



# Monsenso

Knowing how you feel

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- 22.7% of all YLDs/Years Lived with Disability  
(WHO, 2012)
- Cost equals 3,5% of GDP in Europe  
(OECD, 2015)
- 38% of all European suffer from mental disorder  
(ECNP/ECB report 2011)
- Will be largest burden for society in early 2020s  
(WHO, 2012)
- 10% get "adequate" care - 25% any care at all  
(Economist Intelligence Unit, 2015)

...it makes sense!



World Health  
Organization

- Tool to support and improve the treatment of Bipolar Disorder
- Based on three years of R&D with leading experts within mental health, pervasive healthcare and computing
  - Region H (Rigshospitalet)
  - IT University of Copenhagen
  - EU funded STREP project “MONARCA” with 13 European partners
- Developed in collaboration with patients, clinicians and carers



User-centered design with patients and clinicians at the University Hospital of Copenhagen, Denmark.

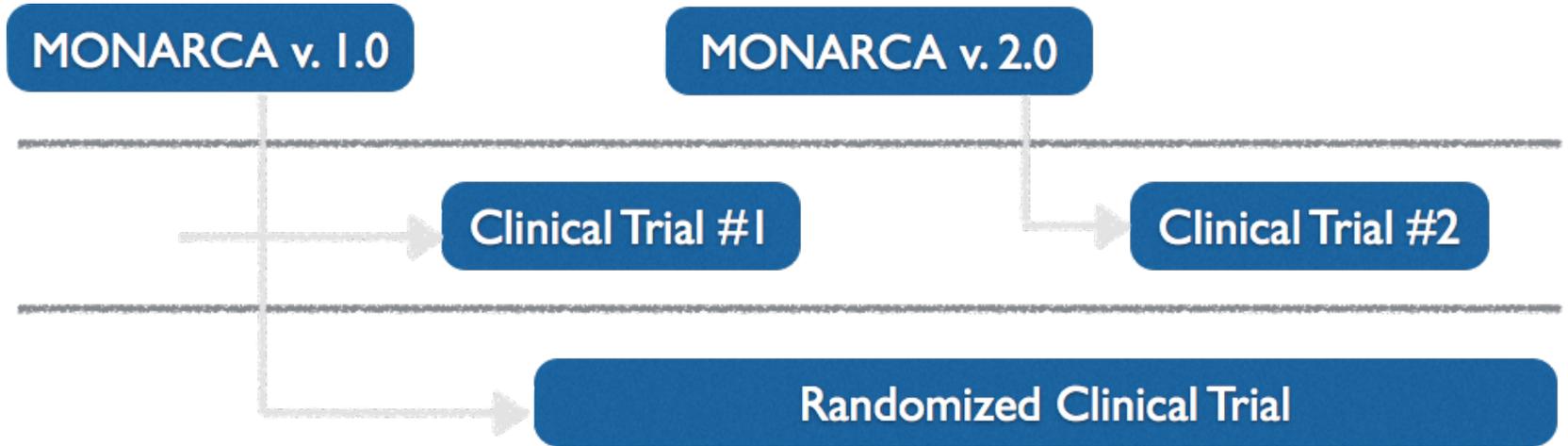
Bi-weekly design sessions over 12 months, each with 3 hours duration

- ~3 patients, ~3 clinicians and ~3 designers.

Design session consisted of:

- Sketching and brainstorming
- Lengthy discussions about features
- Feedback on iterative prototyping





- User-centered Design, Usefulness & Usability
- Data Analysis & Disease Prediction
- Clinical Evidence



## Original Article

Smartphone data as an electronic biomarker of illness activity in bipolar disorder

Faurholt-Jepsen et al. *Bipolar Disorders* 2015

**BMJ open**

**Objectives:** Illness activity for continued objectives of self-monitoring collected us and manic s

**Methods:** S collects aut on illness ac authors. A bipolar dise six months.

**Daily electronic self-monitoring of subjective and objective symptoms in bipolar disorder – the MONARCA trial protocol (MONitoring, treatMent and pRediCtion of bipolar disorder episodes): a randomised controlled single-blind trial**

Maria Faurholt-Jepsen,<sup>1</sup> Maj Vinberg,<sup>1</sup> Ellen Margrethe Christensen,<sup>1</sup> Mads Frost,<sup>2</sup> Jakob Bardram,<sup>2</sup> Lars Vedel Kessing<sup>1</sup>

