.99
NHS Haringey	8	342	5.97	314	5.43	-28	-8.2	-0.54
NHS Havering	14	921	11.02	817	9.75	-104	-11.3	-1.27
NHS Islington	8	338	5.19	285	4.34	-53	-15.7	-0.85
NHS Newham	9	268	2.72	228	2.21	-40	-14.9	-0.51
NHS Redbridge	1	22	3.91	22	3.92	0	0.0	0.01
NHS Waltham Forest	2	82	6.35	35	2.67	-47	-57.3	-3.68
UCL Partners Total	***83***	***4,094***	***6.29***	***3338***	***5.07***	***-756***	***-18.5***	***-1.22***

AHSN/CCG	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
WESSEX								
NHS Dorset	77	9,231	11.79	7,216	9.06	-2,015	-21.8	-2.73
NHS Fareham & Gosport	17	2,756	13.41	2,385	11.61	-371	-13.5	-1.80
NHS Isle of Wight	3	645	20.19	590	18.42	-55	-8.5	-1.77
NHS NE Hampshire & Farnham	2	199	10.51	138	7.23	-61	-30.7	-3.28
NHS North Hampshire	14	1,972	8.75	1,733	7.63	-239	-12.1	-1.12
NHS Portsmouth	15	2,270	9.80	2,092	8.98	-178	-7.8	-0.82
NHS South Eastern Hampshire	20	2,568	11.80	2,426	11.11	-142	-5.5	-0.69
NHS Southampton	6	361	5.54	363	5.48	2	0.6	-0.06
NHS West Hampshire	48	5,661	10.16	5,279	9.22	-382	-6.7	-0.94
Wessex Total	***202***	***25,663***	***10.98***	***22,222***	***9.38***	***-3,441***	***-13.4***	***-1.60***
WEST MIDLANDS								
NHS Birmingham & Solihull	1	100	8.81	76	6.70	-24	-24.0	-2.11
NHS North Staffordshire	1	57	5.00	60	5.26	3	5.3	0.26
NHS Sandwell & West Birmingham	8	337	5.27	204	3.17	-133	-39.5	-2.10
NHS Shropshire	1	61	5.56	55	5.04	-6	-9.8	-0.52
NHS South Warwickshire	3	294	10.94	318	11.69	24	8.2	0.75
NHS Stoke-on-Trent	2	167	9.36	165	9.22	-2	-1.2	-0.14
West Midlands Total	***16***	***1,016***	***7.14***	***878***	***6.14***	***-138***	***-13.6***	***-1.00***
WEST OF ENGLAND								
NHS Bath and NE Somerset	20	1,205	7.78	1,054	6.76	-151	-12.5	-1.02
NHS Bristol, N Somerset & S Gloucestershire	73	7,139	7.43	5,941	6.01	-1198	-16.8	-1.42
NHS Gloucestershire	60	5,129	9.31	4,595	8.30	-534	-10.4	-1.01
West of England Total	***153***	***13,473***	***8.08***	***11,590***	***6.83***	***-1883***	***-14.0***	***-1.25***

AHSN/CCG	Number of practices (n)	Baseline*		Latest **		Change in absolute number of at-risk patients (n)	% change in absolute number of at-risk patients (%)	Change in prevalence per 1,000 patients (n)
		Numerator (n)	Prevalence per 1,000 patients (n)	Numerator (n)	Prevalence per 1,000 patients (n)			
YORKSHIRE & HUMBER								
NHS Barnsley	4	393	9.35	405	9.58	12	3.1	0.23
NHS Calderdale	25	1,934	8.71	2,237	10.01	303	15.7	1.30
NHS Greater Huddersfield	11	611	9.07	481	7.14	-130	-21.3	-1.93
NHS Leeds	2	80	8.29	80	8.29	0	0.0	0.00
NHS Rotherham	5	520	8.89	511	8.52	-9	-1.7	-0.37
NHS Scarborough and Ryedale	1	19	4.83	16	4.25	-3	-15.8	-0.58
NHS Vale of York	8	1,100	6.74	917	5.64	-183	-16.6	-1.10
NHS Wakefield	1	177	14.81	205	17.19	28	15.8	2.38
Yorkshire & Humber Totals	***57***	***4834***	***8.36***	***4,852***	***8.35***	***18***	***0.4***	***-0.01***

*Baseline total practice population = 10,906,453
**Latest total practice population = 11,043,137

6.2.4. Individual prescribing safety indicators (overall summary)

Table 10 shows the numbers of at-risk patients identified at baseline and latest upload for each of the prescribing safety indicators. It can be seen that at baseline, the greatest number of at risk patients identified by the searches were those aged 75 years and older who have been prescribed an angiotensin converting enzyme (ACE) inhibitor or a loop diuretic long term who have not had a computer-recorded check of their renal function and electrolytes in the previous 15 months. Greatest impact was in those patients aged 65 years and over prescribed an oral NSAID, without co-prescription of an ulcer healing drug.

Table 10. Change in numbers of at-risk patients for each of the PINCER indicators in 1,060 practices that have uploaded data at least twice to CHART Online

PINCER NATIONAL PRESCRIBING SAFETY INDICATORS		Baseline			Latest			Change in absolute number of at-risk patients n (%)
		Numerator (n)	Denominator (n)	Percentage (%)	Numerator (n)	Denominator (n)	Percentage (%)	
GI BLEED PRESCRIBING INDICATORS								
A2	Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient aged ≥65 years	18,591	1,355,707	1.4	12,134	1,361,134	0.9	-6,457 (-34.7)
B2	Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient with a history of peptic ulceration	1,188	83,104	1.4	915	81,999	1.1	-273 (-23.0)
B3	Prescription of an antiplatelet drug without co-prescription of an ulcer-healing drug, to a patient with a history of peptic ulceration	5,709	83,104	6.9	4,539	81,999	5.5	-1,170 (-20.5)
C2	Prescription of warfarin or DOAC in combination with an oral NSAID	4,005	245,778	1.6	3,486	254,936	1.4	-519 (-13.0)
D2	Prescription of warfarin or DOAC and an antiplatelet drug in combination without co-prescription of an ulcer-healing drug	4,860	146,801	3.3	3,884	149,831	2.6	-976 (-20.1)
E2	Prescription of aspirin in combination with another antiplatelet drug without co-prescription of an ulcer-healing drug	7,880	160,886	4.9	6,199	151,177	4.1	-1,681 (-21.3)
OTHER INDICATORS								
F2	Prescription of an oral NSAID to a patient with heart failure	1,544	87,804	1.8	1,400	91,336	1.5	-144 (-9.3)
G2	Prescription of an oral NSAID to a patient with eGFR <45	2,733	136,749	2.0	2,425	137,185	1.8	-308 (-11.3)
H2	Prescription of a non-selective beta-blocker to a patient with a history of asthma	14,410	1,146,807	1.3	14,674	1,167,475	1.3	264 (1.8)
MONITORING INDICATORS								
I2	Patients aged 75 years and older who have been prescribed an angiotensin converting enzyme (ACE) inhibitor or a loop diuretic long term who have not had a computer-recorded check of their renal function and electrolytes in the previous 15 months	23,866	393,932	6.1	21,280	399,045	5.3	-2,586 (-10.8)
J2 **J3**	Patients receiving methotrexate for at least three months who have not had: a full blood count (FBC) in the previous three months or liver function test (LFT) in the previous three months	5,948 6,183	36,094 36,094	16.5 17.1	5,582 5,769	37,047 37,047	15.1 15.6	-366 (-6.2) -414 (-6.7)
K2	Patients receiving lithium for at least three months who do not have a recorded check of their lithium concentrations in the previous three months	2,539	7,746	32.8	2,335	7,751	30.1	-204 (-8.0)
L2	Patients receiving amiodarone for at least six months who have not had a thyroid function test (TFT) within the previous six months	2,125	5,709	37.2	1,814	5,495	33.0	-311 (-14.6)

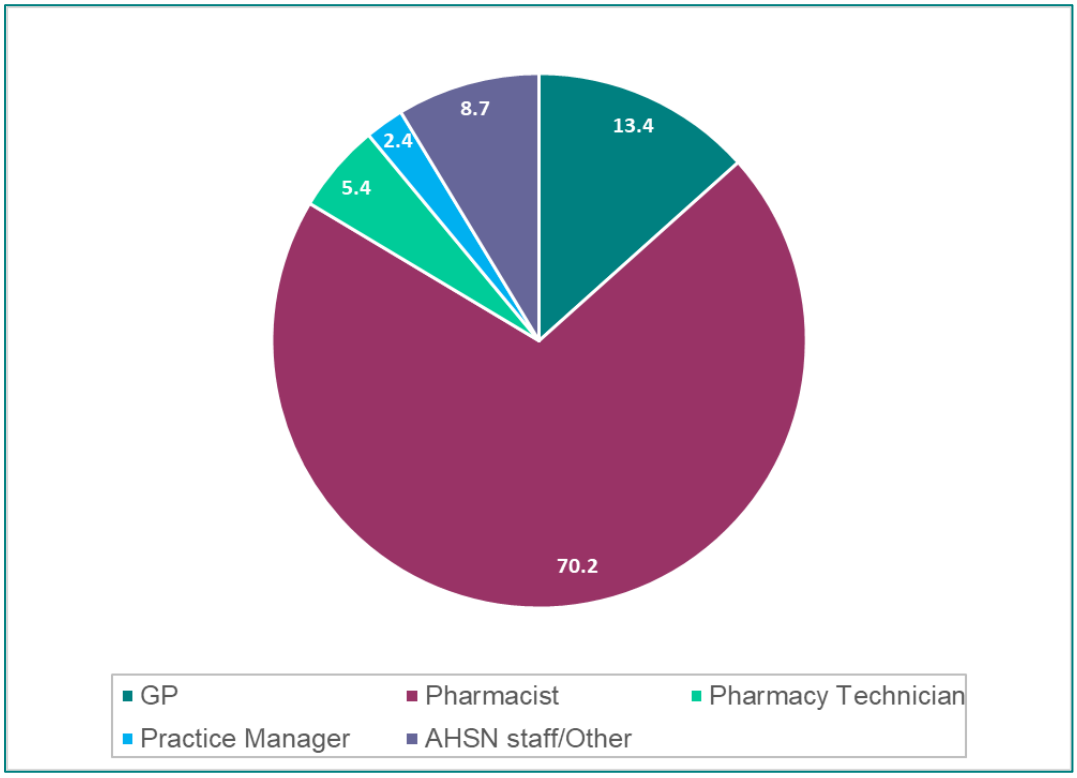
6.2.5. Exemplars

From the findings presented in Tables 4 to 10 above, there is variation in terms of reductions in numbers of patients at risk of medication error at AHSN, CCG and practice level. We know from the many interactions that we have with the CCGs and pharmacists delivering the PINCER intervention (e.g. during face-to-face training sessions, national PINCER meetings and events and also through individual feedback and social media), that innovative strategies are being put in place and quality improvement work undertaken to address the issues highlighted to maximise the impact from the implementation of PINCER. In order to capture and share good practice, many of these exemplars have been turned into case studies which we have published on our website:
https://www.nottingham.ac.uk/primis/case-studies/cs-pincer-protect.aspx

6.3. PINCER Training

The delivery of PINCER training sessions commenced on 3 October 2018. A total of 1,138 pharmacists (of a total 1,622 individuals) have been trained through a combination of eLearning tools, online resources and face-to-face Action Learning Set sessions. Delegates from a range of professional backgrounds have attended the training sessions as shown in Figure 10. Although the majority (70.2%) of delegates have been pharmacists, 13.4% of delegates have been GPs.

