Medicines Optimisation sharing Day: PINCER

Royal Pharmaceutical Society, London

19 June 2017

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Plan for presentation

• Overview of PINCER intervention

• Current work

• What are our main research findings and how are we implementing these findings into practice?

• Plans for future work
• Medication errors in primary and secondary care are an important cause of morbidity and mortality

• Prescribing errors
  - 1 in 20 items with an error – 1 in 550 with a serious error
  - Over 1 billion items dispensed in 2015 = 1.8 million serious prescribing errors

• Preventable medication-related admissions to hospital
  - These account for around 1 in 25 hospital admissions
  - Annual cost of £650m per year

• 4 classes of drug account for over 50% of these admissions:
  - Anti-platelets, non-steroidal anti-inflammatory drugs (NSAIDs), diuretics and anticoagulants

**Big implications in terms of patient safety and costs**
The PINCER Intervention

Pharmacist-led IT-based intervention to reduce rates of clinically important errors in medicines management in general practices

1. Conducting searches on GP clinical systems to identify patients at risk from common and important prescribing and drug monitoring errors

2. Pharmacists (trained in the PINCER approach) working with general practices to develop an action plan to correct and prevent potentially hazardous prescribing

3. Pharmacists (and pharmacy technicians) working with and supporting general practice staff to implement the action plan
The PINCER Trial

A cluster randomised trial comparing the effectiveness of a pharmacist-led IT-based intervention with simple feedback in reducing rates of clinically important errors in medicines management in general practices.

Overview

• The study involved at-risk patients in 72 general practices who were being prescribed drugs that are commonly and consistently associated with medication errors.

• These included the prescription of NSAIDs and beta blockers, and the monitoring of ACE inhibitors or loop diuretics, methotrexate, lithium, warfarin, and amiodarone.
Cluster randomised trial

72 General Practices consented into the study

Simple feedback
Computer-generated feedback on patients at potential risk from hazardous prescribing (n=36)

Pharmacist-led intervention (PINCER)
Simple feedback plus educational outreach and dedicated support to correct and prevent potentially hazardous prescribing (n=36)
PINCER Trial

- PINCER intervention is an effective method for reducing a range of clinically important and commonly made medication errors in primary care.

- At 6-months follow-up patients in the PINCER group had significantly fewer prescribing errors than those in the control group.

- There was evidence that the intervention was cost-effective.

- Could be rolled out across NHS at low cost to reduce medication errors.
Roll out of PINCER Approach

- We have worked with PRIMIS to launch a new PINCER Query Library tool

- Extension of the PRIMIS suite of audit tools

- Consists of eight Rx safety indicators used in the trial

- The aim is to identify patients at risk of medication error so that corrective action can be taken

http://www.nottingham.ac.uk/primis/index.aspx
### 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
Overview of the PINCER Query Library Tool

1. CHART software installed on GP practice computer
   [http://www.nottingham.ac.uk/primis/tools-software/chart/chart.aspx](http://www.nottingham.ac.uk/primis/tools-software/chart/chart.aspx)

2. CHART software used to download the PINCER Query Library

3. PINCER Queries run on GP clinical system using MIQUEST software

4. Data provided to GP practices at individual patient level, with those patients ‘at risk’ highlighted
### General practice view

#### PINCER QUERY SET

**PEPTIC ULCER, NSAID AND PPI**

**PATIENTS AT RISK**

(Other case figures for full description)

<table>
<thead>
<tr>
<th>PINCIS</th>
<th>CHART</th>
<th>The University of Nottingham</th>
</tr>
</thead>
</table>

**FURTHER DETAILS**

<table>
<thead>
<tr>
<th>Patients aged 18 or over with a Peptic Ulcer Read code that is dated over 6 months ago (NM these patients can be seen at the ophthalmic hospital)</th>
<th>339</th>
<th>equals</th>
<th>7</th>
<th>equals</th>
<th>332</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>160.00%</td>
<td>2.00%</td>
<td>57.04%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>332</td>
<td>equals</td>
<td>79</td>
<td>equals</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>100.00%</td>
<td>24.57%</td>
<td>50.15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescription of PPI within the last 6 months</td>
<td>83</td>
<td>equals</td>
<td>3</td>
<td>equals</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>100.00%</td>
<td>3.63%</td>
<td>50.63%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No prescription of PPI within the last 6 months</td>
<td>256</td>
<td>equals</td>
<td>3</td>
<td>equals</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>100.00%</td>
<td>1.17%</td>
<td>0.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These patients can be identified by using preset filter 1 on the datasheet.

#### Patients with Peptic Ulcer AND who have no prescription of PPI in the last 6 months

256

#### OF which have a prescription for NSAID in the last 6 months

3

#### Percentage

1.17%
General practice comparative views

- We have worked with PRIMIS to develop aggregated views of anonymised patient data using CHART Online.

