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Effect of Financial Incentives on Incentivised and Non-Incentivised Clinical Activities

Utilising Primary Care Databases to answer clinical, policy and methodological questions

Evan Kontopantelis    Tim Doran    David Reeves

Centre for Primary Care
Institute of Population Health
Faculty of Medicine
University of Manchester

NSPCR showcase, 19th October 2012
Other departments

- University of Birmingham - Ronan Ryan
  - Regional GP datasets and The Health Improvement Network (THIN)
  - Implementing risk models derived from PCD data in practice (prevention, early detection)

- Keele University - Kelvin Jordan
  - CPRD and local CiPCA
  - Emphasis on musculoskeletal disorders (burden, long term course, management)

- UCL - Irene Petersen (THIN Database Research Team)
  - Drugs prescribed in pregnancy, missing data methods, cardiovascular diseases in SMI patients
  - Hosts a national primary care database user group and provides training courses
  - International initiative to develop reporting guidelines for electronic health records (RECORD)

Outline

1. Background
2. Concluded work
   - Non-incentivised care
   - Diabetes
3. Current work
A pay-for-performance (p4p) program kicked off in April 2004 with the introduction of a new GP contract

- General practices are rewarded for achieving a set of quality targets for patients with chronic conditions
- The aim was to increase overall quality of care and to reduce variation in quality between practices

The incentive scheme for payment of GPs was named the Quality and Outcomes Framework (QOF)

- Initial investment estimated at £1.8 bn for 3 years (increasing GP income by up to 25%)
- QOF is reviewed at least every two years

Quality and Outcomes Framework details for years 1 (2004/5) and 7 (2010/11)

- Domains and indicators in year 1 (year 7):
  - Clinical care for 10 (19) chronic diseases, with 76 (80) indicators
  - Organisation of care, with 56 (36) indicators
  - Additional services, with 10 (8) indicators
  - Patient experience, with 4 (5) indicators

- Implemented simultaneously in all practices (a control group was out of the question)

- Practices are allowed to exclude patients from the indicators and the payment calculations

- Into the 9th year now (01Mar12/31Apr13); cost for the first 8 years was well above the estimate at £8 bn approximately
The Clinical Practice Research Datalink (CPRD)

- Established in 1987, with only a handful of practices
- Since 1994 owned by the Secretary of State for Health
- In July 2012:
  - 644 practices (Vision system only)
  - 13,772,992 patients
- Access to the whole database is offered and costs approximately £130,000 pa
- Offers the ability to extract anything adequately recorded in primary care and construct a usable dataset
Effect of Financial Incentives on Incentivised and Non-Incentivised Clinical Activities

BMJ

Effect of financial incentives on incentivised and non-incentivised clinical activities: longitudinal analysis of data from the UK Quality and Outcomes Framework

Tim Doran clinical research fellow1, Evangelos Kontopantelis research associate1, Jose M Valderas clinical lecturer2, Stephen Campbell senior research fellow1, Martin Roland professor of health services research1, Chris Salisbury professor of primary healthcare2, David Reeves senior research fellow1

1National Primary Care Research and Development Centre, University of Manchester, Manchester M13 9PL, UK; 2NHRI School for Primary Care Research, Department of Primary Health Care, University of Oxford, Oxford OX3 7LF, 3General Practice and Primary Care Research Unit, University of Cambridge, Cambridge CB2 0SR; 4Academic Unit of Primary Health Care, University of Bristol, Bristol BS8 2AA
Incentivised aspects keep improving

- Quality scores for all QOF clinical indicators have been improving
- Only a small proportion of all clinical care
- Concerns that quality for non-incentivised aspects may have been neglected
- How measure performance on non-incentivised care?

Clinical indicators

- Two aspects to clinical indicators:
  - a disease condition (e.g. diabetes, CHD)
  - a care activity (e.g. influenza vaccination, BP control)
- Three indicator classes, in terms of incentivisation:
  - (FI) Condition & process incentivised in QOF (28 ind)
  - (PI) Condition or process incentivised (13 ind)
  - (UI) Neither condition nor process incentivised (7 ind)

Example (Indicators)

- (FI) DM11: Patients with diabetes in whom the last blood pressure (within 15m) is 145/85 or less
- (PI) B4: Patients with peripheral arterial disease who have a record of total cholesterol in the last 15m
- (UI) C4: Patients with back pain treated with strong analgesics (co-dydramol upwards) in the last 15m
Research questions
the obvious ones at least!