Figure 11. Percentage of participants from different professional backgrounds attending PINCER training sessions



6.3.1. Train-the-Trainer

To meet demand for training, we have developed a Train-the-Trainer model to enable PRIMIS Approved Trainers to train on our behalf. There are two categories of trainer:

- A PRIMIS Training Associate: this is an individual employed by PRIMIS on a contractor basis to deliver training services on behalf of PRIMIS. A contractual relationship between PRIMIS and the individual concerned is in place, with the individual charging PRIMIS for their services.
- A Trainer at a Partner Organisation: this is an individual employed by a party separate to PRIMIS to deliver PRIMIS training services using PRIMIS approved training materials.

The training programme is the same for all Approved Trainers:

- Shadow a member of the PRIMIS Team delivering the training, either during a live training event or a run through of the training materials at the University of Nottingham

- Be observed delivering the training by a member of the PRIMIS Team and receive written feedback in order to be assessed in terms of suitability to deliver training services on behalf of PRIMIS.
- Be shadowed delivering the training by a member of the PRIMIS Team on a minimum of two occasions

An Approved Trainer is only permitted to deliver training once they have received a letter from PRIMIS confirming that they have received our approval to deliver a topic or assignment.

To date, we have approved eight AHSN Training Partners and five PRIMIS Training Associates to deliver ALS2 and ALS3 training on our behalf. The AHSN Training Partners are individuals who have been identified by the AHSNs to deliver PINCER training in their localities.

6.3.2. Evaluation of Training

A total of 79 delegates who have attended the PINCER training sessions have completed an evaluation form. Scores range from “1 - Completely disagree” to “6 - Completely agree”. A summary of mean score for each category is shown below:

- The workshop learning objectives were met (4.4).
- There was a good balance between learning aids, presentation, activities and discussions (4.5).
- The learning materials were well designed and guided my learning experience (4.4).
- There was sufficient opportunity for interactive participation (4.6)
- The flow and pace of delivery of the session was appropriate (4.4)

Detailed findings from the evaluation of the training sessions for these 79 delegates are shown in Table 11 and a summary of free-text comments is shown in Box 7.

Table 11. Evaluation of Training (scores)

Delegate	AHSN	Training Date(s)	Training organisation	Training Topic	The workshop learning objectives were met	There was a good balance between learning aids, presentation, activities and discussions	The learning materials were well designed and guided my learning experience	There was sufficient opportunity for interactive participation	The flow and pace of delivery of the session was appropriate
1	East Midlands	22/01/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
2	East Midlands	22/01/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
3	East Midlands	22/01/2020	AHSN Training Partner	EMAHSN PINCER	4	4	4	4	4
4	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
5	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
6	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	5	4	4	4	5
7	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	4	5	5	5	5
8	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
9	East Midlands	30/01/2020	AHSN Training Partner	EMAHSN PINCER	4	4	4	4	4
10	East Midlands	06/02/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
11	East Midlands	06/02/2020	AHSN Training Partner	EMAHSN PINCER	5	5	5	5	5
12	East Midlands	06/02/2020	AHSN Training Partner	EMAHSN PINCER	4	4	4	4	4
13	Health Innovation Network	06/02/2020	PRIMIS	ALS3	5	5	5	5	5
14	Health Innovation Network	24/06/2019	PRIMIS	ALS3	2	3	2	2	2
15	Health Innovation Network	24/06/2019	PRIMIS	ALS3	5	5	5	5	5
16	Health Innovation Network	15/07/2019	PRIMIS	ALS3	4	5	4	3	5
17	Health Innovation Network	15/07/2019	PRIMIS	ALS3	5	5	5	5	5
18	Health Innovation Network	19/07/2019	PRIMIS	ALS3	5	5	5	5	5
19	Health Innovation Network	19/07/2019	PRIMIS	ALS3	5	5	5	5	5
20	Health Innovation Network	19/07/2019	PRIMIS	ALS3	5	5	5	5	5
21	Health Innovation Network	09/08/2019	PRIMIS	ALS3	5	5	5	5	5
22	Health Innovation Network	09/08/2019	PRIMIS	ALS3	5	5	5	5	5

23	Innovation Agency	15/10/2019	PRIMIS	ALS2	5	5	5	5	5
24	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	4	4	4	4
25	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	4	4	4	4
26	Innovation Agency	15/10/2019	PRIMIS	ALS2	5	5	4	5	5
27	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	4	4	5	5
28	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	5	5	5	4
29	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	5	4	4	4
30	Innovation Agency	15/10/2019	PRIMIS	ALS2	5	5	5	5	5
31	Innovation Agency	15/10/2019	PRIMIS	ALS2	4	4	4	4	4
32	Innovation Agency	15/10/2019 30/10/2019	PRIMIS	ALS2	4	4	4	4	4
33	Innovation Agency	15/10/2019	PRIMIS	ALS2	5	5	5	5	5
34	Innovation Agency	23/10/2019	PRIMIS	ALS2	5	5	5	5	5
35	Innovation Agency	13/11/2019	AHSN Training Partner	ALS2	4	3	3	3	4
36	Innovation Agency	23/01/2020	AHSN Training Partner	ALS2	3	4	4	4	3
37	Innovation Agency	23/01/2020	AHSN Training Partner	ALS2	3	3	3	5	2
38	Innovation Agency	23/01/2020	AHSN Training Partner	ALS2	3	4	4	5	3
39	Innovation Agency	12/03/2020	AHSN Training Partner	ALS3	5	5	4	5	4
40	Kent Surrey Sussex	04/03/2020	PRIMIS	ALS2	5	4	5	5	5
41	Kent Surrey Sussex	24/10/2019	PRIMIS	ALS2	5	5	5	5	5
42	Kent Surrey Sussex	05/11/2019	PRIMIS	ALS3	5	5	5	5	5
43	Kent Surrey Sussex	04/03/2020	PRIMIS	ALS2	4	3	4	4	4
44	Kent Surrey Sussex	30/07/2019	PRIMIS	ALS1	4	3	4	4	4
45	Kent Surrey Sussex	11/09/2019	PRIMIS	ALS1	5	4	4	5	5
46	Kent Surrey Sussex	11/09/2019	PRIMIS	ALS1	2	4	4	5	5
47	Kent Surrey Sussex	03/10/2019	PRIMIS	ALS2	5	5	5	5	4
48	Oxford	13/06/2019	PRIMIS	ALS2	4	4	4	4	4
49	Oxford	01/08/2019	PRIMIS	ALS2	5	5	5	5	5
50	Oxford	01/08/2019	PRIMIS	ALS2	5	5	3	5	5
51	Oxford	24/09/2019	PRIMIS	ALS1	5	5	5	5	5

52	Oxford	14/10/2019	PRIMIS	ALS3	5	5	5	5	5
53	Oxford	14/10/2019	PRIMIS	ALS3	5	5	5	5	5
54	South West	03/07/2019	Training Associate	ALS1	3	3	3	3	2
55	South West	04/07/2019	AHSN Training Partner	ALS1	5	5	4	5	5
56	Train-The-Trainer	06/08/2019	PRIMIS	Train The Trainer (PINCER) Day 1	5	5	4	5	5
57	UCL Partners	15/05/2019 14/06/2019 16/07/2019	AHSN Training Partner	ALS 1, ALS2,ALS3	4	5	4	5	5
58	UCL Partners	14/06/2019	PRIMIS	ALS2	4	4	4	5	4
59	UCL Partners	14/06/2019	PRIMIS	ALS2	5	5	4	5	5
60	UCL Partners	16/07/2019	PRIMIS	ALS3	5	5	5	5	5
61	UCL Partners	26/07/2019	AHSN Training Partner	ALS1	5	5	5	4	3
62	UCL Partners	26/07/2019	PRIMIS	ALS1	4	2	3	3	2
63	UCL Partners	04/09/2019	PRIMIS	ALS1	2	2	3	4	3
64	UCL Partners	27/09/2019	PRIMIS	ALS2	5	5	5	5	5
65	UCL Partners	13/11/2019	AHSN Training Partner	ALS2	5	4	4	5	5
66	UCL Partners	06/12/2019	PRIMIS	ALS3	5	5	5	5	4
67	UCL Partners	15/01/2020	AHSN Training Partner	ALS2	5	5	5	5	5
68	UCL Partners	22/01/2020	PRIMIS	ALS3	4	4	3	4	4
69	UCL Partners	22/01/2020	PRIMIS	ALS3	3	3	4	4	4
70	UCL Partners	29/01/2020	AHSN Training Partner	ALS2	4	5	4	5	4
71	UCL Partners	13/02/2020	AHSN Training Partner	ALS2	5	5	5	5	5
72	Wessex AHSN	22/05/2019 19/06/2019	AHSN Training Partner	ALS1	5	5	5	5	5
73	Wessex AHSN	18/06/2019	AHSN Training Partner	ALS2	4	4	4	4	4
74	Wessex AHSN	18/06/2019	AHSN Training Partner	ALS2	5	5	4	5	4
75	Wessex AHSN	19/06/2019	AHSN Training Partner	ALS2	5	5	5	5	5
76	Wessex AHSN	19/06/2019	AHSN Training Partner	ALS2	5	5	5	5	5
77	Wessex AHSN	19/06/2019	AHSN Training Partner	ALS2	4	4	4	4	4
78	Wessex AHSN	19/07/2019	AHSN Training Partner	ALS2	4	5	5	5	5
79	Wessex AHSN	11/02/2020	AHSN Training Partner	ALS2	4	3	3	3	3

