The Relationship Between Quality of Care and Choice of Clinical Computing System
Retrospective Analysis of Family Practice Performance Under the UK Quality and Outcomes Framework

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Outline

1 Background
2 Methods
3 Findings
   • Variation
   • Model results
4 Summary
Clinical Computing Systems

- Promoted as a means to improve the quality of health care, with advantages over paper based systems:
  - improved data recording
  - integration and accessibility
  - feedback and alerts
- Drive improvements in efficiency, process performance, clinical decision making and medication safety?
- In practice the results of implementing information technology systems have been mixed:
  - variable quality of software systems by multiple providers
  - clinicians adapting at different rates to systems that may not address their specific requirements or challenge their approach to existing practice

Clinical Computing Systems in the UK Primary Care

- Developed from multiple systems in the 1980s into a handful using Read codes by 2000
- From 1998 practices partially subsidised for the costs of installing clinical computing systems
- Full subsidies provided from 2003 in preparation for the implementation of a national pay-for-performance scheme, the Quality and Outcomes Framework, in April 2004
The Quality and Outcome Framework (QOF)

- Provides large financial bonuses to practices based on achievement on over 100 quality of care indicators
- Practices awarded points for each quality indicator based on the proportion of patients for whom targets are met
- Each point worth £126, adjusted for the relative prevalence of the disease and the size of the practice population
- Practices can exclude (‘exception report’) inappropriate patients from achievement calculations for various reasons
- Performance data drawn from clinical computing systems and collated on a national database (QMAS)
- QMAS used for feedback and payment calculations

QOF impact

- Substantial impact on use of clinical computing systems
- Practices are required to keep disease registers and because bonus payments increase with disease prevalence there is an incentive to case-find
- QOF business rules specify criteria and permissible Read codes for identifying patients with particular conditions:
  - greater uniformity of code usage
  - even changing diagnostic behaviour
- Software providers have adapted their systems to facilitate better practice performance on the QOF:
  - incorporating pop-up alerts and management tools
  - QOF-oriented training programmes for practice staff
There is no independent evidence to date on whether practice performance on the QOF and recorded quality of care is associated with the practice’s choice of clinical computing system.

We used a unique dataset to assess these relationships in English family practices operating under the national pay-for-performance scheme.

Retrospective study of QOF performance by English family practices from 2007-8 to 2010-11, identifying practice predictors, including choice of clinical computing system.

Data

- Quality Management and Analysis System (QMAS), which holds data for almost all English practices (over 8,200)
- Clinical computing systems info not publicly reported; obtained relevant dataset from the HSCIC
- Practice characteristics and the populations they serve obtained from the General Medical Services (GMS) Statistics database, also provided by the HSCIC
- Area deprivation, as measured by the IMD, from the Communities and Local Government website
- Urban/non-urban classification, from the ONS website
- Data were complete for all practices
Outcomes

- Practice performance on the QOF clinical quality indicators, continually incentivised over the study period
- Three performance measures used:
  - reported achievement (RA), % of eligible patients for whom targets achieved (not including exception reported patients)
  - population achievement (PA), % of eligible patients for whom targets actually achieved (including exc rep patients)
  - % of QOF points scored (PQ), the metric on which remuneration is based
- Across all three outcome measures, practice composite scores were calculated:
  - overall, across all 62 clinical indicators
  - by three categories of activity: measurement activities (35), treatment activities (11) and intermediate outcomes (16)

Statistical Modelling

- Multilevel mixed effects multiple linear regression models to identify population, practice, and clinical computing system predictors
  - Model 1: overall summary measure as outcome
  - Model 2: indicator group (measurement, treatment, outcome) summary measure as outcome
- Analyses controlled for year, practice list size, local area deprivation, rurality, type of GP contract, % female patients, % patients aged 65+, mean GP age, % female GPs, % UK qualified GPs, % GP providers
- Linear predictions, and their 95% CIs, were calculated for each clinical system from the regression models
Fifteen clinical computing systems from eight providers