- We aimed to compare the three classes on changes in quality from pre-QOF (2000/1 - 2002/3) to post-QOF (2004/5 - 2006/7)
- Would FI indicators show most improvement?
- Would PI show some ‘halo’ effects since they involve either a QOF condition or activity?
- Has quality for UI indicators declined?

Issues to tackle

- Indicator classes are imbalanced
- Three different types of activities (x3 classes = 9 groups):
  - clinical processes related to measurement (PM/R)
    F1:17    P1:9    U1:0
    e.g. blood pressure measurement
  - clinical processes related to treatment (PT)
    F1:6    P1:4    U1:7
    e.g. influenza immunisation
  - intermediate outcome measures (I)
    F1:5    P1:0    U1:0
    e.g. control of HbA1c to 7.4 or below
- Quality of care was already improving (prior to QOF)
- The ceiling has been reached for certain ‘easy’ indicators
The approach

With ITS multi-level multiple regression analyses, compared the six indicator groups on two outcomes:

- The difference between observed and expected achievement, in 2004/5
- The difference between observed and expected achievement, in 2006/7
Trends by indicator group

Indicator group performance

Logit transformed scores

Using group means of indicator means (by practice) in brackets, the number of indicators in each group.
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Background
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Diabetes
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Trends by indicator group

Indicator group performance
Logit transformed scores

Year

FI–PM/R (17) FI–PT (6) FI–I (5)
PI–PM/R (5) PI–PT (2) UI–PT (2)

using group means of indicator means (by practice) in brackets, the number of indicators in each group

Trends by indicator group

Indicator group performance
Logit transformed scores

Year

FI–PM/R (17) FI–PT (6) FI–I (5)
PI–PM/R (5) PI–PT (2) UI–PT (2)

using group means of indicator means (by practice) in brackets, the number of indicators in each group
Trends by indicator group

Indicator group performance
Logit transformed scores

using group means of indicator means (by practice)
in brackets, the number of indicators in each group
All three fully incentivised indicator groups significantly increased in level above expectation post-QOF

All partially incentivised treatment indicators significantly decreased in level below expectation post-QOF

### Difference in 2004/5

<table>
<thead>
<tr>
<th>Uplift in 2004/5</th>
<th>Group</th>
<th>Fully incentivized measurement</th>
<th>Fully incentivized outcome</th>
<th>Fully incentivized treatment</th>
<th>Partially incentivized measurement</th>
<th>Unincentivized treatment</th>
<th>Partially incentivized treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td></td>
<td>14.5%</td>
<td>8.2%</td>
<td>4.2%</td>
<td>0.8%</td>
<td>-0.7%</td>
<td>-1.5%</td>
</tr>
<tr>
<td>95% confidence interval</td>
<td></td>
<td>(14.0, 15.0)</td>
<td>(7.3, 9.2)</td>
<td>(3.2, 5.3)</td>
<td>(-0.2, 1.8)</td>
<td>(-1.8, 0.5)</td>
<td>(-3.0, -0.2)</td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.128</td>
<td>0.257</td>
<td>0.03</td>
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<tr>
<td>Difference between means**</td>
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<td>[---------------------------]</td>
<td>[---------------------------]</td>
<td>[---------------------------]</td>
<td>[---------------------------]</td>
<td>[---------------------------]</td>
<td>[---------------------------]</td>
</tr>
</tbody>
</table>

* Group means based on logit-transformed data, back-transformed to percentage scores.

** Neuman-Keuls tests. Means connected by a dashed line were not significantly different (p > 0.05).

### Difference in 2006/7

All three fully incentivised indicator groups significantly increased in level above expectation post-QOF

All partially incentivised and non-incentivised indicator groups significantly decreased in level below expectation post-QOF