Faurholt-Jepsen et al. *BMC Psychiatry* 2014, **14**:309  
<http://www.biomedcentral.com/1471-244X/14/309>

## STUDY PROTOCOL

Daily electronic monitoring of subjective and objective measures of illness activity in bipolar disorder using smartphones – the MONARCA II trial protocol: a randomized controlled single-blind parallel-group trial

Maria Faurholt-Jepsen<sup>1\*</sup>, Maj Vinberg<sup>1</sup>, Mads Frost<sup>2</sup> and Lars Vedel Kessing<sup>1</sup>

Session: Mental Health

CHI 2013: Changing Perspectives, Paris, France

## Designing Mobile Health Technology for Bipolar Disorder: A Field Trial of the MONARCA System

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### ABSTRACT

An increasing number of pervasive healthcare systems are being designed, that allow people to monitor and get feedback on their health and well-being. To address the challenges of

Consequently, a number of personal monitoring and feedback systems have been suggested for the management of a wide range of health-related conditions. In general, these types of systems have been designed to support the management and

Ugeskr Læger 174/44 | 29. oktober 2012

VIDENSKAB | 2707

## Elektronisk monitorering af patienter med bipolar affektiv sindslidelse

Anne Sophie Jacoby<sup>1</sup>, Maria Faurholt-Jepsen<sup>1</sup>, Maj Vinberg<sup>1</sup>, Mads Frost<sup>2</sup>, Jakob Bardram<sup>2</sup> & Lars Vedel Kessing<sup>1</sup>



## Open Access

Monitorering af patienter med bipolar affektiv sindslidelse blev identificeret, hvilket resulterede i fem artikler [13-17]. Endvidere beskrives resultaterne fra forfatterens eget pilotstudie af monitorering, treatment and prediction of bipolar disorder episodes (MONARCA) [18, 19] og fire kommercielle mobilapplikationer til