Box 7. Summary of free-text comments from evaluation forms

Theme		Summary	Example quotes
The most useful part of this session was			
Theme 1	Networking/ opportunities for shared learning	Delegates appreciated the opportunity to network with other colleagues, share their experiences of PINCER and learn from each other.	"Chatting to others about their experience." "Discussion with peers about PINCER implementation within their practices - we learnt a lot from each other." "Getting the chance to share my story of PINCER and to be able to listen and learn from others - it was a small group but think that's what made it better." "Good chance to share experiences with peers" "Sharing everyone's experiences and how they solved obstacles in carrying out their feedback meetings." "Comparing and discussing data from neighbouring practices." "Discussion with other pharmacists who had run the searches and what they thought some of the reasons for patients being on the searches might be."
Theme 2	Greater understanding of QI tools	Delegates found the interactive nature of the training on QI tools (such as RCA) beneficial, not just for PINCER, but also for other aspects of their work.	"Methods of root cause analysis and their application into systematically establishing where to target changes to reduce resurgence of unsafe practices." " Explaining root cause analysis for use with the surgery staff" "Doing examples of Root Cause Analysis." "Reviewing items from session 2 e.g. SMART objectives"
Theme 3	Greater understanding of the data	Delegates found the opportunity to share data and gain a greater understanding of CHART Online helpful.	"Comparing my practice's results with other colleagues' practices, to see which indicators stand out in my practice." "Comparing and discussing data from neighbouring practices." "Observing CHART online" "Seeing how to utilise the PRIMIS website [CHART Online] and discussion on how pincer data can be used." "Understanding the benefits of using PINCER and explaining how to use the upload tool and analyse the results."
The least useful part of this session was			
Theme 1	Lack of detailed explanation of how to run the searches	The lack of a detailed explanation on how to run the searches and/or opportunity for hands-on experience of running the searches and analysis the results was felt to be one of the least useful parts of the training.	"Not being able to have a physical means of running a search while we are at the training to get guidance." "We did not really go over the actual mechanics of the system or how to analyse the reports" "I was hoping more from the actual process of running the audits on PRIMIS - probably my issue as I have never done anything like this and thus the 'jargon' and assumptions

			sometimes left me behind. I intend to work through the process with a technician in the coming days so hopefully all will become clearer."
How could it be improved?			
Theme 1	Provide opportunities for hands-on experience of running the searches	A number of delegates would like the opportunity for hands-on experience of running the searches to be provided during the training session.	"It [the training] was delivered efficiently- the only way to improve it would be to have a play with creating the searches ourselves on computers." "Have a dummy one [clinical system] to use for everyone to see so that any issues can be explained. I learn better by doing and not reading which the case is for other people. All learning styles are different."
Theme 2	Spend more time on understanding/ interpreting the data		"Concentrate more on the actual PINCER tool, how to adapt/analyse its data - graphs, charts etc." "We did not really go over the actual mechanics of the system or how to analyse the reports."
Theme 3	Place greater emphasis on clinical aspects of PINCER	Some delegates would have liked more training on the evidence base underpinning the PINCER intervention and also the clinical aspects of PINCER.	"A focus on clinical reasons behind the criteria used in PINCER would help some explain the background behind why we are doing it." "Discuss potential reasons that some patients may be on 'at risk' combinations and whether the benefit potentially outweighs the risks. It would be useful to have whole-group discussions on different scenarios to see what different opinions people have. Many clinical pharmacists are new to GP surgery, so discussing risk-benefit and how to tackle identified patients would be useful." "It would be really helpful if real life examples of all the reasons previous pharmacists have found for a patient coming up on a search were shared. I think this would aid understanding, share good practice and would make the work quicker to do - both in terms of finding out what needs to change and feeding back to the clinicians in order to come up with a plan. In real life, I would be concerned about missing a potential reason even after using the tools provided in the training session and if there were lists already available as a checklist, this would really help."

7. DISCUSSION

This Progress Report has given an overview of the national rollout of PINCER to GP practices in England using a social franchise approach, presented early findings in terms of impact, and provided insight into some of the key challenges faced by the PINCER Team during the scale and spread of PINCER to GP practices in England. This chapter gives a summary of the main findings, highlights key factors for success and provides insight into lessons learned from scaling a proven intervention such as PINCER in primary care.

7.1. Summary of main findings

Since September 2018, we have been rolling PINCER out to general practices in England using 13 evidence-based prescribing safety indicators. In terms of the scale and spread of PINCER, as of 3 April 2020, 130 (68%) CCGs in 14 AHSN Localities have engaged in the PINCER rollout. A total of 2,430 practices have uploaded baseline data to the national PINCER comparative analysis service showing that a minimum of 23.35 million patient records have been searched to identify instances of potentially hazardous prescribing using 13 evidence-based prescribing safety indicators. In total, 187,534 at-risk patients have been identified in at least one prescribing safety indicator at baseline giving an overall prevalence of 8.03 patients at risk of medication error per 1,000 registered patients.

Of the 2,430 practices that have uploaded baseline data to CHART Online, almost half (1,060) have uploaded follow-up data on at least one occasion. These practices are located within 86 CCGs in 13 AHSN localities. The time between baseline and latest upload for these practices ranges from less than one month to 15.5 months with 916 (86.4%) practices uploading follow-up data at least three months post-baseline.

Analysis of follow-up data from all 1,060 practices shows an overall reduction in the absolute number of at-risk patients identified in at least one prescribing safety indicator of 13,387 patients (from 92,762 to 79,375 patients; -14.4%). Greatest reductions can be seen for those indicators associated with GI bleed which showed a decrease of 10,559 at-risk patients (from 40,720 to 30,161 patients; -25.9%).

Over 1,138 pharmacists (of a total 1,622 individuals) have been trained to deliver the PINCER intervention through a combination of eLearning tools, online resources and face-to-face action learning set sessions. Delegates from a range of professional backgrounds have attended the training sessions and although the majority (70.2%) of those attending are

pharmacists, 13.4% of attendees have been GPs. To meet demand for training, we have developed a Train-the-Trainer model to enable eight AHSN Training Partners and five PRIMIS Training Associates to deliver training on our behalf.

We now have commitment from the majority of AHSNs for continued rollout of PINCER during 2020 to 2021. Further training (and Train-the-Trainer) sessions are planned, including the training of PCN pharmacists, many of whom are new to primary care, with AHSNs reporting that PINCER training has been a springboard for other local quality improvement initiatives.

7.2. Strengths and limitations

Over the last 18 months, the PINCER Team and AHSN Network have worked in partnership using a social franchise approach to scale a proven pharmacist-led intervention to reduce medication error to 2,430 GP practices across 130 CCGs in England. Although there is variation between AHSN regions in terms of uptake of the intervention amongst practices and prevalence of at-risk patients identified at baseline, it needs to be noted that AHSNs commenced rollout of PINCER at different time points, with some AHSNs having implemented previous versions of PINCER over a number of years (e.g. East Midlands and Wessex AHSNs) with other AHSNs only relatively recently coming on board (e.g. Eastern).

One of the key strengths of the national rollout has been the ability for general practices, pharmacists and named individuals at CCGs to access comparative views using the CHART Online comparative analysis service, including time-trended analyses. Over time, as more and more practices have been participating in the national rollout of PINCER, the facility has been providing a national picture of medication safety thus enabling localities to prioritise areas for improvement and providing the impetus for change and evaluate the impact of PINCER implementation. Early findings from the analysis of follow-up data from 1,060 practices have shown an overall reduction in the absolute number of at-risk patients identified in at least one prescribing safety indicator of 13,387 patients (-14.4%), with greatest reductions seen for those indicators associated with GI bleed (-25.9%). The time between baseline and latest upload varies from less than one month to 15.5 months and we know from previous studies that it takes at least 6-12 months for the intervention to bed-in and for maximum impact to be seen. Therefore, we would expect to see even greater impact as the rollout progresses.

Although it is not possible to directly attribute the reductions in numbers of at-risk patients to the PINCER intervention alone, we know from the many interactions that we have with the CCGs and pharmacists delivering the PINCER intervention (e.g. during face-to-face training sessions, national PINCER meetings and events and also through case studies, individual

feedback and social media), that strategies are being developed and quality improvement work undertaken to address the issues highlighted to maximise the impact from the implementation of PINCER. Examples of the types of strategies that have been developed are referred to in Section 6.2.5.

The provision of a comprehensive PINCER training programme, using a QI approach, is a huge strength of the national rollout, both from the perspective of the implementation of PINCER and in terms of upskilling the pharmacy workforce more generally. Although the PINCER indicators have been designed to identify a limited number of patients at significant clinical risk associated with specific groups of drugs, pharmacists report that by using the principles of root cause analysis, that they able to apply knowledge and insight gained from undertaking PINCER to improve hazardous prescribing associated with other drug groups. One of the limitations of the rollout has been the lack of capacity of the team to capture this type of impact quantitatively. However, we have encouraged those practices, pharmacists and CCGs implementing PINCER to work with us to develop case studies so that we can share good practice. One interesting observation during training sessions is that GPs and pharmacists working in primary care report that these PINCER action learning sets are the first time they have ever done any QI or root cause analysis training. This in an important and worrying finding that warrants further exploration.

One of the strengths of the replication model that we designed for the scale and spread of PINCER lies in the ability of the originator to retain a certain level of control over some aspect of the intervention, whilst at the same time allow for flexibility for local implementation. For example, in order to maintain fidelity to the PINCER intervention, the AHSNs adhere to a core set of principles and while there are various quality controls in place to ensure this occurs, the model enables each AHSN to take into consideration existing systems and resource implications when designing their unique approach to their implementation of PINCER. Another strength is that the model is sufficiently flexible to enable any organisation to become franchisees in the future and we expect to make further adaptions to the model as PCNs appoint clinical pharmacists, with PCNs potentially taking over the responsibility for implementing PINCER.

7.3. Contextual factors influencing the scale and spread of PINCER

Although there have been high levels of motivation amongst stakeholders to implement the PINCER intervention, other contextual factors have contributed to the ability to scale and spread at pace.

