An automated method for analyzing adherence to therapeutic guidelines: Application in Diabetes

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Assessing the quality of prescriptions

- Indicators of prescribing appropriateness
  - Based on the Summaries of Product Characteristics (SmPCs)

- The appropriateness of the choice of treatments
  - Based on Clinical Practice Guidelines (CPG)

Various studies show controversial results
Is this because of
- practice differences?
- methods measuring the adherence?
Objective

To develop a *simple* method
- To *quantify* the appropriateness of prescriptions
  - regarding CPGs
- To analyze *easily* the situations in which the recommendations are not followed
- Which can be *automated*

To apply method in type two diabetes
Materials

French CPGs for type two diabetes
- The national reference standard
- Widely available in electronic and paper forms
- A step-by-step therapeutic strategy (graded)

Patient database
- De-identified demographic, clinical, laboratory, and therapeutic data
- Ambulatory patients admitted to Avicenne hospital from June 2003 to September 2004
- For a periodic visit or because of deregulation
- Laboratory tests and clinical examination
Methods

Descriptive model of a therapy

- **Category**
  - Drug prescription
  - Level 0

- **Type**
  - Bitherapy
  - Level 1

- **Class**
  - Biguanides A10BA
  - Sulfonylurea A10BB
  - Level 2

- **INN**
  - Metformin A10BA02
  - Gliclazide A10BB09
  - Level 3

- **Dose**
  - 2 g/day
  - 0.16 g/day
  - Level 4

INN: International non proprietary name

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Computer methods

Calculation of agreement values

PRESRIPTION EVALUATION SYSTEM

Treatment abstraction component
Comparison component
Prescription extraction component
Rule based engine

Manual extraction of rules

Patient database
Pharmacologic knowledge base
The guideline

Agreement on type
Agreement on type and class
Agreement on type and class and dose

Flow of data

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Results

574 patient records included

- Mean age: 59.9 (sd=11.4) years
- Mean duration of diabetes: 11.4 (sd=9.2) years
- Mean body mass index: 29.0 (sd=6.0) kg/m$^2$
- Mean $\text{Hb}_{A1C}$: 7.9 (sd=1.7)%

- 13 patients excluded
  - Thiazolidinediones in treatment and lack of relevant information in the guideline
Adherence levels in overall

<table>
<thead>
<tr>
<th>Type of treatment at admission</th>
<th>Agreement between prescriptions and recommendations at discharge at three levels</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type only n (% in row)</td>
<td>Type and class n (% in row)</td>
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<tr>
<td>Diet and exercise</td>
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<tr>
<td>Oral monotherapy</td>
<td>127 (86)</td>
<td>117 (79)</td>
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<td>Oral bitherapy</td>
<td>119 (82)</td>
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<tr>
<td>Insulin alone or combined with oral therapy</td>
<td>205 (96)</td>
<td>197 (92)</td>
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<td>Total</td>
<td>473 (82)</td>
<td>448 (78)</td>
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## Adherence levels in groups

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## Analysis of decisions for type of treatment

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CPG: guideline recommendations
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*Ph: physician's prescription, CPG: guideline recommendations*
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*Ph: physician's prescription  CPG: guideline recommendations*
Lack of details in CPGs
  • Comparison convention

Reasons of non adherence

Extensibility of basic concepts
  • Dose and class: universal concepts
  • Type: common in chronic diseases

Existing approaches for measuring adherence
  • Explicit criteria, physician surveys, guideline impact, patient records
Our method was automated and used

- to measure prescribing appropriateness
- to analyze a CPG for followed / not followed recommendations

Possible applications

- Monitoring (automatically) the evolution of adherence over time
- Making measurements which can be compared with each other for various CPGs
- Exploring decision-making pathways of medical experts
References

Thank you!

For more information:
massoudtoussi@gmail.com
Annexes

Analysis of the guideline
Checking the system
Comparison algorithm
A more detailed level of comparison
Comprehension of the CPG decision-making flow

- **HbA1c<6.5% → Do not change**

  - **Diet and exercise**

  - **Oral monotherapy → ↑ dose to maximum ± Change ATC Class**
    - **Oral Bitherapy → ↑ Dose to maximum ± Change ATC class**
      - **Insulin therapy → ↑ dose to maximum**
      - **Intensive insulin therapy**
        - **Insulin therapy with oral therapy**

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Checking the system
Comparison algorithm

1. Take a patient
2. Verify the type of treatment in prescription
   - Is it the same as that generated?*
     - No → No agreement is obtained
     - Yes → Verify the class of each drug in prescription
3. Verify the class of each drug in prescription
   - Is it the same as that generated?*
     - No → Agreement over type
     - Yes → Verify the dose of each drug in prescription
4. Verify the dose of each drug in prescription
   - Is it in the same range as that generated?*
     - No → Agreement over type and class
     - Yes → Agreement over type, class and dose
5. Stop comparison

*: If nothing is generated by system consider "Yes" by convention.
### ATC Pharmacotherapeutic Classes

#### ATC Pharmacotherapeutic Class of Oral Treatment at Admission

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<th>ATC Pharmacotherapeutic Classes of Prescribed or Recommended Oral Treatments at Discharge</th>
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</thead>
<tbody>
<tr>
<td>*</td>
<td>B</td>
</tr>
<tr>
<td>Ph CPG</td>
<td>Ph CPG</td>
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<td>BSA</td>
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<tr>
<td>Total</td>
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</tr>
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</table>

**Ph**: physician's prescription  
**CPG**: guideline  
**B**: biguanides  
**S**: Sulfonylurea  
**A**: alpha-glucosidase inhibitors  

* Patients not treated with oral antidiabetic agents (treated with diet and exercise, or insulin).  
† The guideline allows physicians to choose to combine metformine with insulin therapy or not.  
‡ The guideline allows physicians to choose any pharmacotherapeutic class for oral monotherapy