<table>
<thead>
<tr>
<th>Uplift in 2006/7</th>
<th>Group</th>
<th>Fully incentivized measurement</th>
<th>Fully incentivized outcome</th>
<th>Fully incentivized treatment</th>
<th>Unincentivized treatment</th>
<th>Partially incentivized treatment</th>
<th>Partially incentivized measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td></td>
<td>3.9%</td>
<td>3.9%</td>
<td>2.4%</td>
<td>-1.2%</td>
<td>-2.8%</td>
<td>-5.1%</td>
</tr>
<tr>
<td>95% confidence interval</td>
<td></td>
<td>(2.9, 4.8)</td>
<td>(3.1, 4.6)</td>
<td>(1.4, 3.3)</td>
<td>(-2.3, -0.2)</td>
<td>(-4.2, -1.5)</td>
<td>(-6.2, -3.9)</td>
</tr>
<tr>
<td>P value</td>
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<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.024</td>
<td>&lt;0.001</td>
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<tr>
<td>Difference between means**</td>
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<td>[---------------------------]</td>
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<td>[---------------------------]</td>
<td>[---------------------------]</td>
<td>[---------------------------]</td>
</tr>
</tbody>
</table>

* Group means based on logit-transformed data, back-transformed to percentage scores.

** Neuman-Keuls tests. Means connected by a dashed line were not significantly different (p > 0.05).
Conclusions

- Short term, on average:
  - The 3 groups of fully incentivised indicators exhibited performance above expectation
  - Partially incentivised treatment indicators demonstrated significantly lower than expected gains

- Long term, on average:
  - Fully incentivised groups continued to have positive uplifts
  - The three partially incentivised and non-incentivised groups displayed significantly negative uplifts

- QOF did not generate positive spill-overs to other activities & appears to have had a negative impact on non-incentivised ones
Practice level care for Diabetes keeps improving but...

- Quality of care for diabetes known to improve post-QOF
- Did QOF really have an effect, if we account for pre-QOF trends?
- Does quality of care vary across patient subgroups?
- Did the scheme potentially benefit all subgroups uniformly?

The approach

- 23,920 type I & II diabetes patients identified in 148 practices and a sample of 653,500 from CPRD
- Data extracted in yearly ‘bins’, corresponding to QOF years, from 2000/1 to 2006/7
- Three time points before and 3 after the intervention
- For each time point, annually recorded quality of care at the patient level was quantified as an aggregate of the applicable diabetes indicators (of the 17 possible)
- ITS analysis used again, the best possible quasi-experimental approach, in lack of a control group
- Logistic transformation to deal with ceiling effect
Analyses three main analyses

- Examined the overall impact of the QOF pay-for-performance scheme in the CPRD diabetes population
- Compared mean QOF scores in the pre- and post-QOF periods for different patient subgroups
- Examined if the intervention impact varied by patient subgroups (controlled analysis)

Overall pay-4-performance impact

Analysis 1

- In 2004/5 there was improvement in composite recorded QOF care over-and-above that expected from the pre-intervention trend, of 14.2% (13.7%-14.6%)
- By the third year (2006/7), the difference was smaller, at 7.3% (6.7%-8.0%)
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### Differences in pre- and post-QOF level of care
**Analysis 2**

- Score higher for patients aged 65+ than in patients aged 17-39 by 11% pre- and 11.7% post-QOF
- QOF care marginally lower for females in both time periods, by around 2%
- Scores for patients with 3+ conditions higher on average by 6.3% pre- & 6.1% post-QOF compared to patients with no co-morbidities
- Highest for patients living with diabetes for 1-4 yr, lowest for new diagnoses (4.7% pre & 9.1% post)

### Pay-4-performance impact variation
**Analysis 3**

- No significant variation by sex, age, number of co-morbid conditions
- Significant variation by number of years living with condition
- Compared to new diagnoses, all other subgroups more positively affected both in 04/5 & 06/07 (≈6-7%)
Conclusions

- Recorded quality of primary care, as measured by the QOF diabetes indicators, was already improving prior to the introduction of the scheme.
- Improved at an accelerated rate in the first years of implementation but gains diminished in following years.
- QOF may have led to immediate gains in quality of care than would have eventually been achieved in its absence (although it may have taken longer).
- QOF care tended to be higher for patients with more co-morbid conditions throughout the entire study period, including pre-QOF years.
- Newly diagnosed patients seem to have benefitted less from the QOF.

