New tools in respiratory care
added value of digital health

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Belgium
Digital health tools: eHealth versus mHealth

- **eHealth**: online or offline support based on IT solution
- **mHealth**: application on mobile device and wireless tracking devices
Chronic upper airway diseases affect a significant portion of the population. Need for better disease control of patients with CRDs.

**PREVALENCE**
- Chronic rhinosinusitis: 10%
- Allergic rhinitis: 20-25%
- Asthma: 5-12%

**GROWING PATIENT GROUP**

**PARTLY CONTROLLED PATIENTS**

**UNCONTROLLED PATIENTS** 30-40%

**CONTROLLED PATIENTS**
40% of CRS patients are UNCONTROLLED
despite maximal medical therapy and sinus surgery

<table>
<thead>
<tr>
<th></th>
<th>Total (n = 389)</th>
<th>CRSsNP (n = 177, 45.5%)</th>
<th>CRSwNP (n = 212, 54.5%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong> (mean ± SD)</td>
<td>47.3 ± 14.1</td>
<td>45.7 ± 15.0</td>
<td>49.3 ± 12.7</td>
<td></td>
</tr>
<tr>
<td><strong>Gender (% male)</strong></td>
<td>53.2</td>
<td>42.5</td>
<td>66.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Atopy (%)</strong></td>
<td>33.4</td>
<td>28.8</td>
<td>39.0</td>
<td>0.034</td>
</tr>
<tr>
<td><strong>Aspirin intolerance (%)</strong></td>
<td>4.1</td>
<td>0.0</td>
<td>9.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Asthma (%)</strong></td>
<td>17.7</td>
<td>12.3</td>
<td>24.3</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Smoking (%)</strong></td>
<td>15.4</td>
<td>17.9</td>
<td>12.4</td>
<td>0.135</td>
</tr>
<tr>
<td><strong>Revision (%)</strong></td>
<td>29.0</td>
<td>23.6</td>
<td>35.6</td>
<td>0.009</td>
</tr>
</tbody>
</table>

van der Veen J, Allergy 2016
Up to 35% of AR patients are UNCONTROLLED despite conventional pharmacotherapy

<table>
<thead>
<tr>
<th></th>
<th>IT</th>
<th>Non-IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (n)</td>
<td>82</td>
<td>352</td>
</tr>
<tr>
<td>Men (%)</td>
<td>34 (41.5)</td>
<td>151 (42.9)</td>
</tr>
<tr>
<td>Women (%)</td>
<td>48 (58.5)</td>
<td>201 (57.1)</td>
</tr>
<tr>
<td>Mean age (year, mean, standard deviation)</td>
<td>33.1 (11.6)</td>
<td>34.6 (12.7)</td>
</tr>
<tr>
<td>Atopy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mono-sensitized (%)</td>
<td>10 (12)</td>
<td>104 (30)</td>
</tr>
<tr>
<td>Poly-sensitized (%)</td>
<td>72 (88)</td>
<td>248 (70)</td>
</tr>
<tr>
<td>Asthma (%)</td>
<td>12 (14)</td>
<td>42 (12)</td>
</tr>
<tr>
<td>Pharmacological treatment (n)</td>
<td>26 (32)</td>
<td>215 (61)</td>
</tr>
<tr>
<td>Anti-histaminicum (%)</td>
<td>10 (12)</td>
<td>72 (20)</td>
</tr>
<tr>
<td>Intranasal corticosteroids (ICS) (%)</td>
<td>4 (5)</td>
<td>56 (16)</td>
</tr>
<tr>
<td>Anti-histaminicum + ICS (%)</td>
<td>12 (15)</td>
<td>87 (25)</td>
</tr>
</tbody>
</table>

Droessaert V, Rhinology 2016
4 Key Barriers / Solutions throughout the holistic care continuum
Efficiency and Multidisciplinary Collaboration

TIMELY ACCESS
- Patient Education
  - The need for adequate and unbiased information

EFFECTIVE TREATMENT
- Physician Education
  - In daily practice of healthcare delivery
- Patient Education
  - Improve adherence

MONITOR
- Supported self-management
  - Disease action plans

EFFICIENCY + COLLABORATION
- Integrated care pathway solutions
  - Increasing multidisciplinary and transmural collaboration

