Effectiveness of quality improvement strategies on the management of diabetes: Systematic review

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on behalf of the diabetes QI review team

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Diabetes: Growing burden, sub-optimal care

Figure 7: Avoidable Hospitalizations for Acute Diabetes Complications per 100,000 Population

Figure 1: Diabetes in Canada: 2000 to 2020

Figure 3: Cost of Diabetes in Canada: 2000 to 2020

Source: Canadian DCM

Source: OECD, 2009
QI strategies targeting....

**Health systems:**
- Case management
- Team changes
- Electronic patient registry
- Facilitated relay of clinical info.
- Continuous QI

**Healthcare providers:**
- Audit and feedback
- Clinician education
- Clinician reminders
- Financial incentives

**Patients:**
- Patient education
- Promotion of self-management
- Patient reminders
OBJECTIVE

- To examine the influence of QI strategies on the following:
  - glycemic control
  - vascular risk factor management
  - microvascular complication monitoring
  - smoking cessation
  - harms
Methods – Eligibility criteria

- Study design - RCTs
- Patients: adult outpatients with type 1 or type 2 diabetes
- Interventions – QI strategies had to have a health systems/provider component
- Comparators – usual care, other QI strategies, patient-mediated QI strategies
- Outcomes – glycemic (HbA1c), vascular (LDL-c, SBP, DBP, ASA, anti-hypertensive, statins, hypertension control), microvascular (retinopathy, foot, renal), smoking cessation, harms
Methods – Literature search

- Experienced librarian conducted searches in:
  - MEDLINE (July 2003 [last date of the original search for the AHRQ report] to July 2010)
  - Cochrane Effective Practice and Organisation of Care (EPOC) database (July 2003 to July 2010)

  → Peer reviewed using the PRESS checklist

- Scanned reference lists of included RCTs
Synthesis

- Random effects meta-analysis (relative risk for dichotomous outcomes, mean difference for continuous outcomes)
  - Leveraged established methods to
    - combine cluster-RCTs with patient-RCTs
    - impute unreported standard deviations

- Meta-regression analysis on HbA1c
  - Linear effects model
  - Adjusted for median baseline HbA1c and median effective sample size
Results:

Study Flow

5592 titles and abstracts

3440 excluded:
- 2064 Not a randomized trial
- 1376 Not an evaluation of quality improvement interventions

2152 full-text articles reviewed

1990 excluded:
- 617 Not an evaluation of quality improvement interventions
- 498 Not a randomized trial
- 358 Excluded topic
- 259 No component of clinician or organizational change
- 134 Not diabetes care
- 109 Did not report eligible outcomes or usable data
- 15 English translation unavailable

162 included randomized trials:
- 48 cluster randomized trials plus 6 companion reports
- 94 patient randomized trials plus 14 companion reports

2,538 clusters and 84,865 patients

38,664 patients
# HbA1c meta-regression analysis

<table>
<thead>
<tr>
<th>Quality Improvement Strategy</th>
<th># RCTs</th>
<th>MD</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Changes</td>
<td>47</td>
<td>0.52</td>
<td>0.00, 1.04</td>
</tr>
<tr>
<td>Facilitated Relay</td>
<td>31</td>
<td>0.49</td>
<td>0.02, 0.96</td>
</tr>
<tr>
<td>Promotion of Self-management</td>
<td>57</td>
<td>0.45</td>
<td>0.04, 0.87</td>
</tr>
<tr>
<td>Case Management</td>
<td>52</td>
<td>0.41</td>
<td>0.00, 0.82</td>
</tr>
<tr>
<td>Patient Education</td>
<td>52</td>
<td>0.40</td>
<td>0.00, 0.80</td>
</tr>
<tr>
<td>Electronic Patient Register</td>
<td>28</td>
<td>0.39</td>
<td>0.00, 0.78</td>
</tr>
<tr>
<td>Clinician Reminders</td>
<td>16</td>
<td>0.35</td>
<td>0.00, 0.70</td>
</tr>
<tr>
<td>Patient Reminders</td>
<td>20</td>
<td>0.31</td>
<td>0.00, 0.62</td>
</tr>
<tr>
<td>Audit and Feedback</td>
<td>9</td>
<td>0.22</td>
<td>0.00, 0.44</td>
</tr>
<tr>
<td>Clinician Education</td>
<td>12</td>
<td>0.16</td>
<td>0.01, 0.33</td>
</tr>
<tr>
<td><strong>All Interventions</strong></td>
<td><strong>117</strong></td>
<td><strong>0.33</strong></td>
<td><strong>0.01, 0.65</strong></td>
</tr>
</tbody>
</table>

