Patterns of Specialty Medical Referral
Analysis of a Primary Health Care Electronic Medical Record Database

Joshua Shadd, MD CCFP
Bridget Ryan PhD
Moira Stewart PhD
Amardeep Thind MD PhD

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The views expressed in this presentation are those of the authors and do necessarily reflect those of the Ministry of Health.
Outline

• Background
• Research Questions
• Methods & Results
• Implications
Referrals Matter

A referral is a major health care event!

- Request for help
- Marker of not-yet-met health need
- Initiates period of uncertainty for patients
- Inflection point in care cost trajectory
Referral Wait Times Matter

- patients with specialist needs being managed by the primary care system

Why a PHC EMR Database?

• Contains patient-level clinical data not available elsewhere

• Wait 2 documented routinely for all referrals
The DELPHI Database

- Deliver Primary Healthcare Information
- Electronic Medical Records
- 10 Practice Sites
- 25 Family Physicians
- 30,000 + patients
- Inception October 2005
DELPHI and the General Population

DELPHI - 2006 Canadian Census

DELPHI (n=28,279)

Census (n=31,612,895)
Research Questions

• What are the rates of referral by patient?
• What were the actual wait times experienced by patients?
• How do patterns of referrals and wait-times in southwestern Ontario compare to the published literature?
Implications

1. Growth in referrals will vary by specialty, due in part to changing demographics.
2. Time from referral to specialist visit is an underexplored contributor to wait times.
3. Patient-level factors matter. PHC EMR databases are critical tools in this research.
In the DELPHI database, what are the rates of referrals from family physicians to other specialist physicians?

Do referral rates vary by patient or practice characteristics?
Referrals: Methods

Timeline

- Unit of analysis: individual patient
All DELPHI Database Patients

24,856 Visited
April 1, 2007-March 31, 2008

17,085 No Referrals
7,771 (31.3%) One or more referrals
Overall Referral Rate

455 Referrals
per 1000 patients per year
## Referral Rates

<table>
<thead>
<tr>
<th>BY –</th>
<th>RATE / 1000 PATIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>435.5</td>
</tr>
<tr>
<td>Female</td>
<td>470.7</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>0 - 19 yrs</td>
<td>220.9</td>
</tr>
<tr>
<td>20 - 44 yrs</td>
<td>438.8</td>
</tr>
<tr>
<td>25 - 64 yrs</td>
<td>523.5</td>
</tr>
<tr>
<td>65+ yrs</td>
<td>569.9</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>475.7</td>
</tr>
<tr>
<td>Urban</td>
<td>424.4</td>
</tr>
</tbody>
</table>

*significant at p-values = 0.0001
Referral Rate by Consultant Specialty

Top Five: Overall

Males
- Internal Medicine
- ENT
- Urology
- Orthopedic Surgery
- General Surgery

Females
- Dermatology
- ENT
- Orthopedic Surgery
- General Surgery
- Obs/Gyn

Rate / 1000 pts
Referral Rate by Consultant Specialty

Top Five: Age 20-44

**Males**

- General Surgery
- Urology
- Orthopedic Surgery
- Psychiatry
- Other Specialist NOS

**Females**

- General Surgery
- Dermatology
- Psychiatry
- Neurology
- *Ob/Gyn 155.94

Rate / 1000 pts
What does the literature say?

- Referrals per encounter vs. referrals per patient

- Most comparable study: Chan & Austin 2003
  - 560 referrals / 1000 patients / year
  - Patient characteristics important

- In other studies, factors associated with referrals:
  - Patient age, sex, SES, health status
  - Physician sex, training, tolerance of uncertainty
  - Practice location, size, remuneration
  - Health system private vs. public, prevalence of diagnoses, patient pressure perception
Implications

Population growth leads to more referrals.