IMPROVING QUALITY OF LIFE in RHINOLOGY

- Improve Outcomes of Patients with CRDs
- Prevent and Control Asthma
- Create a Socio-Economic Impact
Mapping mHealth tools in CRD

320 Apps in total

234 Android App Store*

148 EXCLUDED**: 37 no English 37 tools only for HCP 30 game 13 alternative medicine 10 breathing exercises 10 general health 5 forecast

86 INCLUDED***

177 Apple App Store*

116 EXCLUDED**: 38 tools only for HCP 27 game 13 forecast 6 breathing exercises 5 alternative medicine 5 general health 2 no English

61 INCLUDED***

112 INCLUDED

15 Asthma & COPD

71 Asthma

15 COPD

5 Asthma and Rhinitis

6 RhinoSinusitis
Mapping mHealth tools in CRD

- **ASTHMA – COPD**: 15 Apps
- **ASTHMA**: 71 Apps
- **COPD**: 15 Apps
- **ASTHMA – RHINITIS**: 5 Apps
- **RHINOSINUSITIS**: 6 Apps

**APP FUNCTIONALITIES**
- Self-monitoring
- Personalized feedback
- Patient education

**Better patient empowerment**
Mapping mHealth tools in CRD

A. Patient self-monitoring
- inhaler use
- environment
- lung function
- disease control
- symptoms

B. Patient feedback
- action plan
- reminder monitoring
- reminder medication use
- share with HCP
- graph/chart

C. Patient education
- inhaler technique
- first aid
- trigger avoidance
- treatment
- disease

Sleurs K, Seys SF, Allergy 2019
Full patient monitoring using mHealth tools for CRD

- Patient reported outcome measures
- Biological parameters
- Physiological parameters
- Environmental exposure
- Adherence to therapy
Full patient monitoring using mHealth tools for CRD

- Sinusitis Diary
- Registration medication use
- Weekly reminder
- Patient feedback

mySinusitisCoach

Seys et al., Rhinology, 2018

Patient reported outcome measures
Full patient monitoring using mHealth tools for CRD

Sharing of results with HCP

Patient reported outcome measures
Full patient monitoring using mHealth tools for CRD

Patient reported outcome measures

How much are your nose symptoms bothering you today?

How much are your eye symptoms bothering you today?

How much are your asthma symptoms bothering you today?

Bousquet et al., Allergy, 2015
Physiological parameters

Full patient monitoring using mHealth tools for CRD

- Evaluation lung function by daily peak flow measurements (PEF)
- Evaluation nasal patency by peak nasal flow measurements?
- Evaluation of general health-related parameters by wireless tracking devices
  - Pulse rate
  - Physical activity
  - Sleep quality

- asthma COPD
- rhinitis CRS
- asthma COPD CRS

Physiological parameters
Adherence to therapy

Full patient monitoring using mHealth tools for CRD

- Reminders for taking medication
- Patient reported medication use via mHealth tool
- Smart sensors
  - Inhalers
  - Nasal sprays
  - Blisters
Full patient monitoring using mHealth tools for CRD

- **Endotype-driven treatment**
  - Blood/nasal secretion/sputum eosinophils
  - FeNO, nNO, VOCs in exhaled breath

- **Need for point of care solutions**

- **Results integrated in mHealth tool**

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**Biological parameters**

**myAirCoach**

Weekly
Planned: Fri, 13/01/2017

<table>
<thead>
<tr>
<th>Link</th>
<th>Date</th>
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<tbody>
<tr>
<td>ACQ week</td>
<td>Tue, 17/01/2017</td>
</tr>
<tr>
<td>Piko-1 (FEV1)</td>
<td>Tue, 17/01/2017</td>
</tr>
<tr>
<td>NIOX Vero (FeNO)</td>
<td>Tue, 17/01/2017</td>
</tr>
<tr>
<td>X-halo (EBT)</td>
<td>Tue, 17/01/2017</td>
</tr>
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</table>
Environmental exposure

Full patient monitoring using mHealth tools for CRD

- Based on geo-localization
  - need for specific consent of patient

- Estimated individual exposure
  - Outdoor air pollution
  - Indoor air pollution
  - Pollen counts