Seven systems accounted for \( \approx 99\% \) of the market

<table>
<thead>
<tr>
<th>Provider</th>
<th>Product</th>
<th>Year 2007-8</th>
<th>Year 2008-9</th>
<th>Year 2009-10</th>
<th>Year 2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMIS</td>
<td>LV</td>
<td>3811 (46.0%)</td>
<td>3661 (44.5%)</td>
<td>3498 (42.2%)</td>
<td>3284 (39.9%)</td>
</tr>
<tr>
<td>In Practice Systems</td>
<td>Vision 3</td>
<td>1572 (19.0%)</td>
<td>1599 (19.5%)</td>
<td>1564 (18.9%)</td>
<td>1492 (18.1%)</td>
</tr>
<tr>
<td>TPP</td>
<td>ProsysoneX</td>
<td>697 (8.4%)</td>
<td>851 (10.4%)</td>
<td>1164 (14.0%)</td>
<td>1466 (17.8%)</td>
</tr>
<tr>
<td>EMIS</td>
<td>PCS</td>
<td>1103 (13.3%)</td>
<td>1160 (14.1%)</td>
<td>1259 (15.2%)</td>
<td>1216 (14.8%)</td>
</tr>
<tr>
<td>iSoft</td>
<td>Synergy</td>
<td>541 (6.5%)</td>
<td>487 (5.9%)</td>
<td>444 (5.4%)</td>
<td>401 (4.9%)</td>
</tr>
<tr>
<td>Microtest</td>
<td>Practice Manager</td>
<td>166 (2.0%)</td>
<td>164 (2.0%)</td>
<td>156 (1.9%)</td>
<td>165 (1.9%)</td>
</tr>
<tr>
<td>iSoft</td>
<td>Premiere</td>
<td>145 (1.8%)</td>
<td>86 (1.0%)</td>
<td>31 (0.4%)</td>
<td>93 (1.1%)</td>
</tr>
<tr>
<td>Other*</td>
<td></td>
<td>248 (3.0%)</td>
<td>212 (2.6%)</td>
<td>169 (2.0%)</td>
<td>132 (1.6%)</td>
</tr>
</tbody>
</table>

* Excluded from analyses: EMISWeb, GV (EMIS), HealthyV5, Crosscare (Healthy Software), Seetec GP Enterprise (Seetec), Ganymede, System 6000 (iSoft), Exeter GP System (Protechnic Exeter Ltd)

Kontopantelis
Clinical Computing Systems and QOF

System and supplier distribution

Overall population achievement (62 indicators) and GP systems products
Average practice scores by Strategic Health Authority, 2010–11

Overall reported achievement (62 indicators) and GP systems suppliers
Average practice scores by Strategic Health Authority, 2010–11

NOTE: Chart size proportional to number of practices in area
Overall population achievement (62 indicators)
Average practice scores by Primary Care Trust, 2010–11

Overall reported achievement (62 indicators)
Average practice scores by Primary Care Trust, 2010–11

Practice characteristics by system
2010-11

List size
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
6903 (4174) 6681 (4286) 6587 (4333) 5715 (3922) 8053 (4287) 6654 (3791) 7104 (3703)

IMD 2010
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
25.2 (17.0) 25.8 (16.6) 28.3 (18.0) 31.1 (18.4) 23.5 (16.7) 25.1 (13.7) 21.1 (15.0)

Percentage of female patients
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
49.7 (2.9) 49.8 (2.6) 49.6 (3.1) 49.4 (3.5) 50.0 (2.2) 50.3 (1.7) 50.0 (1.7)

Percentage of patients aged 65 or over
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
15.4 (6.2) 15.0 (5.8) 15.4 (5.9) 14.3 (5.5) 16.8 (5.3) 19.6 (4.1) 16.3 (4.1)

General Practitioner (GP) age
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
47.6 (7.5) 48.3 (7.9) 47.3 (7.8) 48.2 (8.5) 46.3 (6.4) 47.4 (6.2) 47.9 (7.3)

Percentage of female GPs
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
43.5 (26.3) 39.5 (27.3) 38.6 (26.5) 38.9 (28.8) 45.9 (22.8) 37.3 (24.4) 42.1 (27.5)

Percentage of UK qualified GPs
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
70.6 (35.3) 62.8 (37.2) 63.0 (37.7) 60.3 (39.4) 77.7 (29.9) 84.9 (27.4) 73.5 (34.3)

Percentage of GP providers
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
74.0 (25.1) 73.4 (27.6) 73.0 (30.7) 72.2 (31.1) 72.0 (23.0) 78.1 (22.4) 79.1 (21.7)

Percentage of Urban practices
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
82.90% 88.80% 83.90% 89.60% 85.30% 66.70% 84.80%

Percentage of GMS practices
LV Vision 3 ProdSys-OneX PCS Synergy Practice Manager Premiere
59.00% 59.00% 40.90% 54.00% 46.60% 65.40% 64.40%

* Reporting means (sd) or percentages
Predictors of practice performance
2007-8 to 2010-11