Growth in referrals will vary by specialty, due in part to the changing demographics of the Ontario population.
Referral Volume Extrapolations

• Two extrapolations
  – Apply DELPHI rates to Ontario population 2009
  – Apply DELPHI rates to Ontario population 2036
  – Rates adjusted for population age and sex composition

• Assumptions
  – DELPHI referral rates apply to Ontario as a whole
  – Age/sex category referral rates stable over time

• *For illustrative purposes only*
Ontario Age Pyramid: 2009 and 2036

Total population growth: 37%

Ontario Population Projections Update, 2009-2036, Ontario Ministry of Finance
Referral Volume Extrapolations

Total Number of Referrals

- 2009, age & sex: 5.56 million
- 2036, pop growth: 7.60 million
- 2036, age & sex: 7.87 million

Extrapolations:
- 37% increase from 2009 to 2036 (pop growth)
- 42% increase from 2009 to 2036 (age & sex)
Change in Referral Volume 2009-2036

Projected Percentage Increase

General Surgery
Urology
Obs/Gyn
Pediatrics

Overall change in referral volume
Implications

1. Growth in referrals will vary by specialty, due in part to changing demographics.
2. Time from referral to specialist visit is an underexplored contributor to wait times.
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Referral Wait Times

• What were the actual wait times experienced by patients referred to specialty medical care?

• How did the wait times vary by consultant specialty?
Referral Wait Times: Methods

- Unit of analysis: individual referral
- Excluded referrals:
  - Missing information
  - Duplicates
  - Specialties with <100 total referrals
# Days Waiting

- 16,115 referrals
- Mean wait: 74 days
- Median wait: 47 days, range 0-858 days

<table>
<thead>
<tr>
<th>By –</th>
<th>Mean (median)</th>
<th>95% CI</th>
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</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>73 (49)</td>
<td>64 – 82</td>
</tr>
<tr>
<td>Female</td>
<td>76 (44)</td>
<td>68 – 84</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 19 yrs</td>
<td>56 (38)</td>
<td>52 – 63</td>
</tr>
<tr>
<td>20 - 44 yrs</td>
<td>77 (49)</td>
<td>67 – 87</td>
</tr>
<tr>
<td>25 - 64 yrs</td>
<td>80 (49)</td>
<td>69 – 91</td>
</tr>
<tr>
<td>65+ yrs</td>
<td>72 (43)</td>
<td>61 – 82</td>
</tr>
</tbody>
</table>

95% confidence intervals for the means, adjusted for clustering by practice
Mean Referral Wait Time by Specialty

- **Gastroenterology** – 129 days
- **Overall Mean** – 74 days
- **Pediatrics** – 39 days

*Vertical high-low bars represent 95% CI adjusted for clustering by practices.*
What does the literature say?

• Most reports about wait 2 focus on particular specialty or clinical problem.

• Fraser Institute Waiting List Report 2009
  – survey of specialists in 12 disciplines
  – median overall wait time in Ontario was 6.7 weeks (~47 days)

• Statistics Canada 2010
  – Analysis of 2007 Canadian Community Health Survey
  – 45% <1 month, 41% 1-3 months, 15% > 3 months
The Primary Care Perspective

Referral = request for help

Wait time = duration of burden of unmet health need

Wait 2 = patients with specialist needs being managed by the primary care system
Referral Waits in Context

Consultation with family physician → Consultation with specialist

FP → General Surgeon → Hernia repair
Wait 2* = 62 days
Wait 3† = 110 days

FP → Ob/Gyn → Hysterectomy
Wait 2* = 67 days
Wait 3† = 152 days

FP → Ortho. Surgeon → Hip replacement
Wait 2* = 125 days
Wait 3† = 185 days

* Mean number of days. Data from current study.
† 90th percentile of days Q1 2011. Data from Ontario Ministry of Health and Long Term Care, www.waittimes.net
1. Growth in referrals will vary by specialty, due in part to changing demographics.
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3. Patient-level factors matter. PHC EMR databases are critical tools in this research.
A referral is a major health care event!

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- Inflection point in care cost trajectory

Because the total referral volume is so large, small changes in referral rate may have big implications.

**But what causes referral rate variation?**
Sources of Referral Rate Variation

• Health system
• Geography
• Practice
• Physician
• Patient
How Much Patient Level Variance?

- What proportion of variation in referral rates is attributable to the patient level vs. the practice level?
  - Patient: 92%
  - Practice: 8%

- Multi-level Poisson regression
Potential of EMR Research

- Need to understand the specific patient factors that influence referrals
- EMRs provide a rich source of data about the patient
- EMR data will only grow and improve over time
- Provide information that can be used to influence policy at the patient level
To summarize...

1. Growth in referrals will vary by specialty, due in part to changing demographics.
2. Time from referral to specialist visit is an underexplored contributor to wait times.
3. Patient-level factors matter. PHC EMR databases are critical tools in this research.
Using patients’ records to improve patients’ experiences.

jshadd2@uwo.ca
bryan@uwo.ca