- Alerts might lead to individual patient actions
  - Modify activity
  - Personal protection
  - Medication
Added value of mHealth tools for different stakeholders

**PATIENT**
- Tracking of symptoms and objective monitoring of disease parameters
- Personalized feedback on disease progression and control
- Sharing detailed reports with physician
- Better education about disease, treatment options and correct use of drugs or devices

**PHYSICIAN**
- Early identification of uncontrolled disease and resistance to therapy
- Standardized follow-up after medical treatment and surgery

**HEALTH CARE SYSTEM**
- Cost saving thanks to reducing unnecessary consultations and hospitalizations
- Increasing time efficiency by better patient education

**RESEARCHER**
- Generation of real-life data, comparing efficacy of treatment strategies

**SOCIETY**
- Reduced absenteeism and presenteeism at work
- Reduction of economic costs
- Disease prevention by timely treatment
Adding value for all stakeholders requires adoption of mHealth tool in clinical practice

**STEP 1**
One application for multiple CRDs
CHRONIC RHINOSINUSITIS – ALLERGIC RHINITIS – ASTHMA

**STEP 2**
Adding value for patient and physician
PERSONALISED PATIENT FEEDBACK and IMPROVED PHYSICIAN DASHBOARD

**STEP 3**
Geographical coverage - standardisation
13 EU COUNTRIES (phased implementation in 2019)

**STEP 4**
Adoption in clinical practice to support patient and physician throughout the care pathway
Adding value for all stakeholders requires adoption of mHealth in clinical practice

**DIGITAL SOLUTIONS**

**PATIENT AWARENESS**
- Self-assessment
- Educational material
- Self-management

**PHYSICIAN EDUCATION**
- (1st – 2nd – 3rd line HCPs)
- Integrated care pathways
- Practical workshops for specialists

**OUTCOME RESEARCH**
- Pro-active follow up
- Patient outcome and health economic evidence

**INTEGRATED CARE PATHWAY**
- Increasing awareness and adherence

**IMPROVING QUALITY OF LIFE**
- in CRD

- Improve & Control Patient Outcomes
- Prevent and Control Asthma
- Create a Health-Economic Impact

**REGULATED BACK END (CLOUD) – 24/7 REAL TIME CONNECTION**

**PATIENT APP**
- Enable self-management
  - Symptom monitoring
  - Tracking MyCarePathway
  - Monitor adherence to treatment

**ONLINE PATIENT EDUCATION**
- Adequate information

**PHYSICIAN DASHBOARD**
- (1st – 2nd – 3rd line HCP’s)
  - Patient view
    - Monitor individual patients
  - Patient cohort
    - Monitor groups
  - Outcome registry
    - + Benchmark
  - Decision support
    - Advice on treatment options
  - Physician education
    - CME
  - News and community
    - Updates and sharing insights
BENEFITS

WHY
Non Diagnosed
- Reach General Population
- Improve Detection
- Improve Diagnosis and Referral

Diagnosed
- Monitor Diagnosed Patients

WHAT
- Self Assessment for Non Diagnosed Patients
- Registration of Profile

PATIENT REGISTERS IN THE APP VIA 2 ENTRIES
1/ Non Diagnosed by Self Assessment – 2/ Diagnosed and in Treatment
BENEFITS

WHY
- Standardized follow up of patient outcomes
- Evaluate outcomes after new treatment

WHAT
- Health Diary to monitor airway symptoms (VAS)
- Additional validated questionnaires available
- Feedback to the patient
**PATIENT INDIVIDUAL FILE**

**WHY**
- Continuous monitoring of symptoms
- Feedback on disease control
- Feedback on adherence to medication
- Prediction of outcomes after surgery

**WHAT**
- Remote access to patient results
- Create patient groups (severe, surgery, for biological treatment)
- Access from KWS (in progress)
Want to know more about EUFOREA?
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Bringing solutions for chronic airway diseases into daily practice

Evidence-based transformation of healthcare in Rhinitis, Rhinosinusitis and Asthma via physician education, patient awareness, outcome research, and integrated care pathways.

www.euforea.eu