Program Outcome and Utilization of Health Services in Pediatric Hearing Loss

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CHEO OCHSU ICES Network Presentation
November 20, 2015
Permanent Hearing Loss in Childhood

- Incidence: 1 to 4 per 1,000 live births
  
  *Fortnum et al BMJ, 2001, 323, 536-540*

- High Impact

- Barrier to Communication

- Cascade of Effects

- Economic Costs – individual, families, society
Early Identification is Critical

• Advances in technology

• Advances in program delivery
  – Universal Newborn Hearing Screening Programs
Presence of Co-morbidities

- Incidence of co-occurring conditions in Permanent Hearing Loss (PHL)
  - estimates of 30 to 40%

- Impact
  - Outcome
  - Health Service Utilization
Overarching Goal of Research

- Examine health care needs in pediatric PHL and impact of programs to address needs
  - Impact of early screening for hearing loss
  - Examine co-morbidities and utilization of health services

Funding: CHEO Research Institute Research Growth Award
Ontario: Infant Hearing Program (IHP)

- IHP: Ontario’s program for early screening for pediatric hearing loss
- Ministry of Children and Youth Services (MCYS)
- Implemented in 2002 across Ontario – 12 regions
- Screening
  - Community-based
  - 2 Stage Process
- Identification: Diagnostic assessments
  - CHEO Audiology
Overview of Methodology

• Design
  – Population-based nested case control study

• Data Sources
  – ICES (including OHIP billing data, CIHI Discharge Abstract Database and Same Day Surgery file, Assistive Devices Program (ADP), Registered Persons Database (RPDB), home care utilization data)
  – Audiology Research Database
Audiology Research Database

• Collaborative with CHEO Audiology since 1980

• Extensive data on children with PHL identified and followed at CHEO
  – Allows us to link ICES data with data also in IHP database (MCYS)

• Estimated no. of children residing within CMA Ottawa identified with PHL:
  – 1991 to 2001  \( N = 300 \)
  – 2003 to 2013  \( N = 300 \)
Research Questions

1. Impact of Implementation of Infant Hearing Program (IHP)
   
   *Hypotheses*
   
   – IHP results in earlier identification of PHL
   – More children with mild PHL have been identified with IHP

2. Association of Permanent Hearing Loss (PHL) with comorbidities and utilization of health services
   
   *Hypotheses*
   
   – PHL associated with higher comorbidities
   – PHL associated with higher rates of health care utilization
1. Impact of Implementation of IHP

(1) **Comparison of Before vs. After Implementation**


Dependent: Median age of identification of PHL
Independent: Degree of PHL

(2) **Assess possible confounders by comparison to control group of matched non-PHL**

(3) **Assess if degree of PHL modifies association between Era (Before/After) and Age at Identification**
1. **Impact of Implementation of IHP**

**Secondary Aim:** Development of an algorithm from Ottawa data to identify PHL throughout Ontario

**Reference Standard:** Children with PHL in CHEO database

**Control:** Children without PHL (not in database)

**Analyses:** sensitivity, specificity, PPV, NPV of algorithms based on health service data
2. Permanent Hearing Loss: Comorbidities and Utilization of Health Services

(1) Associated Comorbidities:

Compare PHL cases vs. matched controls
Dependent = Pediatric co-morbidity index


(2) Utilization of Health Services:

Compare PHL cases vs. matched controls
Matching on birth, sex, neighborhood income quintile, comorbidity
Dependent = rates of outpatient physician visits, hospitalizations, ED visits, home care visits
2. Permanent Hearing Loss: Comorbidities and Utilization of Health Services

(2) Utilization of Health Services - continued:
Dependent = outpatient physician visits, hospitalizations, ED visits, home care visits
Time = at time of PHL diagnosis, and yearly thereafter
Stratify outpatient physician billing by specialty

(3) Compare Utilization of Health Services for PHL
Analyses: Poisson regression analyses to compare rates;
Conditional logistic regression to compare likelihood of events
Thank you!