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Presenter Disclosures
Rodney McCurdy

The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

Background
- Care management processes (CMPs) are evidenced-based methods of enhancing chronic illness care in physician practices
  - Disease registries
  - Practice guidelines
  - Feedback to physicians
  - Case management
- National surveys have found minimal CMP use in physician organizations (PO)
  - National Study of Physician Organizations (NSPO), 2001 and 2006
  - CMP use for Asthma, Congestive Heart Failure (CHF), Depression, and Diabetes
Background

- To date, studies on CMP use have focused on 2 areas:
  - Practice capabilities (e.g. Size, Clinical IT, etc)
  - External incentives (e.g. P4P, public recognition for quality)

- Networks have been shown to be influential in adoption and diffusion of medical innovations
  - Contagion perspective - network relationships serve as pipeline for flow of resources and information to/from the focal organization
  - Structural perspective - pattern of network relationships result in resource/info advantages for central (or core) organizations compared to counterparts in the periphery of network space

- Network influences on CMP use have been largely unexplored

Research Purpose and Questions

- Purpose: Examine if variations in CMP usage among POs participating in managed care in California are associated with attributes of network membership

- PO level – Is CMP use associated with:
  - Number/types of exchange relationships (eg. PO to PO, PO to hospitals; PO to HMOs)?
  - Network position (core vs. periphery)?

- Dyad Level – Is similarity in CMP use between two POs associated with:
  - Shared affiliations?
  - Shared position?

Study Design

- Network analysis of all POs participating in managed care in California
  - Ties with other POs, hospital systems, and HMOs
  - Core/periphery analyses to identify PO position

- Statistical analysis of PO subset to test for relationships between network attributes and CMP use
  - California respondents from National Study of Physician Organizations

- Cross-sectional
  - Two survey rounds (2001 and 2006)
### Data Sources

**Cattaneo & Stroud, Inc.**
- All CA risk-bearing physician organizations (>6 MDs)
- Ties with other POs, hospitals, hospital systems and HMOs
- Service Areas
- Enrolled Patients by service area and payer category

**National Study of Physician Organizations (2001 & 2006)**
- Physician organizations (>20 MDs)
- California respondents only
- EMR capability
- Participation in P4P
- Practice size (# of MDs)
- Practice type (MG vs. IPA)

### Population & eligible sample

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (C&amp;S Data)</td>
<td>383</td>
<td>300</td>
</tr>
<tr>
<td># (%) NSPO eligible (&gt; = 20 MDs)</td>
<td>339 (88)</td>
<td>269 (90)</td>
</tr>
<tr>
<td># (%) NSPO responders</td>
<td>167 (50)</td>
<td>180 (67)</td>
</tr>
</tbody>
</table>

- NSPO respondents had more ties with HMOs than non-respondents
- Mean(SD): 5.98(3.04) vs. 4.67(3.09); p < .001
- No difference in PO ties with other POs or with Hospital Systems
- No difference in Network Position (Core/Periphery)

### Methods - Phase I: Network Analysis

- **PO to PO** (2001: 383x383; 2006: 300x 300)
  - Cell value Xij = 0/1 presence of tie between PO(i) and PO(j)
  - Row value Xi = total number of PO ties for PO(i)
- **PO to Hospital Systems** (2001: 383 x 14; 2006: 300 x 16)
  - Cell value Xim = 0/1 presence of affiliation between PO(i) and Hospital System/HMO (m) as appropriate
  - Row total Xi = number of ties for PO(i) by category
- **Core/periphery analysis** conducted on affiliation matrices
  - Core network membership = core members of both matrices
- **Co-membership matrices** (2001: 383x383; 2006: 300x 300)
  - PO x PO matrices for hospital systems and HMOs
  - Cell value Xij = number of shared affiliations between PO(i) and PO(j) by category
**PO connectivity**

Mean(SD) network affiliations for 683 physician organizations in the California managed care network (2001 and 2006).

- **Ties with other POs**
  - 2001: 3.173 (4.646)
  - 2006: 3.120 (4.123)
  - T-test: 0.830
  - p-value: 0.34

- **Ownership**
  - 2001: 213 (412)
  - 2006: 202 (378)
  - T-test: 0.085
  - p-value: 0.85

- **Medical director**
  - 2001: 325 (971)
  - 2006: 427 (1,287)
  - T-test: 0.036
  - p-value: 0.22

- **Management agency**
  - 2001: 2.508 (3.772)
  - 2006: 2.412 (3.405)
  - T-test: 0.060
  - p-value: 0.35

- **Number of hospital affiliations**
  - 2001: 4.116 (4.805)
  - 2006: 4.174 (4.953)
  - T-test: 0.042
  - p-value: 0.16

- **Number of affiliations with hospital systems**
  - 2001: 1.512 (1.095)
  - 2006: 1.889 (2.266)
  - T-test: 0.928
  - p-value: 0.001

- **Number of HMO affiliations**
  - 2001: 2.828 (2.985)
  - 2006: 3.329 (2.563)
  - T-test: 0.150
  - p-value: 0.802

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**PO Characteristics by Position**

Organizational characteristics of 683 physician organizations by core and periphery position in the California managed care network.

