The impact of guideline-based decision support on general practitioners’ test ordering

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http://www.eur.nl/FGG/MI/
Outline

- Introduction
- Research in the Netherlands
- Analysis of guidelines of Dutch College of General Practitioners (DCGP)
- Randomized trial with BloodLink a computer-based decision support system on blood test ordering
- Conclusions
Introduction

- 3-4% of patient’s encounters with GP result in test ordering
- Annually: over $40.000.000
- Large diversity in test-ordering behavior
- Difficult to influence
Research in the Netherlands with proven effect on test ordering behavior
DCGP-Guidelines

- DCGP-guidelines difficult to access

- Analysis DCGP-guidelines (M1 - M64)
  - 23 guidelines include recommendations for test ordering

- Ordering protocols based on DCGP-guidelines
Objective

To evaluate which method is most effective on test-ordering behavior

– BloodLink-Guideline
– BloodLink-Restricted
Methods

- Randomized controlled trial
- Two versions of module BloodLink
  - BloodLink-Guideline
    - indication-oriented (based on DCGP-guidelines)
BloodLink-Problems oriented Laboratory Request.

Naam: M.A.M. Wijk van Grabijnhof 2A 46 jr. Man 230 P

Guideline:
- Liver disorders
- Drug-induced liver damage
- Hepatitis A
- Hepatitis B
- Hepatitis C
- Icterus
- Icterus neonatorum
- Livercirrhosis
- Suspicion alcohol-hepatitis

Liver disorders
- Mononucleosis infectiosa
- Pregnancy
- Prostate complaints
- Rheumatoid arthritis
- TIA
- Thyroid dysfunctions
- Vague Complaints

MEER
BloodLink-Guideline

BloodLink Problem-oriented Laboratory Request.

<table>
<thead>
<tr>
<th>Naam</th>
<th>M.A.W. Wijk van Grabijnhof 2A 46 jr. Man</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline</td>
<td>Liver disorders</td>
</tr>
<tr>
<td>Disease</td>
<td>Hepatitis B</td>
</tr>
<tr>
<td>Indication</td>
<td>Recent infection hepatitis B</td>
</tr>
<tr>
<td>Protocol</td>
<td></td>
</tr>
<tr>
<td>ALAT(PT)</td>
<td>Yes</td>
</tr>
<tr>
<td>HBC-AS</td>
<td>Yes</td>
</tr>
<tr>
<td>HBSAG</td>
<td>Yes</td>
</tr>
<tr>
<td>Other test</td>
<td>No</td>
</tr>
</tbody>
</table>

Fasting value: No
Urgent: No

<Enter> = Switch Yes/No
<F3> = Help Information
-> = Fasting value/Urgent
\ = Fasting value/Urgent
<F1> = Exit this screen
**BloodLink-Guideline**

**BloodLink Problem Oriented Laboratory Request.**

<table>
<thead>
<tr>
<th>Naam</th>
<th>M.A.M. Wijk van Grabijnhof 2A 46 jr. Man</th>
</tr>
</thead>
</table>

**Guideline:** Liver disorders  
**Disease:** Hepatitis B  
**Indication:** Recent infection hepatitis B

**Protocol**

- **ALAT(PT):** Yes
- **HBC-AS:** Yes
- **HBSAG:** Yes
- **Other test:** Yes

**Bepaling:** hb

**Which test?**

<table>
<thead>
<tr>
<th>HB ELECTR</th>
<th>HB ELECTROFORESE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBA1C</td>
<td>HBA1C</td>
</tr>
<tr>
<td>HBC-AS</td>
<td>HBC-AS</td>
</tr>
<tr>
<td>HBEAG</td>
<td>HBEAG</td>
</tr>
<tr>
<td>HBS-AS</td>
<td>POSTVACCINAT</td>
</tr>
<tr>
<td>HBSAG</td>
<td>HBSAG</td>
</tr>
</tbody>
</table>

- `F1` = Exit this screen
- `F3` = Fasting value
- `F4` = Urgent

**Fasting value:** No  
**Urgent:** No
Methods

- Randomized controlled trial
- Two versions of module BloodLink
  - **BloodLink-Guideline**
    - indication-oriented (based on DCGP-guidelines)
  - **BloodLink-Restricted**
    - restricted order form
BloodLink Restricted

BloodLink Restricted Laboratory Request.

Naam: M.A.M. Wijk van Grabijnhof 2A 46 jr. Man 230 P

Protocol
ALAT(PT): Yes
ASAT(OH): No
BILIRUBINE TOT: No
BSE: No
CHOLESTEROL: No
GAMMA GT: Yes
GLUC BL: No
GLUC BL N: No
HB: Yes
HBA1C: No
K: No
KREAT: No
MCV: No
PAULBUNNELL: No
TSH: No
VRIJE T4: No

Other test: No
Fasting value: No
Urgent: No

<Enter> = Switch Yes/No
<F3> = Help information
-> = Fasting value/Urgent
\ = Fasting value/Urgent
<F1> = Exit this screen
BloodLink Restricted Laboratory Request.