- This allows practices to view their results in relation to other practices within their CCG and see improvements over time.
CHART Online

Various views of data:

- Compare all practices one indicator
- Compare one practice all indicators
- Compare practice progress time trend
Query 1: Patients with a past medical history of peptic ulcer who have been prescribed a non-selective NSAID without co-prescription of a PPI

What is the risk to patients?

According to the BNF, the CSM has advised that non-selective NSAIDs are contraindicated in patients with previous or active peptic ulceration. Several case-control and cohort studies have found a significant association between prolonged use of NSAIDs and upper gastrointestinal ulceration and bleeding. A past history of peptic ulcer increases the risks of bleeding associated with NSAIDs by around three-fold. There is increased susceptibility of older patients to the side effects of NSAIDs owing to age related reduction in renal clearance. Many older patients thus accrue drugs slowly and are highly susceptible to the gastrointestinal side effects of NSAIDs through their inhibition of COX-1 enzymes in the gastrointestinal tract (BNF).

What evidence is there that this pattern of prescribing is harmful?

The BNF identifies gastrointestinal toxicity as one of the common side effects of long term use of NSAIDs. It warns that all NSAIDs are associated with serious gastrointestinal toxicity, the risk being highest in the elderly. Evidence on the relative safety of certain NSAIDs indicates differences in risk, with aspirin (discontinued in the UK) being the highest risk and ibuprofen the lowest. Proxamic, ketoprofen, indometacin, naproxen and diclofenac are associated with intermediate risk.
Key impacts

• The PINCER Query Library Tool is available to all GP practices in England and has been accessed by >2,000 GP practices across 196 CCGs

• Rolled out to GP practices in Wessex AHSN

• Piloted in 20 GP practices in Northern Ireland with potential for rollout to all practices

• The intervention has now been supported by NICE in its ‘Medicines Optimisation Clinical Guideline’ published 04/03/15 and available at: http://www.nice.org.uk/guidance/ng5/evidence

‘Organisations and health professionals should consider applying the principles of the PINCER intervention to reduce the number of medicines-related patient safety incidents, taking account of existing systems and resource implications.’
Recent work
PINCER 3: Prescribing Safety Indicators

We have focused on indicators associated with significant harm:

- Gastrointestinal bleed (6 indicators + composite outcome)
- Acute exacerbation of asthma (2 indicators)
- Heart failure (1 indicator)
- Stroke in dementia (1 indicator)
- Acute kidney injury (1 indicator)
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 >6 weeks 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
General practice/CCG summary view

Practice position in the CCG for each analysis

GI Bleed Composite score
40 events / 40 patients

Age >= 65, no gastroprotection but oral NSAID
19 patients at risk

Peptic ulcer, no gastroprotection but oral NSAID
No patients at risk

Peptic ulcer, no gastroprotection but antiplatelet
1 patient at risk

Warfarin / NOAC & oral NSAID
2 patients at risk

Warfarin / NOAC antiplatelet & no gastroprotection
6 patients at risk

Asthma, long acting beta 2-agonist inhalers & inhaled corticosteroids
No patients at risk

Heart failure & NSAID
1 patient at risk

Dementia but no psychosis & anti-psychotics
7 patients at risk

Chronic renal impairment & NSAID
1 patient at risk
## CCG comparative view

<table>
<thead>
<tr>
<th>Indicator score (at risk / potentially at risk (%))</th>
<th>CCG average</th>
<th>National average</th>
<th>Practice spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Age &gt;=65 and NSAID</td>
<td>2.07%</td>
<td>2.37%</td>
<td></td>
</tr>
<tr>
<td>B - PU and NSAID</td>
<td>2.42%</td>
<td>2.10%</td>
<td></td>
</tr>
<tr>
<td>C - PU and antiplatelet</td>
<td>7.41%</td>
<td>7.00%</td>
<td></td>
</tr>
<tr>
<td>D - Warfarin and NSAID</td>
<td>0.91%</td>
<td>1.28%</td>
<td></td>
</tr>
<tr>
<td>E - Warfarin and antiplatelet</td>
<td>3.88%</td>
<td>4.16%</td>
<td></td>
</tr>
<tr>
<td>F - Aspirin and other antiplatelet</td>
<td>4.22%</td>
<td>4.87%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator score (at risk / potentially at risk (%))</th>
<th>CCG average</th>
<th>National average</th>
<th>Practice spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>G - Asthma and beta-blocker</td>
<td>1.21%</td>
<td>0.91%</td>
<td></td>
</tr>
<tr>
<td>H - Asthma LABA and no ICS</td>
<td>24.37%</td>
<td>17.95%</td>
<td></td>
</tr>
<tr>
<td>I - HF and NSAID</td>
<td>2.58%</td>
<td>2.05%</td>
<td></td>
</tr>
<tr>
<td>J - Dementia and anti-psychotic</td>
<td>10.87%</td>
<td>10.61%</td>
<td></td>
</tr>
<tr>
<td>K - CRF and NSAID</td>
<td>2.54%</td>
<td>2.15%</td>
<td></td>
</tr>
</tbody>
</table>
## CCG composite indicators view