- **Number of physicians**
  - 2001: 496.93 (687.43)
  - 2006: 669.83 (746.83)
  - T-test: 2.857
  - p-value: 0.005

- **Ties with other POs**
  - 2001: 5.241 (5.247)
  - 2006: 4.502 (5.169)
  - T-test: -0.827
  - p-value: 0.41

- **Isolates, n(%)**
  - 2001: 190 (49.8)
  - 2006: 149 (48.7)

- **Number of Cliques (3 or more POs)**
  - 2001: 27
  - 2006: 20

- **Clique size, Mean(SD)**
  - 2001: 6.04 (3.8)
  - 2006: 6.25 (6.25)

- **Organizations in Clusters, n(%)**
  - 2001: 163 (42.7)
  - 2006: 125 (40.8)

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**Physician organization ties**

**2001**

- **Number of physicians**
  - 496.93 (687.43)

- **Ties with other POs**
  - 5.241 (5.247)

- **Isolates, n(%)**
  - 190 (49.8)

**2006**

- **Number of physicians**
  - 669.83 (746.83)

- **Ties with other POs**
  - 4.502 (5.169)

- **Isolates, n(%)**
  - 149 (48.7)

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*Isolates removed for ease of viewing*
**Logistic Regression Results: Top Quartile of CMP Use and Network Attributes (n=247)**

<table>
<thead>
<tr>
<th>DV: Top Quartile of CMP Use (1/0)</th>
<th>Asthma</th>
<th>CHF</th>
<th>Diabetes</th>
<th>All Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relational Variables</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Clique membership†</td>
<td>1.13 (0.39)</td>
<td>2.13 (0.66)*</td>
<td>1.27 (0.35)</td>
<td>1.41 (0.35)</td>
</tr>
<tr>
<td>Number of Hospital Systems</td>
<td>1.09 (0.07)</td>
<td>1.03 (0.06)</td>
<td>1.12 (0.07)</td>
<td>1.05 (0.06)</td>
</tr>
<tr>
<td>Number of HMOs</td>
<td>0.83 (0.06)**</td>
<td>0.94 (0.06)</td>
<td>0.94 (0.05)</td>
<td>0.87 (0.04)**</td>
</tr>
<tr>
<td><strong>Positional Variable</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Core Network Member (1/0)†</td>
<td>0.99 (0.40)</td>
<td>1.22 (0.46)</td>
<td>0.59 (0.20)</td>
<td>1.60 (0.46)</td>
</tr>
</tbody>
</table>

† Compared to non-clique or periphery groups as appropriate.

*p<.05; **p<.01; ***p<.001

**Summary**

- **Relational effects**
  - Supplier–supplier linkages appear to be beneficial for CMP use in POs and CMP homogeneity among PO pairs
  - PO to PO: PO to Hospital System
  - Negative results for Supplier–Buyer affiliations (PO and HMOs)
  - Relationships among health care delivery organizations may be qualitatively different than with HMOs
    - Closer coordination of activities
    - Homophily

- **Positional effects**
  - Core POs enjoyed resource advantage compared to periphery POs
    - Larger, greater percent commercial patients, less Medicaid patients
  - Dyad level (compared to heterogeneous pairs)
  - Similarity in CMP use lowest among periphery pairs
  - Peripheral POs may be at a structural disadvantage in regards to the flow of information or resources necessary to implement CMPs.
Study Limitations

- Contextual aspects of relationships are ignored
  - Effects of network influences by exchange relationship a contribution of this study
- The study examined large POs in California
  - The prevalence of managed care varies considerably across the US
  - California’s use of the delegated network model
- 5-year gap between survey years
  - Subject to omitted variable bias

Policy Implications

- The findings support the potential of Accountable Care Organizations (ACOs) to improve quality
  - ACOs align goals and rewards among exchange partners
- Findings also suggest that incentives should be included to facilitate linkages between core and periphery organizations
  - E.g. bonus payments for developing ties between established core POs and those in underserved and rural areas.

Questions?