**Naam**: M.A.M. Wijk van Grabijnhof 2A 46 jr. Man

**Protocol**
- ALAT(PT): Yes
- ASAT(OT): No
- BILIRUBINE TOT: No
- BSE: No
- CHOLESTEROL: No
- GAMMA GT: Yes
- GLUC BL: No
- GLUC BL N: No
- HB: Yes
- HBA1C: No
- K: No
- KREAT: No
- MCV: No
- PAULBUNNELL: No
- TSH: No
- VRIJE T4: No
- Other test: Yes

**Bepaling:** al

**Which test?**
- ALAT: ALAT(PT)
- ALB: ALBUMINE
- ALBUMEN: EIWIT KW URINE
- ALCOHOL: ETHANOL
- ALDOLASE: ALDOLASE
- ALDOSTERON: ALDOSTERON
- ALFA 1: ALPHA1FOET
- ALK FOS: ALK FOS
- ALK FOS ISOENZYMEN: ALK FOS ISOENZYMEN
- ALUMINIUM: ALUMINIUM

Fasting value: No
Urgent: No

\(\checkmark\) = Fasting value/Urgent

\(<F1>\) = Exit this screen
Method

- Randomized controlled trial
- Two versions of module BloodLink
  - BloodLink-Guideline
  - indication-oriented (based on DCGP-guidelines))
  - BloodLink-Restricted
    - restricted form (Zaat 1991)
- Integrated in EPR
- Delft Region, general practitioners, R. de Graaf Hospitals
Study

- Period: March 1st 96 through March 1st 97
- Population: 60 gp’s, 44 practices
- Randomization at the level op practice
- Paperform available during study period
- Comparing average number of test per order form
## Total number of tests

<table>
<thead>
<tr>
<th>Module</th>
<th>Total Number of order forms</th>
<th>Total Number of requested tests</th>
<th>Average number of test per order form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BloodLink Restricted</td>
<td>12.786</td>
<td>87.634</td>
<td>6.9</td>
</tr>
<tr>
<td>BloodLink Guideline</td>
<td>12.700</td>
<td>70.479</td>
<td>5.5</td>
</tr>
</tbody>
</table>

(Mann-Whitney test p=0.003, N=44)
## Number of ordered test per module

<table>
<thead>
<tr>
<th>Test</th>
<th>BloodLink Guideline</th>
<th>Difference</th>
<th>BloodLink Restricted</th>
</tr>
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<tbody>
<tr>
<td>ESR</td>
<td>5612</td>
<td>-29%</td>
<td>7932</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>6061</td>
<td>-17%</td>
<td>7332</td>
</tr>
<tr>
<td>WBC</td>
<td>3719</td>
<td>-26%</td>
<td>5039</td>
</tr>
<tr>
<td>Hematocrite</td>
<td>3611</td>
<td>-25%</td>
<td>4830</td>
</tr>
<tr>
<td>Creatinine</td>
<td>3314</td>
<td>-34%</td>
<td>5024</td>
</tr>
<tr>
<td>Erytrocytes</td>
<td>3360</td>
<td>-28%</td>
<td>4690</td>
</tr>
<tr>
<td>MCV</td>
<td>3159</td>
<td>-32%</td>
<td>4642</td>
</tr>
<tr>
<td>WBC count</td>
<td>3060</td>
<td>-26%</td>
<td>4151</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>3413</td>
<td>-1%</td>
<td>4354</td>
</tr>
<tr>
<td>TSH</td>
<td>3213</td>
<td>9%</td>
<td>2954</td>
</tr>
<tr>
<td><strong>Gamma-GT</strong></td>
<td><strong>2004</strong></td>
<td><strong>-42%</strong></td>
<td><strong>3466</strong></td>
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<tr>
<td>Glucose in serum</td>
<td>2964</td>
<td>19%</td>
<td>2501</td>
</tr>
<tr>
<td>ALAT (SGPT)</td>
<td>1892</td>
<td>-34%</td>
<td>2850</td>
</tr>
<tr>
<td>Potassium</td>
<td>1096</td>
<td>-53%</td>
<td>2320</td>
</tr>
<tr>
<td>ASAT (SGOT)</td>
<td>959</td>
<td>-58%</td>
<td>2269</td>
</tr>
<tr>
<td>Glucose fasting</td>
<td>1286</td>
<td>-20%</td>
<td>1611</td>
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<tr>
<td>Triglycerides</td>
<td>1398</td>
<td>1%</td>
<td>1380</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>1350</td>
<td>-2%</td>
<td>1382</td>
</tr>
<tr>
<td>Natrium</td>
<td>745</td>
<td>-30%</td>
<td>1070</td>
</tr>
<tr>
<td>Free T4</td>
<td>618</td>
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Conclusion

- Computer-based test ordering is feasible
- Decision support based on guidelines is more effective in changing blood test-ordering behavior than merely reducing the number of test options
Effective introduction of DCGP Guidelines in daily practice