HbA1c meta-analysis: reduction of 0.37% (0.28-0.45%)
<table>
<thead>
<tr>
<th>Baseline levels</th>
<th># RCTs</th>
<th>MD (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 8</td>
<td>46</td>
<td>-0.233 (0.34, -0.127)</td>
</tr>
<tr>
<td>≥ 8</td>
<td>70</td>
<td>-0.461 (-0.577, -0.346)</td>
</tr>
</tbody>
</table>
### HbA1c meta-analysis by baseline levels

<table>
<thead>
<tr>
<th>QI strategy</th>
<th>All studies</th>
<th>HbA1c &gt;8%</th>
<th>HbA1c ≤8%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>#RCTs</td>
<td>MD (95% CI)</td>
</tr>
<tr>
<td>Promotion of self management</td>
<td>1</td>
<td>60</td>
<td>-0.57 (-0.83, -0.31)</td>
</tr>
<tr>
<td>Team changes</td>
<td>2</td>
<td>47</td>
<td>-0.57 (-0.71, -0.42)</td>
</tr>
<tr>
<td>Case management</td>
<td>3</td>
<td>57</td>
<td>-0.50 (-0.65, -0.36)</td>
</tr>
<tr>
<td>Patient education</td>
<td>4</td>
<td>52</td>
<td>-0.48 (-0.61, -0.34)</td>
</tr>
<tr>
<td>Facilitated relay</td>
<td>5</td>
<td>32</td>
<td>-0.46 (-0.60, -0.33)</td>
</tr>
<tr>
<td>Electronic patient register</td>
<td>6</td>
<td>27</td>
<td>-0.42 (-0.61, -0.24)</td>
</tr>
<tr>
<td>Patient reminders</td>
<td>7</td>
<td>21</td>
<td>-0.39 (-0.65, -0.12)</td>
</tr>
<tr>
<td>Audit and feedback</td>
<td>8</td>
<td>8</td>
<td>-0.26 (-0.44, -0.08)</td>
</tr>
<tr>
<td>Clinician education</td>
<td>9</td>
<td>15</td>
<td>-0.19 (-0.35, 0.03)</td>
</tr>
<tr>
<td>Clinician reminders</td>
<td>10</td>
<td>18</td>
<td>-0.16 (-0.31, -0.02)</td>
</tr>
<tr>
<td><strong>All interventions</strong></td>
<td><strong>120</strong></td>
<td><strong>-0.37 (-0.45, -0.28)</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>
Interpretation

- Rapidly expanding field (from 53 RCTs in 2005 to 120 RCTs in 2010 for HbA1c)
- QI strategies significantly improved intermediate disease outcomes: HbA1c, LDL-c, SBP, DBP
  - Effects are important on a population level
  - Larger effects with poor baseline control
- QI strategies significantly improved some process indicators: aspirin use, anti-hypertensive use, retinopathy screening, renal screening, foot screening but not hypertension control, statin use, smoking cessation
  → few RCTs and infrequently the focus of the intervention
Interpretation

- All categories of QI interventions appeared effective but larger effects observed for:
  - ✓ Team changes
  - ✓ Case management
  - ✓ Facilitated relay
  - ✓ Electronic register
  - ✓ Self management
  - ✓ Patient education
  - ✓ Patient reminders

- BUT:
  - Most RCTs poorly described interventions

→ Optimal components of interventions unclear
→ Optimal combination of interventions unclear
Interpretation

- Larger effect sizes where baseline values poorer
  - **Graded interventions should be tailored for patients at higher risk**
    - Complex, expensive interventions (e.g. team changes, case management) most effective for high risk patients
    - Adding patient-mediated interventions (e.g. self management) likely useful for all patients

- **BUT:**
  - Cost-effectiveness unclear
  - Targeting the ‘right’ patients and providing them with the ‘right’ intervention is complex...
Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis. In Press. The Lancet


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