



# MONARCA

## MONitoring, treAtment and pRediCtion of bipolar Disorder Episodes

**MONARCA** will develop and validate solutions for multiparametric, long-term monitoring of behavioural and physiological information relevant to bipolar disorder. It will combine those solutions with an appropriate platform and a set of services into an innovative system for management, treatment, and self-treatment of the disease.

### Objectives of the project

Bipolarism is a mood disorder characterized by alternating periods of mania and depression. The current diagnostic methodologies of this disease are based on self-reported experiences done typically after crisis episodes that are intrinsically subject to a lack of objectivity due to the patients' condition. The treatment of bipolar disorder is based on pharmacological and psychotherapeutic techniques typically characterized by low adherence from patients.

**MONARCA's** aim is to develop and validate a closed-loop, multiparametric approach to the treatment, management, and self-treatment of bipolar disorder disease and facilitate effective and efficient therapy that reduces costs and the load of the health system while at the same time improving the quality of life of patients.

**MONARCA** objectives include:

- Bipolar disorder events assessment based on objective, measurable data
- Continuous multiparametric monitoring
- Timely warnings on "risky" trends (Prevention of crisis)

Increase of patients' awareness through self-monitoring and timely personalized coaching

### Project Description

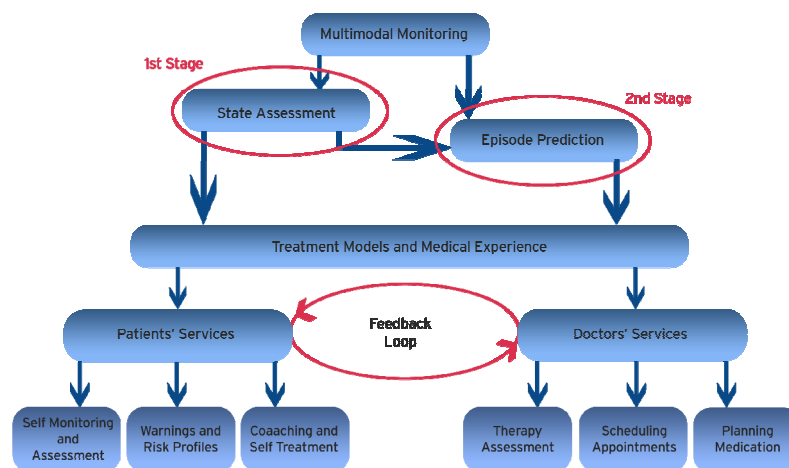
**MONARCA** will develop and validate solutions for multiparametric, long term monitoring of behavioural and physiological information relevant to bipolar disorder. It will combine those solutions with an appropriate platform and a set of services into an innovative system for management, treatment, and self-treatment of the disease.

**MONARCA** system will be designed to comply with all relevant security, privacy and medical regulations, it will pay close attention to interoperability with existing medical information systems, it will be integrated into relevant medical

workflows, and it will be evaluated in a statistically significant manner in clinical trials.

**MONARCA** system consists of 5 components:

- A sensor enabled mobile phone
- A wrist worn activity monitor,
- A novel "sock integrated" physiological (GSR, pulse) sensor
- A stationary EEG system for periodic measurements
- A home gateway



### SCENARIO

MONARCA system will be tested for the assessment and forecasting of episodes of bipolar disorder disease. These tests will be carried out involving patients and the use of 5 main components: a sensor enabled mobile phone, a wrist worn activity monitor, a novel "sock integrated" physiological (GSR, pulse) sensor, a stationary EEG system for periodic measurements, and a home gateway. GPS location traces, physical motion information, and recognition of complex activities (nutrition habits, household activity, amount and quality of sleep) will be combined into a continuously updated behavioural profile that will be provided to doctors in a meaningful way for supporting treatment. The system will support both the patients by personalized interfaces helping them to better manage their disease, and the medical professionals to design a therapy.

GPS location traces, physical motion information and recognition of complex activities (nutrition habits, household activity, amount and quality of sleep) will be combined into a continuously updated behavioural profile. Physiological information from the “GSR sock”, the periodic EEG measurements, voice analysis from mobile phone conversations and motion analysis will provide an objective assessment of emotional state and mood. Combining this information with patients’ medical records and established psychiatric knowledge quantitative assessment of patients’ condition (expressed in Psychiatric Rating Scales like BRAM or HAMD) and prediction of depressive and manic episodes will be implemented.

**MONARCA** system will include a close-loop approach between the system and the final users (both patients and medical staff) through dedicated interfaces. On one hand the patients will be enabled with mechanisms for self-assessment, provision of warnings and risk profiles through persuasive user interaction and a coaching concept for self-treatment. For the medical staff, interfaces for interpreting the data, therapy assessment and therapy planning tools (scheduling visits, planning medication) will be developed.

## Expected Results & Impacts

MONARCA aims at effectively and efficiently facilitate the therapy of bipolar disorder disease by adopting a holistic approach. From a technological point of view the project will extend the use of mobile platforms with further development of existing sensor technology to accurately measure physiological and contextual signals related to manic and depressive states. In the medical field, MONARCA will focus on objective assessment and prediction of bipolar disorder events and on the discovery of new markers for this disease. From a social perspective, the project will explore means for improving the provisioning of healthcare assistance related to this disease by reducing the load (and costs) of the health system while at the same time enhancing the patients’ quality of life.

Expected results of the MONARCA project include:

- Accurate assessment of bipolar disorder episodes through objective monitoring
- Prevention of crisis episodes through event prediction algorithms
- Identification of main and eventually new markers for diagnosis and treatment of bipolar disorder
- Support caregivers for handling treatment and risk situations
- Improve patients’ self-management of the disease
- Positively impact in reduction of healthcare costs
- System validation through dedicated trials in two European countries.



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**Partners:**

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- Aipermon gmbh & co. Kg (Germany)
- BITZ (Braunschweiger Informatik und Technologie-zentrum) (Germany)
- ETH Zürich (Eidgenössische Technische Hochschule Zürich) (Switzerland)
- IT University of Copenhagen (Denmark)
- Meditrainment Consulting gmbh (Austria)
- Region hovedstaden (Denmark)
- Psychiatric State Hospital of Tiroler Landeskrankenanstalten GmbH (Austria)
- SUPSI (Scuola Universitaria Professionale della Svizzera Italiana) - Switzerland
- Systema Human Information Systems GmbH (Germany)
- Universitaet Bielefeld (Germany)
- Universität Passau (Germany)

**Timetable:** from February 2010 to January 2013

**Total cost:** € 5,134,000

**EC funding:** € 3,670,000

**Instrument:** STREP

**Project Identifier:** FP7-ICT-2009-4-248545

### **KEYWORDS**

Bipolar disorder, Manic and depression events assessment, Episodes prediction, Crisis prevention, Emotional state, Mood disorders