Using electronic health records for population-level research of pediatric caries in Alaska

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Can electronic health records be used to evaluate the epidemiology of pediatric dental caries in AI/AN populations?
Population

• Urban Anchorage, Alaska
  • Alaska Native Medical Center
  • Southcentral Foundation
    • Pediatric Dental Residency

• Annual AI/AN birth cohort: 650
Prevalence Of Caries Among Southcentral Foundation Dental Clinic Pediatric Patients, 2006-2013, Anchorage, Alaska.

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Methods

• Retrospective chart review

• Data extracted from electronic dental records
  • Eaglesoft system

• Inclusion criteria
  • Children aged 0-5 years old
  • Comprehensive exam
  • Anchorage and surrounding areas
  • 2006-2013
Methods

• Each individual given a unique study ID

• ADA current dental terminology (CDT) codes defined dental outcomes

• Decayed and filled teeth (dft) scores were calculated
  • Missing teeth not calculated to avoid assumptions
Results

• Years 2006 -13, inclusive
• 30,299 pediatric visits
• 7,725 children had full dental exam
Number of Children Seen by Year and Age Class
## Caries Experience and Mean dft

<table>
<thead>
<tr>
<th>Age in years</th>
<th>2010-2013</th>
<th>Mean Number of Teeth</th>
<th>% with ≥ 1 decayed tooth</th>
<th>% with ≥ 1 filled tooth</th>
<th>% with ≥ 1 decayed or filled tooth</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>decayed</td>
<td>filled</td>
<td>decayed or filled</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.08</td>
<td>0.02</td>
<td>0.10</td>
<td>3.4%</td>
<td>1.1%</td>
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<td>0.83</td>
<td>12.6%</td>
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<td>1.24</td>
<td>2.07</td>
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<td>3</td>
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<td>4.52</td>
<td>25.5%</td>
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<td>0.92</td>
<td>4.11</td>
<td>5.04</td>
<td>27.6%</td>
<td>63.9%</td>
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</table>
Caries Experience by Age Class
Procedures requiring General Anesthesia

25% of children were treated in the operating room before age 6
Evaluating A New Classification System For Caries Experience Pediatric Dental Patients, Anchorage, Alaska

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# Caries in the Primary Dentition Classification

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<th>18-23</th>
<th>24-29</th>
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<th>36-47</th>
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--- (CIPD Level) ---
METHODS

- Retrospective Cohort Study
  - Born 2002 through 2007
  - Anchorage or nearby residents
  - Complete dental exam by 3rd birthday
  - Followed through sixth year of life

- Evaluated likelihood of developing an adverse outcome
  - dft ≥ 5
  - Full Mouth Dental Reconstruction
    - dft ≥ 5
    - General anesthesia

- Survival Analysis
  - Cox Proportional Hazards
  - SAS software
Initial Cohort:
Children born between 2002-2007
n=4,669

Children who received exam by 3y
n=1,759

FMDR in the OR with dft ≥ 5 cohort

Removed 171 children who had already been to the OR w/ dft ≥ 5 by age 3

222 were lost to follow up and had no exam after age 3

Children for analysis of dft ≥ 5
n=1,269

dft≥ 5 cohort

Removed 274 children who already had dft ≥ 5 by age 3

216 were lost to follow up and had no exam after age 3

Children for analysis of FMDR in OR
n=1,366
Risk of Developing a dft \( \geq 5 \), According to Initial CIPD Score
Risk of Developing a dft ≥5, according to Initial ECC score
Risk of Developing a dft ≥5, according to Initial CIPD or ECC score
Risk of Having a FMDR, According to Initial CIPD or ECC score
Limitations

- Electronic records not designed for population studies
  - Extensive data manipulation needed
    - Could be preprogrammed and packaged by software developers

- “Missing” teeth not included
  - Systematically undercounts caries morbidity
  - Comparisons with other studies limited

- Population studies of clinic patients
  - Potentially biased by who accesses care
  - Loss to follow up may affect generalizability
Conclusions

• Electronic dental records can be used to
  • Evaluate prevalence of caries
  • Link outcomes for individuals
  • Track outcomes over time

• Caries in the Primary Dentition (CIPD) Scores
  • Can be determined and tracked in a population using E.D.R.
  • Provide more discrimination than ECC classification
  • Appear useful for
    • Identifying high risk patients
    • Evaluating populations over time
Next steps

• Evaluate use of E.H.R. for older children
  • Scoring and tabulation for mixed dentition is challenging

• Evaluate CIPD system using
  • Alternate cut-points to maximize sensitivity/specificity

• Evaluate calculated dft scores
  • Accuracy: larger sample
  • Representativeness: population survey

• Develop user-friendly interface for providers/planners