The national rollout of PINCER is taking place in general practices throughout England, where structures and processes are in place to encourage practices to take part in prescribing-related initiatives, and to support them with these initiatives. At the time the rollout commenced, all general practices in England were part of 195 CCGs and most of these groups had embedded pharmacists within their medicines management teams available to help practices with prescribing-related initiatives. There had been long-standing investment in pharmacists (funded by CCGs and other predecessor primary care organisations) working with general practices, and so many practices were used to the idea of being asked to take part in prescribing-related initiatives. Many of these initiatives have been associated with cost-control and in some cases general practices have been incentivised financially to take part. Nevertheless, it is standard practice in England for general practices to undertake a number of prescribing-related initiatives each year with guidance and support from pharmacists employed by CCGs. Therefore, the rollout of a medication safety initiative through CCG pharmacy teams to general practices would likely be considered an expected activity for those practices, even without financial incentives. For the CCG pharmacists, involvement in a medication safety intervention might have been considered attractive given that much of their time and resource is usually spent on cost–control, and so they may have been particularly motivated to engage with the intervention.

Within the NHS, patient safety is considered a high priority and has prominent backing from the highest levels of the organisation. Nevertheless, cost-control is also a major issue for the NHS, and this is particularly the case for CCGs, which hold the budgets for commissioning the majority of NHS services. Therefore, while CCGs might on the one hand wish to support a medication safety intervention, on the other hand they might be cautious about releasing pharmacist time to do this if this was to reduce their ability to control prescribing costs.

General practices in England have some of the most sophisticated clinical computer systems in the world, and this means that IT-based interventions such as PINCER (whereby patients at risk of hazardous prescribing are identified through searches of the GP computer system) are more feasible than they would be in other parts of the world. In addition, regulations are in place to ensure that IT-based interventions can work across different types of clinical computer system. Also, general practices in England are regularly involved in quality improvement initiatives, meaning that involvement in the PINCER intervention would not be considered an unusual undertaking.

The NHS works as a single system of healthcare, and this means that it may be more feasible than it may be in some other systems to roll out quality improvement initiatives at scale, and with fidelity. One factor that might also help here is that general practitioners in England are

paid in a mixture of ways, but capitation and quality-associated payments are particularly prominent, while fee-for-service is less common. In a fee-for-service system, it might be more difficult to encourage general practitioners to be involved in a medication safety initiative unless this was accompanied by payment.

7.4. Changes in policy over time in relation to PINCER

In recent years, a number of policy changes have happened in England that have been helpful when discussing the place of PINCER with general practices and CCGs.

Firstly, and arguably most importantly, NHS England in early 2019 set out in its long-term plan a commitment for pharmacists to take on an expanded role at the heart of local Primary Care Networks (PCNs) across the country. The new GMS contract set out the ambition for every PCN to have access to a pharmacist. In essence, this ensured that there was a commitment to establishing and expanding the workforce in place capable of carrying out the PINCER intervention in collaboration with CCG teams.

In April 2019, the GMS contract encouraged general practices to "engage with their local AHSNs to use PINCER" as part of the quality improvement domain. Practices were incentivised to demonstrate continuous quality improvement in relation to prescribing safety. And whilst not exclusively directed to PINCER, the PINCER intervention was highlighted as an example: https://www.england.nhs.uk/wp-content/uploads/2019/05/gms-contract-qof-guidance-april-2019.pdf. Although this had the positive effect of increasing engagement with general practices, due to its time-limited nature this also resulted in an increased demand for the rollout of PINCER in AHSN localities over and above those included in Year 1 plans and added to the already existing debate around "equivalence".

In July 2019, NHS Improvement published their Patient Safety Strategy. It stated that in its first year, they would "enable case finding in primary care; for example, PINCER, a pharmacist-led information technology intervention for reducing clinically important errors in general practice prescribing. This will support work to reduce prescribing error rates by 50%, improving safety and reducing costs. AHSN-supported national roll-out will reach at least 40% of general practices by 2020":
https://improvement.nhs.uk/documents/5472/190708_Patient_Safety_Strategy_for_website_v4.pdf

These national policy signals helped local conversations move away from “the data” and how to carry out the searches to more meaningful discussions about how to implement the PINCER intervention and how to replicate the results found in the original PINCER trial.

7.5. Factors for successful implementation of PINCER

The success to date of the national rollout of PINCER has been dependent on several factors, including contextual factors referred to in Section 7.3. However, five key critical success factors are outlined below.

1. Evidence-based intervention

The fact that PINCER is an evidence-based intervention, having demonstrated significant reductions in numbers of patients at risk of medication error in a robust randomised controlled trial, was the foundation of the national rollout. PINCER being incorporated into NICE guidance in 2015 added to the credibility of the intervention making it more acceptable for adoption by primary care organisations.

2. Robust replication model

Receiving funding from the Health Foundation to work with Spring Impact, global leaders in scaling proven social impact solutions, provided the team with an opportunity to develop a robust replication model, which was rigid enough to maintain fidelity to the PINCER intervention, but flexible enough to allow for adaptation for local implementation. By partnering with the 15 AHSNs using a social franchise model, we were able to roll the intervention out at much great greater pace and scale than could be achieved by a relatively small PRIMIS Team.

3. Strong leadership

Strong leadership and unwavering support, both from within the PINCER team and from the AHSN Network, was critical in the early stages of the rollout, given the challenges faced at the time. At local AHSN level, strong clinical leadership (with some primary care experience) with senior Programme Manager support was the optimal combination for successful scale and spread.

4. Provision of a comprehensive PINCER training programme

The provision of a comprehensive PINCER training programme, using a QI approach, was key to the success of the rollout, both in terms of engaging and supporting primary care pharmacists to deliver the PINCER intervention, but also in terms of engaging AHSNs through the Train-the-Trainer programme. Although the PINCER indicators have been designed to identify a limited number of patients at significant clinical risk associated with specific groups of drugs, pharmacists report that by using the principles of root cause analysis, that they able to apply knowledge and insight gained from undertaking PINCER to improve hazardous prescribing associated with other drug groups.

5. Local support ("PINCER champions")

The extent to which stakeholders engage with PINCER at different stages of implementation is a crucial factor for PINCER uptake, use and sustainability; as is securing agreement for the allocation of pharmacist resource. In keeping with the research findings, we encouraged the development of a network of "PINCER Champions", to increase levels of engagement and strategic direction at general practice, CCG and AHSN levels.

Critical factors for successful implementation in primary care organisations have been summarised in Box 7.

Box 8. Key factors for successful implementation of PINCER

Primary care organisations that have successfully implemented PINCER have capitalised on the following key factors:

- **Evidence-based intervention**
- **Local PINCER Champion**
- **Clear vision and objectives**
- **Strong stakeholder agreement at all levels**
- **Activity plan with targets**
- **Adequate resources**
- **Agreement for the allocation of pharmacist time**
- **Management commitment and support**
- **Clinical ownership**
- **Recruiting the right people**
- **Realistic expectations**

- **Control and risk management**
- **Linking in with other activities and initiatives e.g. prescribing incentive schemes**
- **Clearly defined reporting structures**
- **Commitment to monitor progress and impact**

7.6. Challenges

National scaling of a complex innovation with the AHSN Network as a partner needs to be sufficiently flexible to take account of differences in capacity and subject matter expertise across the Network by creating a supportive learning community of partners; it also needs to be sensitive to the different histories, sets of beliefs and capabilities in adopting communities. Building trusted supportive relationships between PRIMIS, AHSN Network PINCER leads, policy leads and the primary care communities adopting PINCER was critical to the success the programme achieved.

National target-setting of trajectories for adoption is a double-edged sword. It provides a focus and urgency that is very helpful; yet in some instances it can induce behaviours that focus on the means, the target, at the expense of the end, sustainable change in practice.

Where, as with PINCER, there is a rapid shift from plans for phased, national scaling over three years to a more rapid adoption of the PINCER intervention over a shorter period, there is a need to ensure that three critical elements that create levers for adoption – policy, policy guidance and messaging round both of these; PRIMIS capacity and capability to support rapid national scaling; and AHSN Network capacity and capability to support rapid scaling – are reviewed and aligned to match the level of ambition. In a system such as the NHS, juggling many priorities, achieving such alignment is a challenge but persisting in seeking to achieve it does ultimately pay dividends.

Adoption of innovation happens in a contested space with competition from other innovations and from processes that reflect the status quo. National policy guidance from NHS England and NICE referring to “PINCER or equivalent” raised questions about the “equivalence” of other primary care provider solutions. We recognise that “or equivalent” is driven by a legitimate desire to avoid “lock-in” to a single process innovation, and that it may not be possible for national policy to be specific. However, in the absence of a clear articulation by policy bodies of “equivalence”, the result was that a number of adopter communities asserted

that their existing processes were “equivalent” when this was not the case. Engaging with such communities was particularly challenging.

Additionally, these factors proved to be a significant distraction for the central AHSN MO lead team, with the first year being spent rehearsing arguments around equivalence rather than being able to support AHSNs to develop successful programmes based on lessons already learned.

AHSN/CGG staff changeover, particularly attrition of PINCER trained pharmacists was another challenge both for the PRIMIS team in terms of training capacity, but also for the AHSNs involved and may have had a detrimental effect in terms of the efficacy of the intervention.

In order to mitigate against these challenges, along with support from colleagues at Wessex AHSN and the AHSN Network, we have worked hard to develop and maintain good working relationships with key stakeholders at NHS England, AHSN, CCG and GP practice level, and also with individual pharmacists delivering the intervention, having overcome many of the initial “teething” issues experienced early in the rollout. We have also worked hard to streamline in-house systems and processes and have increased training capacity by developing a Train-The-Trainer model and by creating online resources including a PINCER eLearning package for ALS1 launched in October 2019.

7.7. Lessons learned

Key lessons learned from the national rollout of PINCER are summarised below:

1. A clear commissioning pathway and agreed milestones and outcomes are required from the outset, with input from all stakeholders.
2. Whichever replication model is used for scale and spread of any intervention, it needs to be flexible to allow for local implementation. It also must be sensitive to the different histories, sets of beliefs and capabilities in the adopting localities.
3. Mechanisms need to be in place to systematically collect qualitative as well as quantitative outcome data.
4. Involvement of the academic team who developed and tested PINCER was crucial to the success of the rollout. Although the academic team were involved in the design of the intervention from the outset, the secondment of a member of the academic team to the role of PINCER National Programme Manager, did not happen until August 2019, which was a year into the national rollout. This appointment should have occurred sooner.