<table>
<thead>
<tr>
<th>Composite scores (rate per 1000)</th>
<th>CCG average</th>
<th>National average</th>
<th>Practice spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI Bleed</td>
<td>6.12</td>
<td>5.17</td>
<td></td>
</tr>
<tr>
<td>Other Indicators</td>
<td>2.70</td>
<td>2.57</td>
<td></td>
</tr>
<tr>
<td>All Indicators</td>
<td>8.61</td>
<td>7.61</td>
<td></td>
</tr>
</tbody>
</table>
Current work: HF Scaling Up PINCER

Findings to date:

- 361 general practices in 12 CCGs (>94%)
- 279 TPP; 82 EMIS Web
- >2.9 million patient records searched
- 21,617 cases of potentially hazardous prescribing identified
- Funnel plots and Statistical Process Control charts fed back to CCGs
Current work: HF Scaling Up PINCER

Funnel Plots

- Funnel plot
  - Upper control limit
  - Lower control limit
  - Mean
  - Outlier

Statistical Process Control Charts

- Indicator: Age >= 65, no gastroprotection but oral NSAID
  - (Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient aged >= 65 years)
- X (horizontal) axis: Timeline of past data collection
- Y (vertical) axis: Percentage of patients exposed to hazardous prescribing
- Diamond shape denotes the existence of special cause variation
Indicator A: Prescription of an oral NSAID, without co-prescription of an ulcer healing drug, to a patient aged ≥65 years
Future work

**NIHR PRoTeCT:** Avoiding patient harm through the application of prescribing safety indicators in English general practices.

**Aim:** To evaluate the application of ‘prescribing safety indicators’ in English general practices to reduce hazardous prescribing and avoidable harm to patients.

This will include the introduction of prescribing safety indicators to computerised decision support software, and a pharmacist-led IT-based intervention (PINCER).

**Start date:** 01 March 2017  
**End date:** 29 August 2021
NIHR PRoTeCT

Avoiding patient harm through the application of prescribing safety indicators in English general practices

- CPRD studies to explore risk of serious harm
- Evaluation of Optimise Rx CDS
- Process evaluation to generate policy recommendations
- Evaluation of PINCER when rolled out at scale
- 1\textsuperscript{st} and 2\textsuperscript{nd} care data linkage to investigate morbidity
- Economic impact of hazardous prescribing
WHO’s Third Global Patient safety Challenge

“Now the Third Global Patient Safety Challenge seeks the commitment of health ministers, health-system leaders, and a range of stakeholders, including educational institutions, experts……and professional organisations. Its goal will be to reduce the level of severe, avoidable harm related to medications by 50% over 5 years, globally.”

Medication Without Harm: WHO’s Third Global Patient Safety Challenge

In 1956, Alphonse Capunis, turned his attention from engineering to health care. In a study of medication-related errors in a 1100-bed hospital, he and his colleague identified seven sources of such errors potentially leading to harm to a patient: medicine omitted, or given to the wrong patient, at the wrong dose, as an unintended extra dose, by the wrong route, at the wrong time, or as the wrong drug entirely. Almost 60 years later, these same types of errors still happen worldwide. Later that year in a follow-up policy paper, Capunis identified four areas of recommendations that could prevent harm and remain relevant today: written communication, medication procedures, the working environment, training, and education. Indeed, it is difficult to avoid the conclusion that had the recommendations from this revelatory patient safety research been assiduously followed over the past five decades, hundreds of thousands fewer patients would have been killed or seriously harmed by the medicines intended to make them well.

Beginning in 2004, WHO, working in partnership with the then World Alliance for Patient Safety, initiated two Global Patient Safety Challenges, Clean Care is Safer Care and Safe Surgery Saves Lives. These challenges mobilised worldwide commitment and action to reduce health-care-associated infections and risk associated with surgery, respectively. At the second Global Summit of Health Ministers on Patient Safety in Bonn, Germany, on March 29, 2012, the Director-General of WHO announced that the Third Global Patient Safety Challenge, Medication Without Harm, would address medication safety.

The previous challenges secured strong and early commitment from health ministers, professional bodies, regulators, health leaders, civil society, and health-care practitioners. The action required to deliver the goals of each was broadly similar: an evidence-based analysis of the key problems and solutions; an invitation to WHO member states and other relevant parties to pledge, or sign-up, to address the aims of the challenge; high-profile actions to generate passion and enthusiasm; facilitation
Could PINCER be rolled out in your AHSN?

**Obtain stakeholder backing for PINCER**
- Consider who pays for the pharmacists time i.e. CCG/practice
- Include PINCER into a work plan/incentive scheme and find a GP advocate
- Long term view
- Communication plan for practices

**Commitment from the prescribing team**
- Change to previous working, each practice is different
- Name a lead to drive the project forward and be the link person

**Consider IT skills and access rights**

**Consider how to evidence the changes**

**Cost pressures change priorities frequently**
- Consider how to keep PINCER a focus
- Barriers/facilitators
Thank you for listening

Any comments/question?

Further information available from:

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