- Little change over time
- Most practice and patient characteristics had significant but small effects
- Overall performance differed significantly by clinical system used, for all three outcomes
  - Best: Vision 3 (RA), Synergy (PA & PQ)
  - Worst: PCS, across all three measures
  - Synergy practices on average gain £602 more than PCS practices each year
- Performance by type of activity varied significantly across clinical systems, for all three outcomes
  - Similar system rankings
  - Biggest differences across outcome indicators

<table>
<thead>
<tr>
<th>Predictions scored</th>
<th>Reported achievement</th>
<th>Population achievement</th>
<th>% of points scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictions (95% CI) rank</td>
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</tr>
<tr>
<td>Overall (aggregate over all 62 indicators), from regression model 1</td>
<td>Outcome (aggregate over 11 indicators), from regression model 2</td>
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</table>

### Predictions of practice performance, by system
2007-8 to 2010-11

<table>
<thead>
<tr>
<th>System</th>
<th>Reported Achievement</th>
<th>Population Achievement</th>
<th>% of points scored</th>
<th>Reported Achievement</th>
<th>Population Achievement</th>
<th>% of points scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision 3</td>
<td>90.1 (90.0,90.2)</td>
<td>85.4 (85.3,85.5)</td>
<td>97.8 (97.7,97.9)</td>
<td>81.0 (80.9,81.1)</td>
<td>75.3 (75.2,75.4)</td>
<td>98.3 (98.1,98.6)</td>
</tr>
<tr>
<td>Practice Manager</td>
<td>89.8 (89.5,90.1)</td>
<td>84.7 (84.4,85.0)</td>
<td>97.4 (97.0,97.8)</td>
<td>81.4 (81.0,81.7)</td>
<td>75.0 (74.6,75.4)</td>
<td>98.2 (97.8,98.7)</td>
</tr>
<tr>
<td>Synergy</td>
<td>89.8 (89.7,89.9)</td>
<td>85.6 (85.4,85.7)</td>
<td>98.1 (97.9,98.2)</td>
<td>80.4 (80.2,80.6)</td>
<td>75.4 (75.2,75.6)</td>
<td>98.0 (97.7,98.3)</td>
</tr>
<tr>
<td>Premiere</td>
<td>89.8 (89.5,90.0)</td>
<td>85.1 (84.8,85.3)</td>
<td>98.7 (98.3,98.4)</td>
<td>80.7 (80.4,81.1)</td>
<td>74.9 (74.6,75.3)</td>
<td>98.3 (97.9,98.7)</td>
</tr>
<tr>
<td>ProdSysOneX</td>
<td>89.6 (89.4,89.7)</td>
<td>84.5 (84.4,84.6)</td>
<td>97.6 (97.5,97.7)</td>
<td>80.3 (80.1,80.5)</td>
<td>74.1 (73.9,74.2)</td>
<td>97.8 (97.5,98.1)</td>
</tr>
<tr>
<td>LV</td>
<td>89.4 (88.3,89.5)</td>
<td>85.0 (85.0,85.1)</td>
<td>97.7 (97.6,97.8)</td>
<td>79.5 (79.5,79.6)</td>
<td>74.3 (74.2,74.4)</td>
<td>97.8 (97.5,90.0)</td>
</tr>
<tr>
<td>PCS</td>
<td>88.7 (88.6,88.8)</td>
<td>84.3 (84.2,84.4)</td>
<td>97.3 (97.2,97.4)</td>
<td>78.7 (78.5,78.8)</td>
<td>73.3 (73.2,73.5)</td>
<td>97.4 (97.1,97.7)</td>
</tr>
</tbody>
</table>
Findings

• Performance levels differed significantly across clinical computer systems, even after controlling for practice and patient characteristics

• Differences were small in absolute terms, but:
  • the association between system and performance was stronger than for any other patient or practice characteristic
  • substantial at the population level e.g. 1% difference in achievement of BP control targets for HT patients ≈ 9 patients in average practice; over 71,000 patients nationally

• Overall, best average performance across all outcomes measures was by Vision 3, Synergy or Premiere systems
  • Synergy & Premiere in a diminishing minority of practices and are now likely to be withdrawn from the market

Conclusions

• QOF performance is partly dependent on the clinical computing system used by practices

• Raises the question of whether particular characteristics of computing systems facilitate higher quality of care, better data recording, or both

• Inconsistency across clinical computer systems which needs to be understood and addressed

• Researchers who use primary care databases, which collect data from a single clinical system, need to be cautious when generalising their findings

• Messages relevant to international health care systems
Kontopantelis E, Buchan I, Reeves D, Checkland C and Doran T. The Relationship Between Quality of Care and Choice of Clinical Computing System: Retrospective Analysis of Family Practice Performance Under the UK’s Quality and Outcomes Framework. Under review

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