7.8. Sustainability of PINCER

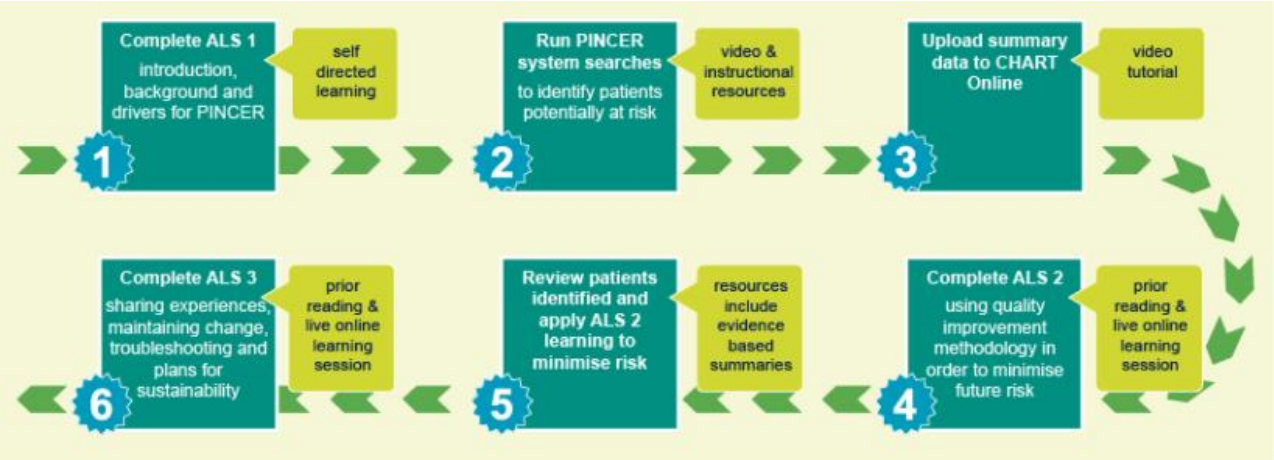
Over the next six months we plan to:

1. Focus on the sustainability of PINCER by:

    a. Working with Spring Impact to develop a sustainable model that will allow us to partner with one or more organisations once the current franchise model with AHSNs ceases (March 2021)
    b. Establishing a PINCER Strategic Advisory Group to set the longer-term strategy for the sustainability of PINCER
    c. Identifying a national sponsor for provision of continued funding in absence of AHSN support

2. Develop, pilot and implement an online PINCER training programme using a mix of eLearning materials, self-directed learning and facilitated webinars. This has largely been in response to the COVID-19 pandemic but will also contribute towards the sustainability of PINCER. A working group has been set up which includes members of the PRIMIS team and Training Associates from a number of AHSNs to develop and pilot the online materials. The first online training sessions will be piloted towards the end of July 2020, with full online PINCER training programme (Figure 12) commencing in September 2020. As part of this process, we plan to extend our Train-the-Trainer programme to train our Training Associates to deliver the PINCER training materials via an online platform.

Figure 12. Overview of the PINCER training and learning process



3. Continue to identify opportunities for further scale and spread of PINCER e.g.:
    a. Scale and spread to the home nations (Wales, Scotland, Northern Ireland). PINCER has been identified as an evidence-based approach to reducing a range of medication errors as part of the mandatory QI project in the new GMS Contract Wales: QI Framework 2019-20 and discussions about the rollout of PINCER to general practices in Wales are ongoing.
    b. Having completed a "proof of concept" study to explore the implementation of PINCER in the prison setting, we were in the process of recruiting further pilot sites when the pandemic started and recruitment was put on hold. However, we plan to resume this work once the immediate impact of the pandemic has eased.

The intervention is likely to be even more acceptable for wider use in general practice with increased access to adequate resources (particularly time for pharmacists and pharmacy technicians) and more information on the potential for PINCER to provide cost-savings through reductions in hospital admissions. The PINCER Team is exploring this as part of their NIHR Programme Grant "Avoiding patient harm through the application of prescribing safety indicators in English general practices" (PRoTeCT). Further details of this work can be found at: https://www.nottingham.ac.uk/research/groups/medicinesafetyeffectivehealthcare/protect-study/index.aspx

7.9. Impact of COVID-19 pandemic

In response to the COVID-19 pandemic, PRIMIS has developed stand-alone system searches to help practices identify patients who may be at increased risk of hospitalisation. These patients are not necessarily at an increased risk of contracting COVID-19 but, by keeping them out of hospital, it will help to reduce the current pressure on secondary care services. Equally, as these searches identify patients who are already presenting with long term conditions, these patients may experience complications if they do contract COVID-19.

The searches currently available cover respiratory health (asthma and COPD), patients at risk of gastro-intestinal bleed and medications safety and further searches will be made available in due course. Further details can be found on our targeted system searches page, including links to locations to download the searches themselves:
https://www.nottingham.ac.uk/primis/covid-19/targeted-system-searches.aspx

The NHS Specialist Pharmacy Service has recently published an operational model to help pharmacy and medicines teams implement the NHS England and NHS Improvement Primary Care and Community Health Support for Care Homes guidance.[26] The model includes a matrix

of actions that any Pharmacy and Medicines Care Home Taskforce could take, including the use of available information such as the patient clinical record and risk stratification software, including PINCER and system searches. Many GP practices will have systems in place to ensure that patients have a coded entry for 'lives in a care home' in their clinical record. Therefore, when using system searches, be that the PINCER prescribing safety indicators or any other PRIMIS tool based on a system search, the ability to filter and prioritise patients living in care homes (or residential homes) can be easily achieved.

The COVID-19 pandemic has led to a reduction in PINCER activity, as reflected in the numbers of practices uploading data to the national comparative data analysis service since April 2020. However, with the provision of online training, and a return to routine audit work in general practices, it is hoped that PINCER activity will start to resume to pre-COVID levels over the coming weeks. Discussions with AHSN MO Leads have highlighted the need to prioritise the monitoring of high risk patients, who have largely stayed away from general practice over the lock-down period.

Although patient safety is a priority area for the NHS, the magnitude of the pandemic in terms of NHS resource use might well have a negative impact on our sustainability plans, particularly in relation to securing future funding beyond AHSN involvement. Given the current financial situation all universities now find themselves in as a result of the pandemic (including the University of Nottingham) we will have to secure income prior to delivering any services. There is therefore a need to secure central funding to continue to support and make available the PINCER system searches, including the licensing of the indicators in third party software, and deliver PINCER training to primary care pharmacists, including PCN pharmacists, many of whom are new to primary care. A national sponsor would enable us to develop new indicator sets (e.g. indicators focusing on polypharmacy, anticholinergic burden or opioid prescribing for instance), expand our Train-the-Trainer programme, and retain the PINCER National Programme Manager post which is due to end in January 2021.

7.10. External awards and achievements

In recognition of our work, PRIMIS and the AHSN Network have been shortlisted for Patient Safety Team of the Year at this year's HSJ Patient Safety Awards 2020 (winners to be announced 10 November 2020). Other awards and achievements include the following:

- **Peer reviewed publications:** Rodgers S et al. Building a replication model for the national rollout of PINCER using a social franchising approach. *Pharmacoepidemiology & Drug Safety*. 2020;29(S2):3–28.

- **Other publications:** Emma Wilkinson. The GP pharmacists leading a life-saving medicines safety project. *The Pharmaceutical Journal, 18 February 2019.* Joy Ogdon. The PINCER initiative: reducing medication errors in primary care. *Prescriber, 31 May 2020.*
- **Other publications in press:** NIHR Case Study.
- **Peer reviewed presentations:** Rodgers S et al. Building a replication model for the national rollout of PINCER using a social franchising approach. Oral presentation, PRIMM (UK & Ireland) 31st Annual Scientific Meeting, 17 January 2020, Manchester, UK.
- **Other presentations:** the team have been invited to run PINCER workshops and/or present at a number of regional and national events including:
  - Medicines Optimisation Sharing Day, 27 February 2020, London.
  - Wessex AHSN: PINCER Data Sharing Event, 26 February 2020, Southampton.
  - NHSE/I National PCN Event, 28 Jan 2020, London, Birmingham, Taunton, Leeds.
  - First DataBank User Group, 1 and 2 October 2019, Nottingham & Leeds.
  - Primary Care Pharmacy Association Annual Members Conference, 10 October 2019 and 12 June 2018, London.
- **Awards received:** Shortlisted for University of Nottingham Exchange Impact Award, November 2019; shortlisted from 800 teams across the NHS Midlands and East and selected as regional winner in "The Excellence in Primary Care Award" category of the 2018 NHS70 Parliamentary Awards.
- **Conference abstracts accepted:** International Society for Quality in Healthcare (ISQua), 8 – 11 July 2021, Florence (accepted for oral presentation); Society for Academic Primary Care (SAPC), 15th -17th July, Leeds (conference cancelled but abstract published on the SAPC website during the conference dates).

7.11. Recommendations

Key recommendations arising from this work are as follows:

1. There is a need to establish a National Strategic Advisory Group to set the longer-term strategy for the development and continued funding of PINCER. This will help ensure that PINCER retains a high profile within the national patient safety strategy.
2. As AHSN Network support for this work tapers off, there is a need to identify national champions for this work committed to ensuring that a supportive policy context for implementation continues and that the learning from implementation is fed back in order to inform further policy and guidance development.
3. Further work needs to be done to establish whether reducing the risk of medication error translates into actual reduction in non-elective admissions in these patient cohorts. The

PINCER Team are currently undertaking an NIHR-funded programme of work to explore this in the East Midlands and opportunities to do this work also exist in localities such as Wessex AHSN where the majority of practices implemented PINCER.

4. The opportunity for PRIMIS to work with national NHS organisations and system suppliers to further improve the accessibility and reporting of the PINCER prescribing indicators to all GP practices in the UK.
5. The provision of QI training for GPs and pharmacists working in primary care should be increased.
6. Further consideration should be given to the wider use of social franchising as a method for scale and spread of innovation within the NHS setting.

7.12. Conclusions

PINCER has been widely implemented in general practices across England with reductions in hazardous prescribing, particularly for prescribing safety indicators associated with gastrointestinal bleeding. These early findings demonstrate the impact that PINCER is having in terms of making primary care prescribing even safer for patients and are comparable with findings from the original research study, which we have managed to replicate at scale and pace. The time between baseline and latest upload varies from less than one month to 15.5 months and we know from previous studies that it takes at least 6-12 months for the intervention to bed-in and for maximum impact to be seen. Therefore, we would expect to see even greater impact as the rollout progresses. It also needs to be noted that some AHSNs such as East Midlands AHSN started from a lower baseline prevalence of at-risk patients than other AHSNs due to having implemented previous iterations of PINCER.

