Cost-effectiveness of real-time medication monitoring (RTMM) in children with asthma

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Background
- Growing burden of asthma
- Many children with uncontrolled disease
- Medication adherence could be improved
- Objective: to investigate the effectiveness and cost-effectiveness of a Real-Time Medication Monitoring system (RTMM) to improve adherence to inhalation corticosteroids

The adHaler

Intervention
- Device detects inhalation being taken
- Text message to parents if inhalation is forgotten
- Prevention of alert fatigue

The e-MATIC trial

Outcome measures
- Adherence
  - Proportion of prescribed inhalations that were taken at planned time (+/− 3 hours)
- Health
  - Asthma Controle Test (ACT)
  - Paediatric Asthma Quality of Life Questionnaire (PAQLQ)
- Costs
  - Societal and healthcare perspectives
- 12 months of follow up, several measurements per outcome

- e-Monitoring of Asthma Therapy to Improve Compliance in children
- Multi-center, randomised controlled trial
- 209 children:
  - Recruited from outpatient clinics
  - Inhaled corticosteroids (ICS) use for at least 3 months.
  - 4-12 years old (mean 7.8 years)
  - 63% boys
- Randomisation:
  - Intervention: adHaler + RTMM
  - Control: adHaler
Repeated-measures analysis

- Addresses attrition and missing values
- Linear model with correlated errors
- Covariance structure: exchangeable
- Explanatory variables (all dummies): time, interactions of time and treatment
- Predictions of mean outcomes per measurement and treatment:
  \[ \text{Adherence}_{[\text{tr}=1, \text{time}=2]} = \beta_0 + \beta_{\text{time}=2} + \beta_{\text{time}^2*\text{treatment}} \]

Adherence

- Full year: adherence 69.0% vs 57.3%
  - Improvement 11.8% (CI: 6.9%-17.5%)
- First half year: improvement 15.2%
  (CI: 9.5%-21.1%)
- Second half year: improvement 8.3%
  (CI: 0.7%-15.4%)

Childhood Asthma Control Test score

- 7 questions on preceding month
- Range: 0-27
- Minimal clinically relevant difference: 3 points

Asthma-related quality of life

- Paediatric Asthma Quality of Life Questionnaire (PAQLQ)
- 23 questions on preceding week
- Score after 12 months:
  - RTMM: 6.2 (CI: 6.0-6.3)
  - Control: 6.3 (CI: 6.1-6.5)
  - Difference: -0.06 (CI: -0.4 - 0.14)

Results costs

- Intervention costs (including device, activation, monitoring): €185 for first year
- Healthcare costs
  - RTMM: €719
  - Control: €615
  - Incremental: €104 (CI: -€40 – €275)
- Societal costs
  - RTMM: €1030
  - Control: €743
  - Incremental: €287 (CI: -€35 – €547)

Conclusion

- Effective in increasing adherence, especially in short-term
- No effect on health outcomes in this population
- Not cost-effective in this context
- Explanations:
  - Uncertainty about optimal inhalation frequency of ICS
  - Relatively good adherence in control group