Regional variation of thyroid cancer incidence in Belgium

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BTC 26th april 2014
## Thyroid cancer incidence in Belgium

| Thyroid cancer: age-standardised incidence (WSR) by sex and Region, 1999-2008 |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| **Males**                  |          |          |          |          |          |          |          |          |          |          |
| Belgium                    | 2.1      | 2.5      | 2.4      | 2.6      | 2.8      |          |          |          |          |          |
| Flemish Region             | 1.4      | 1.4      | 1.1      | 1.3      | 1.3      | 1.4      | 1.6      | 1.8      | 1.9      | 2.0      |
| Brussels Capital Region    | 3.5      | 2.5      | 3.4      | 3.9      | 4.9      |          |          |          |          |          |
| Walloon Region             | 3.1      | 4.1      | 3.3      | 3.5      | 3.7      |          |          |          |          |          |
| **Females**                |          |          |          |          |          |          |          |          |          |          |
| Belgium                    | 6.9      | 7.0      | 7.4      | 7.4      | 7.6      |          |          |          |          |          |
| Flemish Region             | 2.7      | 3.2      | 3.1      | 3.9      | 4.0      | 4.3      | 5.4      | 5.4      | 5.0      | 5.2      |
| Brussels Capital Region    | 12.5     | 8.1      | 9.8      | 13.3     | 10.4     |          |          |          |          |          |
| Walloon Region             | 10.0     | 9.8      | 10.3     | 10.1     | 11.0     |          |          |          |          |          |

WSR: age-standardised incidence rate, using the World Standard Population (n/100,000 person years)
Geographical differences in thyroid cancer incidence by district (2004-2006)

Flanders: 4.1/100 000 PY

ESR: 5.8/100 000 PY
664 new cases per year

Wallonia: 8.3/100 000 PY

Belgian Cancer Registry
Incidence by histological type and tumor size

- Papillary Ca: 6.8 per 100,000 person years
- Follicular Ca: 2.7 per 100,000 person years

ESR (per 100,000 person years) for PTC T1:

- Brussels: 3.5
- Wallonia: 2.5
- Flanders: 2.0
Incident in Fleurus in August 2008

ISP/WIV

Health risks related to nuclear power plants or facilities

KCE-BCR

Diagnostic/therapeutic procedures for thyroid disease
Outline

• Regional variation, most marked for small carcinomas

• Hypothesis:

  * differences in diagnostic and therapeutic strategies contribute to
  
  geographic variation in thyroid cancer incidence in Belgium.

• TSH testing and imaging rates
Variability of screening and case finding

Neck mass → TSH → (Non) thyroidal problem

Thyroid Imaging

FNAC
TSH testing and imaging rates, methodology

Population

• EPS = « permanent sample » in within BHI, including / excluding patients with known thyroid pathology**
• **use of thiamazol/LT4 or with I\(^{131}\) /thyroidectomy in the year preceding the test.

Analysis: standardized rate of test per year (2003-2008)

• Generalized Estimating Equation (GEE) method to test differences between regions over the time
• Primary analysis: Direct gender and age Standardization (Europe 1991 = standard pop)
• Sensitive analysis: Indirect gender and age Standardization (Belgian EPS pop 2008 = standard pop)
### Variability of screening and diagnostic procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Belgium (/ 1 000 py)</th>
<th>Walloon Region</th>
<th>Flemish Region</th>
<th>Brussels Region</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH</td>
<td>340</td>
<td>350</td>
<td>338</td>
<td>321</td>
<td>0.256</td>
</tr>
<tr>
<td>Neck US (+/- TSH)</td>
<td>8</td>
<td>12.5</td>
<td>5.1</td>
<td>10.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Carotid duplex</td>
<td>12</td>
<td>14</td>
<td>11</td>
<td>16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>High-tech imaging (CT/MRI/PET CT)</td>
<td>59</td>
<td>71</td>
<td>50</td>
<td>73</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

*Standardized rates; in population without history of thyroid disease*

These exams can potentially unmask indolent or very small thyroid tumours.
Outline

• Regional variation, most marked for small carcinomas
• Hypothesis:
  differences in diagnostic and therapeutic strategies contribute to
  geographic variation in thyroid cancer incidence in Belgium.
  • imaging rates differ, higher rates in HIR

• Treatment strategies in thyrotoxicosis
• Treatment strategies in nodular disease
? Variability of treatment strategies in thyroid disease

- Nodular disease
  - Neck mass
  - Imaging
  - FNAC

- Thyrotoxicosis
  - Follow-up
Therapeutic strategies & surgical cohort: methodology

Therapeutic strategies

- Thyrotoxicosis (n=69.420)
- Nodular disease (n=57.935)

Data sources

- BHI database
- 2003-2008
Variability of treatment strategies for thyrotoxicosis

<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>Walloon Region</th>
<th>Flemish Region</th>
<th>Brussels Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence rates</td>
<td>87/100 000</td>
<td>63/100 000</td>
<td>102/100 000</td>
<td>79/100 000</td>
</tr>
<tr>
<td>Surgery (minority)</td>
<td>8%</td>
<td>10%</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Antithyroid mdt’s</td>
<td>69%</td>
<td>62%</td>
<td>71%</td>
<td>73%</td>
</tr>
<tr>
<td>Radioiodine</td>
<td>22%</td>
<td>27%</td>
<td>22%</td>
<td>17%</td>
</tr>
<tr>
<td>No data for PTU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Slightly more surgical interventions → Slightly higher probability to discover small thyroid tumours (anatomopathology)
# Variability of treatment strategies for thyroid nodules