The extent to which stakeholders engage with PINCER at different stages of implementation is a crucial factor for PINCER uptake, use and sustainability as is securing agreement for the allocation of pharmacist resource. The intervention is likely to be even more acceptable for wider use in general practice with increased access to adequate resources (particularly time for pharmacists and pharmacy technicians) and more information on the potential for PINCER to provide cost-savings through reductions in hospital admissions.

We now have commitment from the majority of AHSNs for continued rollout of PINCER during 2020 to 2021 and further training sessions are planned. To meet demand for training, we have developed a Train-the-Trainer model to enable AHSN Training Partners and PRIMIS Training Associates to deliver training on our behalf. In response to the COVID-19 pandemic, we have developed a suite of online resources and eLearning tools to enable online provision

of training sessions. We continue to monitor the impact of PINCER, as increasing numbers of practices upload their follow-up data to the PINCER national comparative analysis service.

We have identified that in light of the creation of Primary Care Networks (PCNs), coupled with increasing numbers of pharmacists working within these networks, with continued funding PINCER has the potential to become fully embedded into everyday clinical practice in primary care. We have been working with Spring Impact and the Health Foundation to update our replication model in readiness for AHSN Network support tapering off post-March 2021 and look forward to working with national bodies to ensure that this important safety work is embedded in areas yet to take up the intervention, and that it is sustained long-term.

THE SUITE OF PINCER RESOURCES

The suite of PINCER resources consists of:

- PINCER Handbook.
- Self-Assessment Readiness Tool.
- CCG engagement event presentation (made available during AHSN training).
- Data Processing Agreement (sent to general practices once the CCG Coordinator has confirmed the practice details and the names and email addresses of the practice information governance leads).
- PINCER Evidence Based Summaries (made available to pharmacists at training sessions).
- PINCER training materials for pharmacists (made available to pharmacists via the AHSN or CCG PINCER Coordinator).
- National PINCER Indicator data specification (available on request from the PINCER Team).
- GP system searches for use in EMIS Web, TPP SystmOne and Vision (available on request from the PINCER Team).
- Online PINCER Implementation Resource Area.
- PINCER upload tool (available on request from the PINCER Team).
- AHSN reporting template.
- Practice reporting template.
- Branding guidelines.
- Template training certificate for pharmacists and pharmacy technicians.

All of the above resources are available from PRIMIS on request.

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- The AHSN Directors, MO Leads, Project Managers and other key AHSN staff for working with us in partnership to implement PINCER at scale and pace to general practices in England.
- AHSN Training Partners and PRIMIS Training Associates for delivering PINCER training on our behalf.
- The CCGs, Medicines Management Teams, PCNs, GPs and general practices involved in the national rollout.
- The pharmacists and pharmacy technicians delivering the PINCER intervention.

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- Lincolnshire Community Health Services NHS Trust
- NHS England
- NIHR Greater Manchester Patient Safety Translational Research Centre
- NIHR School for Primary Care Research
- Spring Impact
- The Health Foundation
- The University of Edinburgh
- The University of Lincoln
- The University of Manchester

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APENDICES

Appendix 1. PINCER Query Library (PINCER 1)

Query 1: Patients with a history of peptic ulcer who have been prescribed a non-selective non-steroidal anti-inflammatory drug (NSAID) without co-prescription of a proton-pump inhibitor (PPI)

Query 2: Patients with a history of asthma who have been prescribed a beta-blocker

Query 3: Patients aged 75 years and older who have been prescribed an angiotensin converting enzyme (ACE) inhibitor or a loop diuretic long term who have not had a computer-recorded check of their renal function and electrolytes in the previous 15 months

Query 4: Women with a past medical history of venous or arterial thrombosis who have been prescribed combined hormonal contraceptives (CHC)

Query 5: Patients receiving methotrexate for at least 3 months who have not had a recorded full blood count (FBC) or liver function test (LFT) within the previous 3 months

Query 6: Patients receiving warfarin for at least 3 months who have not had a recorded check of their international normalised ratio (INR) within the previous 12 weeks

Query 7: Patients receiving lithium for at least 3 months who have not had a recorded check of their lithium concentrations in the previous 3 months

Query 8: Patients receiving amiodarone for at least 6 months who have not had a thyroid function test (TFT) within the previous 6 months

Appendix 2. PINCER Query Library (PINCER 2)

Query 1: Aspirin or clopidogrel prescribed to people with previous peptic ulcer or GI bleed without gastroprotection

Query 2: Prescription of a long-acting beta-2 agonist inhaler to a patient with asthma who is not also prescribed an inhaled corticosteroid

Query 3: Glitazone prescribed to patient with heart failure

Query 4: Metformin prescribed to a patient with renal impairment where the eGFR is ≤30 ml/min

Query 5: Prescription of oral or transdermal oestrogens to a woman with a history of breast cancer

Query 6: Prescription of oral or transdermal oestrogen without a progestogen in a woman with an intact uterus

Query 7: Prescription of a combined hormonal contraceptive to a woman aged 35 years or older who is a current smoker

Query 8: Prescription of an NSAID in a patient with chronic renal failure with an eGFR <45

Query 9: Prescription of an NSAID in a patient with heart failure

Query 10: Prescription of digoxin at a dose > 125 micrograms daily in a patient with renal impairment (e.g. CKD 3 or worse) [be aware of 125+62.5 digoxin]

Query 11: Antipsychotics prescribed for >6weeks in the over 65's with dementia but not psychosis [note time frames]

Query 12: Prescription of a combined hormonal contraceptive to a woman with a body mass index of ≥40

Query 13: Prescription of an NSAID, without co-prescription of an ulcer healing drug, to a patient with a history of peptic ulceration

Query 14: Prescription of warfarin and aspirin in combination (without co-prescription of gastroprotection)

Query 15: Prescription of warfarin in combination with an oral NSAID

Appendix 3. PINCER indicators for Scaling Up PINCER project (PINCER 3)

OUTCOME: GI BLEED

Query A: Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient aged ≥65 years

Query B: Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient with a history of peptic ulceration

Query C: Prescription of an antiplatelet drug without co-prescription of an ulcer-healing drug, to a patient with a history of peptic ulceration.

Query D: Prescription of warfarin or NOAC in combination with an oral NSAID

Query E: Prescription of warfarin or NOAC and an antiplatelet drug in combination without co-prescription of an ulcer-healing drug

Query F: Prescription of aspirin in combination with another antiplatelet drug without co-prescription of an ulcer-healing drug

OUTCOME: EXACERBATION OF ASTHMA

Query G: Prescription of a **non-selective** beta-blocker to a patient with a history of asthma

Query H: Prescription of a long-acting beta-2 agonist inhaler (excluding combination products with inhaled corticosteroid) to a patient with asthma who is not also prescribed an inhaled corticosteroid

OUTCOME: HEART FAILURE

Query I: Prescription of an oral NSAID to a patient with heart failure

OUTCOME: STROKE

Query J: Prescription of antipsychotics for >6weeks in a patient aged ≥65 years with dementia but not psychosis

OUTCOME: KIDNEY INJURY

Query K: Prescription of an oral NSAID to a patient with eGFR <45

Appendix 4. CHART Online: Overview of the range of organisational reports available and related access rights

High level overview of access rights

Data views	AHSN	CCG	Practice
Activity	• All AHSNs • CCGs in their AHSN only • Practices in their AHSN only	• All AHSNs • CCGs in their AHSN only • Practices in their CCG only	• None
Performance	• All AHSNs • CCGs in their AHSN only • **No** practice level performance data	• All AHSNs • CCGs in own AHSN • Named practices in own CCG	• All AHSNs • CCGs in own AHSN • All except own practice(s) anonymised

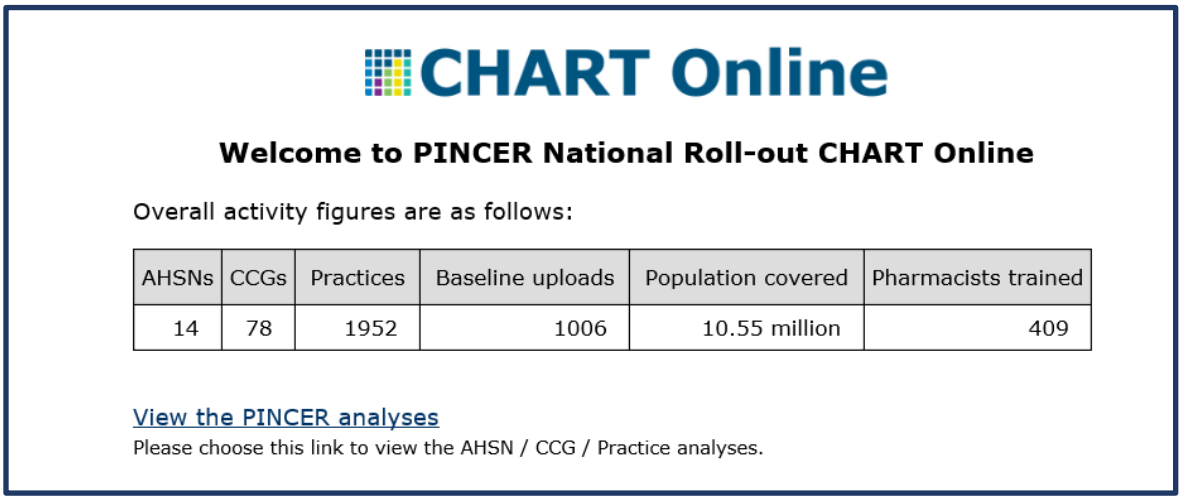
Named practice data

The only users with permission to view named practice data are:

- CCG super users (notified to PRIMIS) supporting PINCER implementation in their locality. CCG super users have permission to see the names of practices that belong to their associated CCG(s).
- Practice based users (notified to PRIMIS). A user can be attached to more than one practice. These users will see only their associated practices named in any reports.

There are no exceptions. PRIMIS can monitor activity across all AHSNs and CCGs however practice performance data is anonymised.

Landing page: The first landing section of CHART Online gives an overview of the progress and scale of the national roll out. This can be seen by all users.