Research

CPRD and/or QOF related

- Investigating effects of the QOF using the GPRD (Evan Kontopantelis)
  - Indicator removal
  - Exception reporting and gaming
  - Diabetes mortality and condition complications
- Investigating quality of care for severe mental health patients using the GPRD (Robyn Reilly & Evan Kontopantelis)
  - Examine those with condition develop co-morbidities earlier
  - Examine BMI, cholesterol, BP and blood glucose and quantify the effect of the QOF
  - Determine rates of consultations
- Investigating cancer screening utilisation for patients with type 2 diabetes (NAEDI funded study, in progress)
- Investigating the effect of GP clinical system on QOF performance (in progress)
- Exempting dissenting patients for p4p schemes: an analysis of exception reporting in the UK QOF (BMJ, 2012)
- Family doctor responses to changes in incentives for influenza immunisation under the QOF (Health Services Research, 2012)
- Framework and indicator testing protocol for developing and piloting quality indicators for the UK QOF (BMC Family Practice, 2011)
- Effect of financial incentives on incentivised and non-incentivised clinical activities: longitudinal analysis of data from the UK QOF (BMJ, 2011)
- Simulation generation methods (in progress)
- Imputation methods for missing data in the GPRD (in progress)
- Representative sampling, a gravity algorithm (submitted)
- Investigating the validity of Primary Care Databases (David Reeves)
  - Aims to identify further develop and test methods for addressing validity issues in PCDs.
Validity of evaluations of effectiveness based on PCDs
Reeves, Kontopantelis, Doran, Ashcroft, Ryan, Morris

- Recommend methods by which the internal and external validity of evaluations of effectiveness based on PCDs can be assessed and maximised

Exploring physical health and primary care management of SMI patients using the CPRD
Reilly, Kontopantelis, Doran, Reeves, Ashcroft, Gask, Planner

- Patients with SMI (schizophrenia, schizophrenia-like psychosis, bipolar affective disorder or other psychosis) are at greater risk of developing chronic physical illnesses than the general population
- This is a result of both the primary illnesses and their treatment
- This higher incidence of chronic disease is compounded by generally poorer health outcomes in patients with SMI
- This despite frequent contact with health care professionals
By examining 2000-2011 CPRD data aims to:

- Determine frequency of primary care usage and of primary preventative activities for patients with SMI compared to patients without
- Compare the number and pattern of comorbidities in patients with SMI compared with those without SMI
- Examine whether patients with SMI develop comorbidities at a younger age than those without SMI
- Assess quality of care for all mental health related activities incentivised under the QOF scheme, and whether this changed following the introduction of QOF.

Three different projects which aim to investigate aspects of the UK primary care pay-for-performance scheme with the use of CPRD.

These projects, albeit different in scope, share a common background and require the same or a very similar extraction procedure:

- Indicator removal
- Exception reporting
- Diabetes management on survival and diabetes-related complications

Therefore, combined in a single programme of work.
An investigation of the Quality and Outcomes Framework (QOF) using the CPRD
Project 1 - indicator removal

- Performance of GPs under the p4p scheme has been quantified using indicators that express the percentage of the patients for which the appropriate treatment, test, examination etc was performed
- Considering resources are fixed, in order to maximise the benefit from the scheme, indicators would need to be routinely replaced
- However, we do not know what the effect of removal will be on levels of performance
- Three indicators were removed in 2006/7 and we will investigate their performance over time

An investigation of the Quality and Outcomes Framework (QOF) using the CPRD
Project 2 - Exception reporting

- To protect patients from being discriminated against, the scheme allows for practices to exclude patients from the payment calculations for a variety of reasons
- However, the true levels of this provision are unknown since patients that have been excluded and for which the respective clinical indicator has been ‘met’ are included in the payment calculations
- Using the CPRD we will
  - estimate the actual levels of exception reporting
  - investigate the profile of excluded patients
  - use the timing of exceptions to assess whether they have been used appropriately
An investigation of the Quality and Outcomes Framework (QOF) using the CPRD
Project 3 - Diabetes complications and survival

- Diabetes is one of the conditions incentivised under the QOF, through 17 clinical indicators
- Some of these indicators are based on findings from the UKPDS study which established the positive effects of blood pressure, HbA1c and total cholesterol control
- However, in that study only patients aged 25-65 were enrolled, while various other patient exclusion criteria were applied
- Using the CPRD we will determine the effects for all subgroups and would be able to control the analyses for other important factors, such as co-morbidities
- We will also investigate the effect of all the indicators on survival and diabetes complications

Comments and questions:
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