<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>Walloon Region</th>
<th>Flemish Region</th>
<th>Brussels Region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidence rates</strong></td>
<td>85/100 000</td>
<td>110/100 000</td>
<td>66/100 000</td>
<td>113/100 000</td>
</tr>
<tr>
<td><strong>Surgery</strong></td>
<td>55%</td>
<td>69%</td>
<td>47%</td>
<td>48%</td>
</tr>
<tr>
<td><strong>FNAC + Surgery</strong></td>
<td>18%</td>
<td>13%</td>
<td>22%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Conservative managment</strong></td>
<td>45%</td>
<td>31%</td>
<td>53%</td>
<td>52%</td>
</tr>
</tbody>
</table>

More surgery

→ Higher probability to discover thyroid tumours (anatomopathology)
Outline

- Regional variation, most marked for small carcinomas
- **Hypothesis:**
  
  *differences in diagnostic and therapeutic strategies contribute to* 
  
  *geographic variation in thyroid cancer incidence in Belgium.*

  - imaging rates differ, higher rates in HIR.
  - Treatment strategies in thyrotoxicosis / nodular disease differ, higher proportions of surgical vs conservative treatment in the HIR
  - Surgery rates, FNAC rates
  - Surgical cohort
Rates of thyroid specific procedures

<table>
<thead>
<tr>
<th>AS Rates per 100,000 py</th>
<th>Walloon Region</th>
<th>Flemish region</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroid surgery</td>
<td>80.3</td>
<td>34.0</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>lobectomy</td>
<td>17.2</td>
<td>10.7</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>total thyroidectomy</td>
<td>64.0</td>
<td>23.9</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Surgery preceded by FNAC</td>
<td>13.0</td>
<td>13.7</td>
<td>ns</td>
</tr>
<tr>
<td>FNAC</td>
<td>47.6</td>
<td>49.2</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>
Surgical cohort and preoperative strategies

- **Walloon, high incidence region**
  - 18% preceded by FNAC
  - 6.7% preceded by thyrotoxicosis

- **Flemish, low incidence region**
  - 41% preceded by FNAC
  - 14% preceded by thyrotoxicosis
Outline

• Regional variation, most marked for small carcinomas
• *Hypothesis:* differences in diagnostic and therapeutic strategies contribute to geographic variation in thyroid cancer incidence in Belgium.
  • imaging rates differ
  • Treatment strategies in thyrotoxicosis / nodular disease differ, different proportions with surgical vs conservative treatment.
  • Surgery rates are different, FNAC rates are similar
  • Surgical cohort, % thyroid cancer ?
Surgical cohort and thyroid cancer cohort

- BCR database 2004-2006
- BHI database 2003-2008
Total thyroidectomy for nodular disease
% cancer diagnosis

Walloon, high incidence region

- Benign: 11.6%
- Thyroid cancer: 7.7%
- Other than PTC1a: 3.9%

Flemish, low incidence region

- Benign: 14.6%
- Thyroid cancer: 12.3%
- Other than PTC1a: 2.3%
- PTC1a: 7.7%
## Thyroid cancer patient

<table>
<thead>
<tr>
<th>Proportion preceded by FNAC</th>
<th>Walloon, high incidence region</th>
<th>Flemish, low incidence region</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cancer patients</td>
<td>27,8</td>
<td>59,5</td>
<td>&lt; 0,05</td>
</tr>
<tr>
<td>Cancer patients excluding PTC1a</td>
<td>30,2</td>
<td>60,7</td>
<td>&lt; 0,05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proportion with synchronous LND</th>
<th>Walloon, high incidence region</th>
<th>Flemish, low incidence region</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cancer patients</td>
<td>12,0</td>
<td>22,3</td>
<td>&lt; 0,05</td>
</tr>
<tr>
<td>PTC excluding PTC1a</td>
<td>15,6</td>
<td>24,8</td>
<td>&lt; 0,05</td>
</tr>
</tbody>
</table>
Study conclusion (1):

- Higher imaging rates
- More surgery for thyrotoxicosis/nodular disease
- Higher surgical rates
- ~ higher probability of indolent cancers

Van den Bruel et al. JCEM 2013, 98(10):4063-4071
Study conclusion (2): underuse of FNAC

- Lower proportion of preoperative FNAC in surgical (cancer) patients
- Lower % of thyroid cancer in surgical cohort

Van den Bruel et al. JCEM 2013, 98(10):4063-4071
Limits

- Geographic analysis, at the population level
- Retrospective, administrative data
- Other factors? Related to practitioners and hospital e.g. anatomopathological analyses, related to environment

Strengths

- BHI-BCR dataset, completeness of data at the population level, universal health insurance coverage
- Novel tools outlining geographic variations in the clinical pathway that leads to thyroid cancer diagnosis *

* Davies, JCEM 2013,98(10):3977-3979
Thank you!

- J. Francart, M. Adam
- H. De Schutter, K. Henau,
- L. Van Eycken

- C. Dubois, J. Vlayen
- S. Stordeur, R. Mertens
- B. Decallonne