Report views – access rights

Activity based report	Organisation level view	Description and access rights	Access
Pincer national rollout activity	ALL: (AHSNs) AHSN: (CCGs) CCG : (Practices)	Compare activity in terms of organisations engaged, data processing agreements signed, and baseline uploads sent. ✓ AHSN and CCG users can view all activity within own AHSN	AHSN coordinator CCG coordinator CCG pharmacists

Latest data upload reports	Organisation level view	View	Access
Indicator by organisation	ALL: (AHSNs) AHSN: (CCGs) CCG: (Practice, PCN)	View comparative results for one indicator between peer group organisation level. ✓ All users can view AHSN level comparison ✓ All uses can view all CCGs within AHSN border ✓ CCG user can compare all own practices ✓ Practice user can identify own practice compare all practices in CCG anonymised.	AHSN coordinator CCG coordinator CCG pharmacists Practice pharmacists
Organisation by all indicators	AHSN:(CCGs) CCG:(Practices) Practice:(Practices)	View comparative results for one organisation for all indicators in one chart. ✓ All users can compare own AHSN average with national average. ✓ All users can compare any CCG average with local or national average within own AHSN border. ✓ CCG user can view all practice level reports identified. ✓ Practice user can view own report and other practices anonymised.	AHSN coordinator CCG coordinator CCG pharmacists Practice pharmacists
CCG overview all indicators	CCG	View comparative results for all practices in a CCG for all indicators in one table. ✓ CCG user can view all identified practices within own CCG. ✓ practice user can view all anonymised practices against own identified practice within own CCG.	CCG coordinator CCG pharmacists Practice pharmacists

Time trend reports	Organisation level view	View	Access
Time trend all indicators one CCG	CCG	View the time trend results for one CCG for all indicators in one table ✓ All users can identify results from all CCGs within own AHSN border.	AHSN coordinator CCG coordinator CCG pharmacists Practice pharmacist
Time trend all CCGs one indicator	AHSN:(CCGs)	View the time trend results for all CCGs in one AHSN for one PINCER Indicator ✓ All users can identify results from all CCGs within own AHSN border. ✓	AHSN coordinator CCG coordinator CCG pharmacists Practice pharmacist
Time trend all practices one indicator	CCG	View the time trend results for all practices in one table for one CCG for one Indicator ✓ CCG can view all own practices identified ✓ Practice user can view all anonymised practices against own identified practice.	CCG coordinator CCG pharmacists
CCG overview time trend	CCG	View high level time trend changes for all practices in one table for one CCG for all Indicators. ✓ Practice user can view all anonymised practices against own identified practice.	CCG coordinator CCG pharmacists
Practice pdf report printing	Practice	Summary of all online graphs, tables, time trend comparing practice to CCG ✓ CCG user can print any practice report ✓ Practice user can print own report only	CCG coordinator CCG pharmacists Practice pharmacist
CCG pdf report printing	CCG	Summary of all online graphs, tables, time trend comparing all practice in CCG. ✓ AHSN user can identify and own CCG reports with practices anonymised. ✓ CCG user can see all own practices for own CCG only	AHSN coordinator CCG coordinator CCG pharmacist

Activity Data Views

Dropdown view 1: PINCER National Rollout activity

- This view shows rollout activity for each organisation e.g. numbers of engaged practices, numbers of data processing agreements (DPA) signed and uploads to CHART Online
- This level of data is accessible by the AHSN, CCG and PRIMIS. Practice based users cannot see this data. The organisation level options are: National (All), AHSN and CCG

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<tr>
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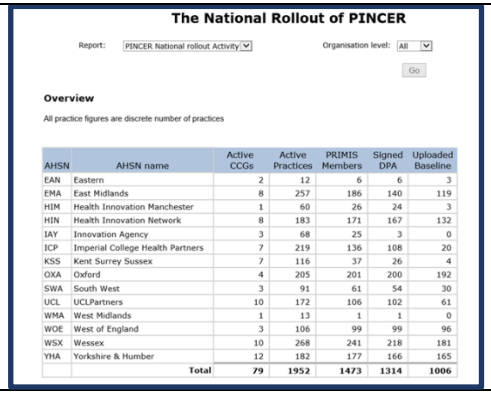
The National Rollout of PINCER

Report: PINCER National rollout Activity Organisation level: All

Go

Overview

All practice figures are discrete number of practices

AHSN	AHSN name	Active CCGs	Active Practices	PRIMIS Members	Signed DPA	Uploaded Baseline
EAN	Eastern	2	12	6	6	3
EMA	East Midlands	8	257	186	140	119
HIM	Health Innovation Manchester	1	60	26	24	3
HIN	Health Innovation Network	8	183	171	167	132
IAY	Innovation Agency	3	68	25	3	0
ICP	Imperial College Health Partners	7	219	136	108	20
KSS	Kent Surrey Sussex	7	116	37	26	4
OXA	Oxford	4	205	201	200	192
SWA	South West	3	91	61	54	30
UCL	UCLPartners	10	172	106	102	61
WMA	West Midlands	1	13	1	1	0
WOE	West of England	3	106	99	99	96
WSX	Wessex	10	268	241	218	181
YHA	Yorkshire & Humber	12	182	177	166	165
	Total	79	1952	1473	1314	1006
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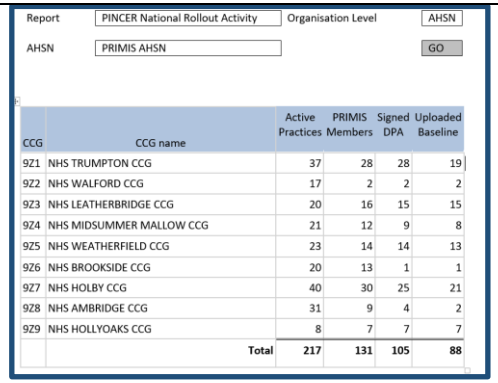
Report PINCER National Rollout Activity Organisation Level AHSN

AHSN PRIMIS AHSN GO

CCG	CCG name	Active Practices	PRIMIS Members	Signed DPA	Uploaded Baseline
9Z1	NHS TRUMPTON CCG	37	28	28	19
9Z2	NHS WALFORD CCG	17	2	2	2
9Z3	NHS LEATHERBRIDGE CCG	20	16	15	15
9Z4	NHS MIDSUMMER MALLOW CCG	21	12	9	8
9Z5	NHS WEATHERFIELD CCG	23	14	14	13
9Z6	NHS BROOKSIDE CCG	20	13	1	1
9Z7	NHS HOLBY CCG	40	30	25	21
9Z8	NHS AMBRIDGE CCG	31	9	4	2
9Z9	NHS HOLLYOAKS CCG	8	7	7	7
	Total	217	131	105	88
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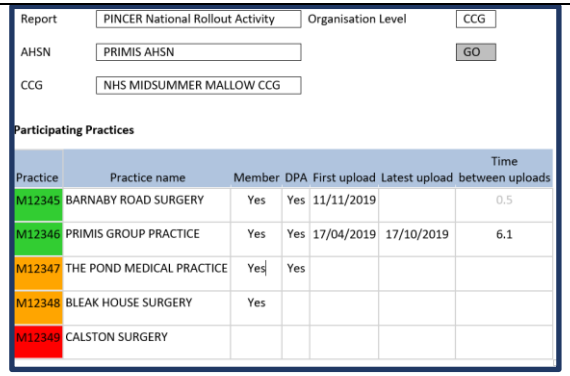

Report PINCER National Rollout Activity Organisation Level CCG

AHSN PRIMIS AHSN GO

CCG NHS MIDSUMMER MALLOW CCG

Participating Practices

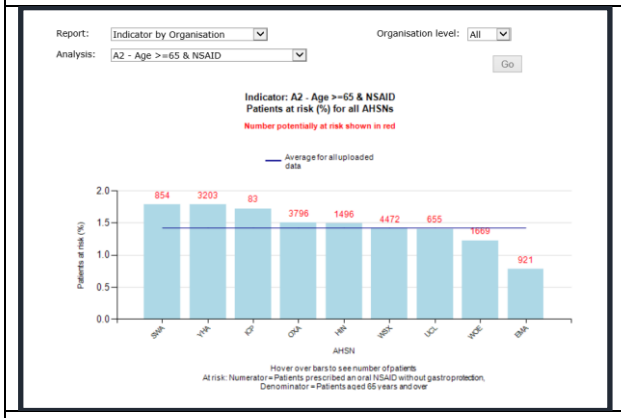
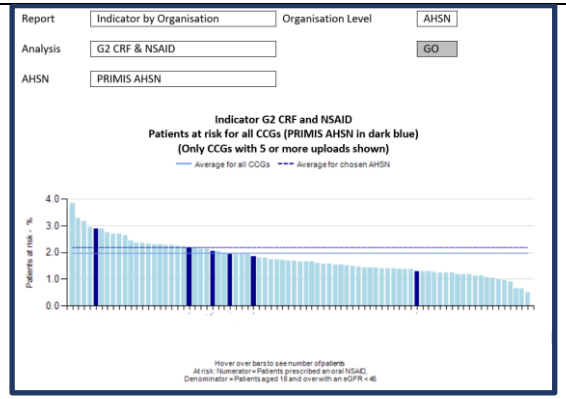
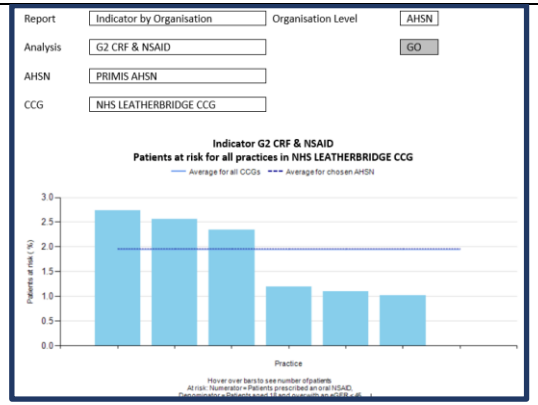
Practice	Practice name	Member	DPA	First upload	Latest upload	Time between uploads
M12345	BARNABY ROAD SURGERY	Yes	Yes	11/11/2019		0.5
M12346	PRIMIS GROUP PRACTICE	Yes	Yes	17/04/2019	17/10/2019	6.1
M12347	THE POND MEDICAL PRACTICE	Yes	Yes			
M12348	BLEAK HOUSE SURGERY	Yes				
M12349	CALSTON SURGERY					
</td>
</tr>
<tr>
<td>This view is accessible by:
• AHSN staff
• CCG super user
• PRIMIS staff</td>
<td>This view is accessible by:
• AHSN staff (own AHSN only)
• CCG super user (any CCG within their AHSN)
• PRIMIS staff</td>
<td>This view is accessible by:
• AHSN staff (only CCGs within the AHSN area)
• CCG staff (own CCG only)</td>
</tr>
<tr>
<td>Totals for each AHSN
• Number of practices signed up (active)
• Number of members (should be minimum 1 IG lead and 1 Pharmacist per practice)
• Number where practice staff member has signed a DPA
• Number of baseline uploads</td>
<td>Totals for each member CCG
• Number of practices signed up (active)
• Number of members (should be 1 IG lead and 1 Pharmacist per practice)
• Number where a practice staff member has signed a DPA
• Number of baseline uploads</td>
<td>For each practice shows
• Practice has registered members
• Both the IG lead and pharmacist have signed the DPA
• Practice has uploaded to Chart online
• Time between uploads</td>
</tr>
</table>

Performance level data

Dropdown view 2: Indicator by organisation

Provides graphical comparison for each individual indicator for a single selected organisation (hover over graph title for full description).