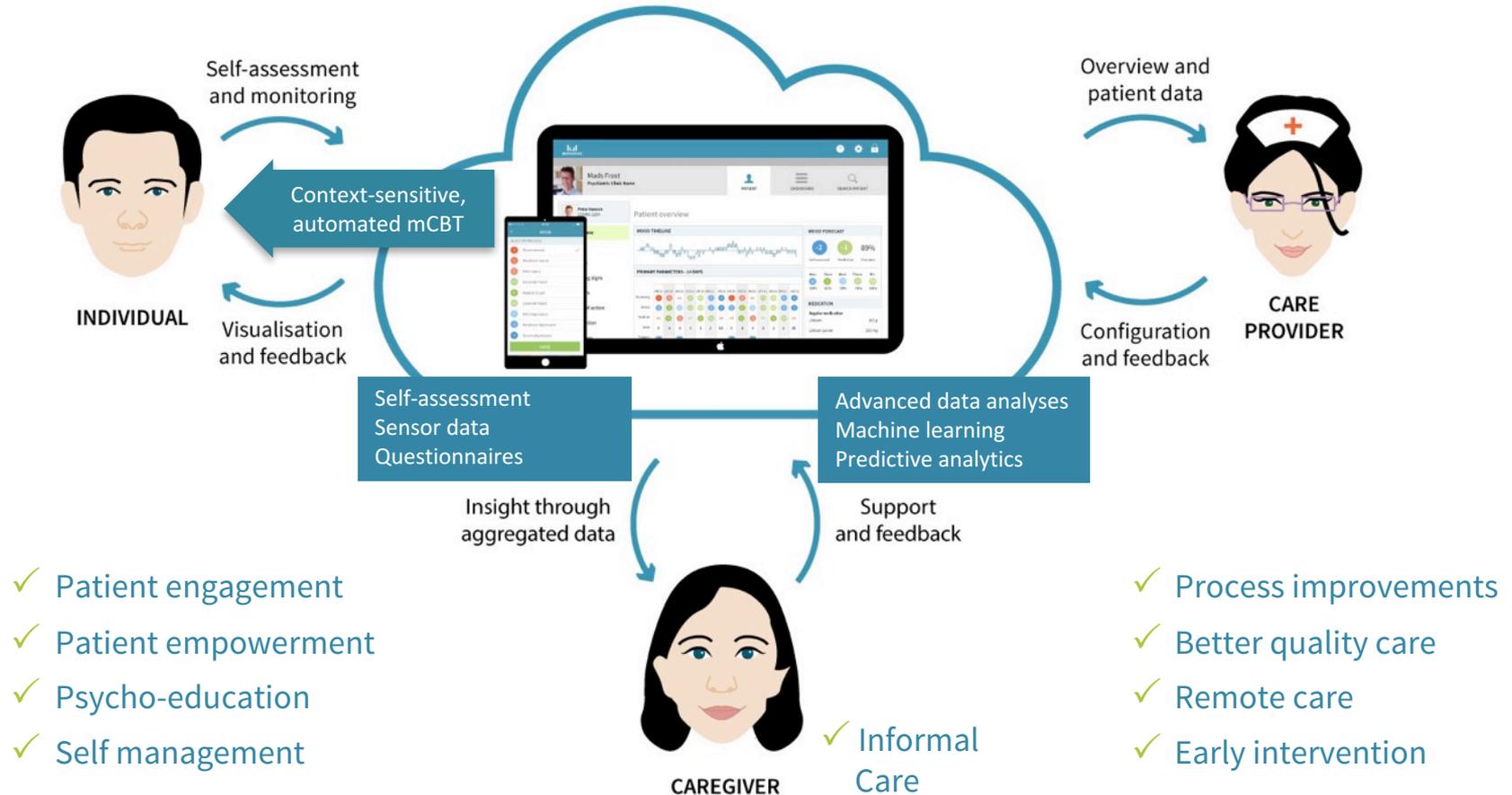
### STATUSARTIKEL

1) Psykiatrisk Center København  
2) IT Universitetet, København

- Technical evaluations have proven that
  - Solution is stable and scalable
  - Battery/power consumption on the phone is minimal
  - Mean Absolute Error (MAE) in mood forecast between 0.06 and 0.82 ( $\pm 3$  mood scale)
  - Voice analysis correlates highly with the mood of the patients
- Patient-oriented clinical evaluations have shown that
  - Compliance rate is very high (87-93%)
  - Solution is considered very useful and extremely usable by patients and clinicians
  - Solution helps patients better manage their disease
  - Solution helps clinicians in better patient treatment
- Clinical evaluations have shown that
  - Self-assessed mood ratings using a smartphone correlates strongly with blinded clinically rated depressive and manic symptoms
  - Automatically sampled behavioural data collected from the smartphone correlates with blinded clinically rated depressive and manic symptoms in patients with bipolar disorder

- mHealth solution to improve mental health insight
- Based on five years of R&D with leading experts within mental health, pervasive healthcare and computing
  - Region H (Rigshospitalet)
  - IT University of Copenhagen
  - EU funded STREP project “MONARCA” with 13 European partners
  - Involved in 10 research projects
- Developed in collaboration with patients, clinicians and carers
- Monsenso founded in 2013





- ✓ Patient engagement
- ✓ Patient empowerment
- ✓ Psycho-education
- ✓ Self management

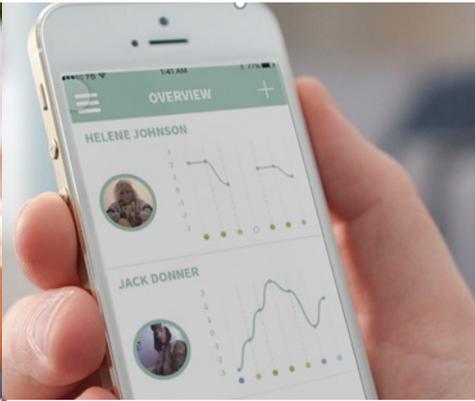
- ✓ Process improvements
- ✓ Better quality care
- ✓ Remote care
- ✓ Early intervention

✓ Informal Care



## Patient smartphone

- Self-assessment
- Sensor data collection
- Questionnaires
- Triggers / warning signs
- Medication compliance
- Visualization and motivational feedback
- Communication with clinic



## Carer smartphone

- Overview of the patient
- Evaluate the patient
- Notes



## Clinical web portal

- Overview and patient specific dashboard
- Historical overview
- Correlation analysis
- Triggers / Early Warning Signs
- Medication management
- Notes / medical record
- Communication with patient



## Back-end data analysis

- Aggregation of health and behavioural data
- Correlation between behavioural data and disease progression
- Pattern analysis
- Prediction of illness & mood forecasting

- Solution currently configured for
  - Bipolar disorder
  - Depression
  - Schizophrenia
  - Borderline
  - PTSD
  - Anxiety

- Solution can be configured to support
  - Specific diseases
  - Detailed clinical needs



[OPI video](#)

# Questions?

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