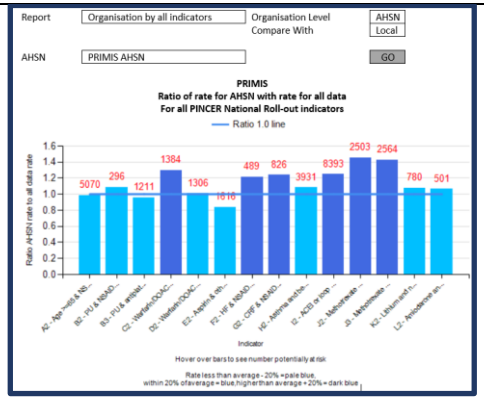
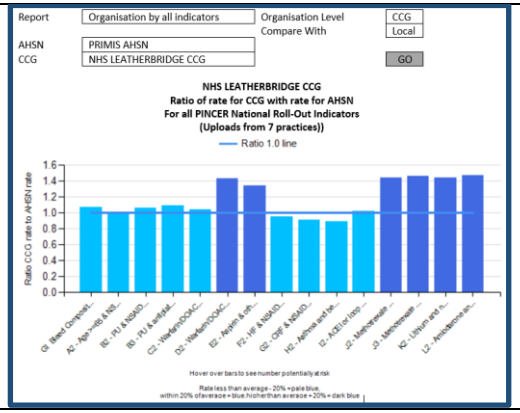
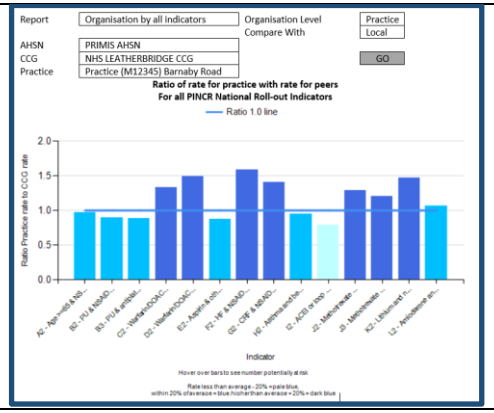
- This level of data is available to AHSN, CCG, Practice users (named practice data is subject to appropriate permissions)
- Members of the organisation are named on the x axis (anonymised for purpose of this document)
- The organisation level options are All, AHSN and CCG
- Height of column reveals percentage, this is important as this takes into account the different sizes of the peer organisations
- Data is compared with local and national averages
- The numerator and denominator are revealed by hovering over each column
- A CCG view will only be shown if it data is available from 5 or more practices. This is to enable meaningful comparisons.

ALL	AHSN	CCG
		
AHSN CCG Super-user Practice	AHSN (own AHSN only) CCG (own AHSN only) Practice (own AHSN only)	CCG (own CCG only) Practice (own practices only)
For each participating AHSN this shows: • Total number of patients at potentially risk (in red) for the selected indicator • The percentage of patients at potentially risk for the selected indicator.	For own AHSN this shows totals for selected indicator for each participating named CCG (in dark blue) including: • The percentage of patients at risk • The local average percentage • The national average	For own CCG this shows totals for selected indicator for each participating practice (anonymised except own practice(s)): • The percentage of patients at risk • The local average percentage • The national average

Dropdown view 3: organisation by all indicators

This report is designed to enable you to view comparative results for one organisation for all fourteen PINCER indicators in one chart. The percentage potentially at risk for the chosen organisation is compared with the percentage potentially at risk for a wider group and the result plotted as a ratio on the chart. This level of data is available to AHSN, CCG and practice users

- You can change comparison level between local and national averages. The average is always set to 1.0
- Compares average for organisation with average of all data for all organisations (height shows whether greater or less than average)
  For example assume the percentage potentially at risk is 20.8% and the percentage potentially at risk for all data uploaded is approximately 16.5%. The organisation percentage is (20.8% / 16.5%) = 1.26 times higher than the result for all data.
- The numerator and denominator can be revealed by hovering over each bar
- Colour coding: Rate less than 20% of average = pale blue. Rate within 20% of average = blue. Rate higher than 20% over average = dark blue

AHSN	CCG	Practice
		
AHSN (own AHSN only) CCG (own AHSN only) Practice (own AHSN only)	AHSN (CCGs within own AHSN only) CCG (CCGs within own AHSN only) Practice (CCGs within own AHSN only)	CCG (own practices identified else anon) Practice (own practices only)
• The number of patients at risk (in red) • The ratio at risk for the AHSN for each indicator • Compared with overall local or national average for all indicators	• The ratio at risk for CCG for each indicator • Compared with overall local or national average for all indicators • The local number of practices uploading and included in average totals	• The ratio at risk for CCG for each indicator • Compared with overall local or national average for all indicators

Dropdown view 4: CCG overview, all indicators

For this report choose an organisation at CCG level. A grid will be shown with a single row for each practice and a column for each PINCER indicator.

- This level of data is available to CCG and Practice users only
- Table compares shows practices and all indicators in one table
- Table shows which practices have uploaded and the date of the last upload
- Each column label has hyperlink to relevant evidence based summary
- CCG staff can view all practice ID codes
- Practice attached staff can view associated practice IDs only (else anonymised).

CCG / Practice

Report: CCG overview all indicators

Organisation Level: CCG

Measure: Number at risk

AHSN: PRIMIS AHSN

CCG: NHS LEATHERBRIDGE CCG

GO

Practice	Ref Date	A2	B2	B3	C2	D2	E2	F2	G2	H2	I2	J2	J3	K2	L2
M12345	18/06/19	10	1	2	2	3	5	0	0	8	9	3	4	6	2
M23456	28/05/19	3	0	1	2	5	4	1	1	7	4	0	0	2	0
P_01701	21/06/19	6	0	3	0	3	6	0	0	9	7	11	11	3	1
P_01692	21/06/19	26	0	5	3	1	5	0	0	7	48	4	7	1	5
P_01756	28/06/19	8	1	10	0	3	11	0	1	16	16	5	4	6	1
P_01679	19/06/19	20	0	5	1	4	2	0	0	10	22	4	5	4	0
P_01869	26/07/19	33	3	6	3	1	10	3	9	14	23	4	3	2	4
P_01866	31/07/19	2	0	2	1	3	4	0	0	12	7	0	0	1	2

Hover over column header to view indicator description
Click on a column header to review evidence base

Functions

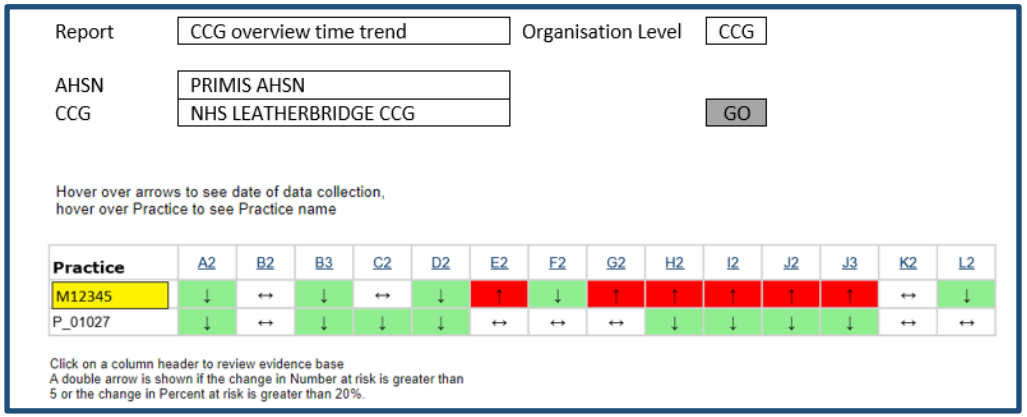
The numbers in the grid can be switched to show the number of patients potentially at risk, the percentage of patients potentially at risk or the rank quartile.

The colour shading of each cell reflects the rank quartile position of the practice in the CCG for percentage of patients potentially at risk. Darker shades indicate a lower rank position e.g. quartile 1 = white, (which means relatively fewer patients potentially at risk) quartile 4 = dark blue (which means relatively more patients potentially at risk)

Dropdown view 5: CCG overview time trend

- This level of data is available to CCG and practice users only
- Table shows pictorial indication of the change in the numbers of patients at risk.
- Compares all practices that have uploaded at least twice
- Compares latest upload with first upload
- Hover over cell to see date and number at risk for baseline and latest upload.
- One column per indicator
- Each column label has hyperlink to relevant evidence based summary
- CCG can view all practice ID codes
- Practice attached staff can view associated practice ID codes only (else anonymised)

CCG/Practice



Report: CCG overview time trend | Organisation Level: CCG

AHSN: PRIMIS AHSN

CCG: NHS LEATHERBRIDGE CCG | GO

Hover over arrows to see date of data collection, hover over Practice to see Practice name

Practice	A2	B2	B3	C2	D2	E2	F2	G2	H2	I2	J2	J3	K2	L2
M12345	↓	↔	↓	↔	↓	↑	↓	↑	↑	↑	↑	↑	↔	↓
P_01027	↓	↔	↓	↓	↓	↔	↔	↔	↓	↓	↓	↓	↔	↔

Click on a column header to review evidence base
A double arrow is shown if the change in Number at risk is greater than 5 or the change in Percent at risk is greater than 20%.

Description

- Green cell and down arrow = small decrease
- Red cell and up arrow = small increase
- White cell horizontal arrow, Change in percentage at risk less than 0.1, or no change in number at risk and change in percentage at risk less than 5
- Any colour and double arrow = change in number at risk greater than 5 or change in percent is greater than 20%
- Hover over cell to see dates of both uploads and numbers of patients at risk with each upload.

Note: It is possible that the number at risk goes up but the percentage at risk goes down and vice versa. In this case ↔ will be shown.