POWER2DM

"Predictive model-based decision support for diabetes patient empowerment"

Research and Innovation Project
PHC 28 – 2015: Self-management of health and disease and decision support systems based on predictive computer modelling used by the patient him or herself

Deliverable 4.8

D4.5.1 Integrated eHealth Systems for Pilot Site

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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EXECUTIVE SUMMARY

This document describes the Shared Decision Making Application (SDMA) module of POWER2DM. The SDMA integrates PDS containing patient data, and the predictive services provided by KADIS into a single user interface. The SDMA also provides an overview of the patient's adherence to his/her self-management goals like physical exercise, carb intake and medication adherence. It gives the care provider an overview of the patient's barriers as identified by the system based on the patient's questionnaires presented to him/her in SMSS. Lastly SDMA lets the patient create goals related to their condition and assign action plans to these goals.

POWER2DM Consortium Partners

Abbv	Participant Organization Name	Country
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek	Netherlands
IDK	Institute of Diabetes “Gerhardt Katsch” Karlsburg	Germany
SRDC	SRDC Yazilim Arastirma ve Gelistirme ve Danismanlik Ticaret Limited Sirketi	Turkey
LUMC	Leiden University Medical Center	Netherlands
SAS	SAS Servicio Andaluz de Salud	Spain
SRFG	Salzburg Research Forschungs Gesellschaft	Austria
PD	PrimeData	Netherlands
iHealth	iHealthLabs Europe	France

OPEN ISSUES

No:	Date	Issue	Resolved
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1 INTRODUCTION

1.1 Purpose and Scope

This document describes the Shared Decision Making Application module of POWER2DM, as developed according to the guidelines set in WP4. The SDMA integrates the different modules developed for tasks 4.1 through 4.4 and makes use of Privacy and Security measures created for task 4.6.

1.2 References

- D2.6 - D2.4.2 Web based GUI Components for Visualization of Predictions/Simulations
- D2.2 - D2.2.1. Mid- and Long-term Predictive Component

1.3 Definitions, Abbreviations and Acronyms

Table 1 List of Abbreviations and Acronyms

Abbreviation/ Acronym	DEFINITION
UKPDS	United Kingdom Prospective Diabetes Study (UKPDS): clinical and therapeutic implications for type 2 diabetes
API	Application Programming Interface
SMSS	Self Management Support System
BG	Blood Glucose
CGM	Continuous Glucose Monitoring
PDS	POWER2DM personal data store. Central patient data storage system.
SDMA	Shared Decision Making Application

2 INTEGRATED EHEALTH SYSTEMS

2.1 Overview

For the core part of the POWER2DM project, enabling access to short, medium- and long-term predictions and allowing the patient and his/her care provider to plan according to the results of the predictions, the Shared Decision Making Application (SDMA) was developed.
The SDMA integrates PDS containing patient data, and the predictive services provided by KADIS into a single user interface. The SDMA also provides an overview of the patient's adherence to his/her self-management goals like physical exercise, carb intake and medication adherence. It also gives the care provider an overview of the patient's barriers as identified by the system based on the patient's questionnaires presented to him/her in SMSS. Lastly SDMA lets the patient create goals related to their condition and assign action plans to these goals.

The figure below shows the SDMA's place in the POWER2DM integrated system:

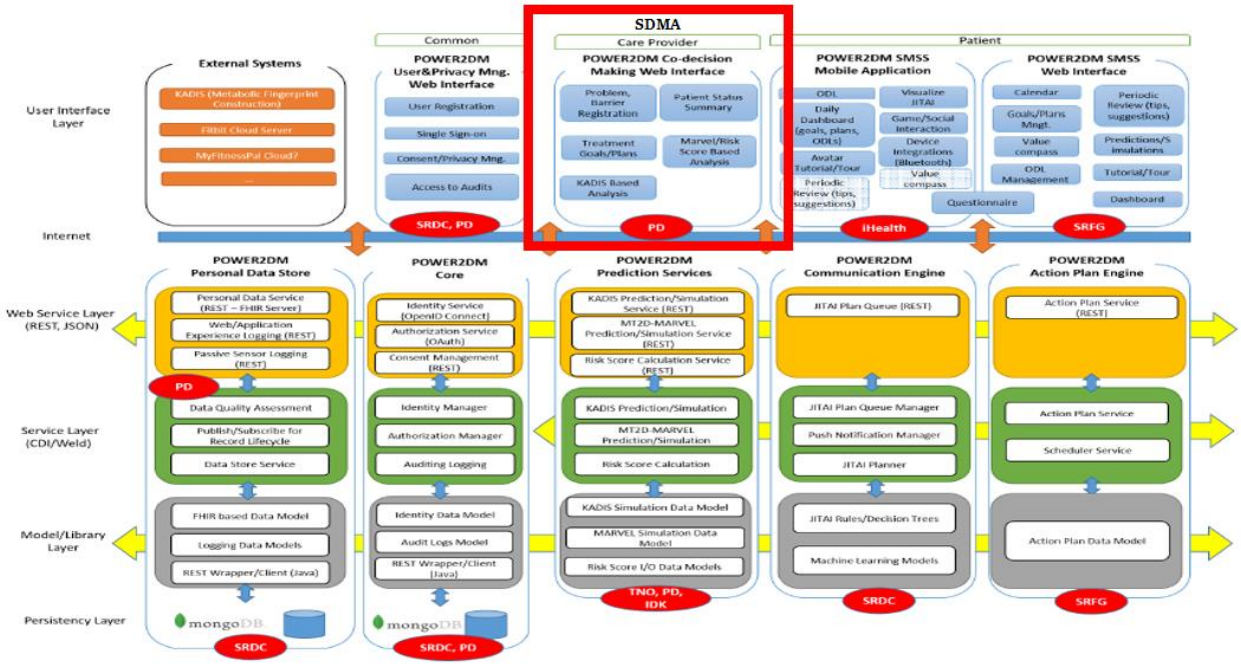

Figure 1

2.2 Languages

As SDMA is mainly intended for use by the care provider, with input by the patient, it was decided that English would be the only necessary language. However, the system was designed to be easily translated with minimal development effort.

2.3 Main page

The main pages shows the user an overview of the patient's main characteristics, his/her blood glucose profile as collected during the 3 day data collection phase, the overview compasses and Action Plans (See Figure 2).

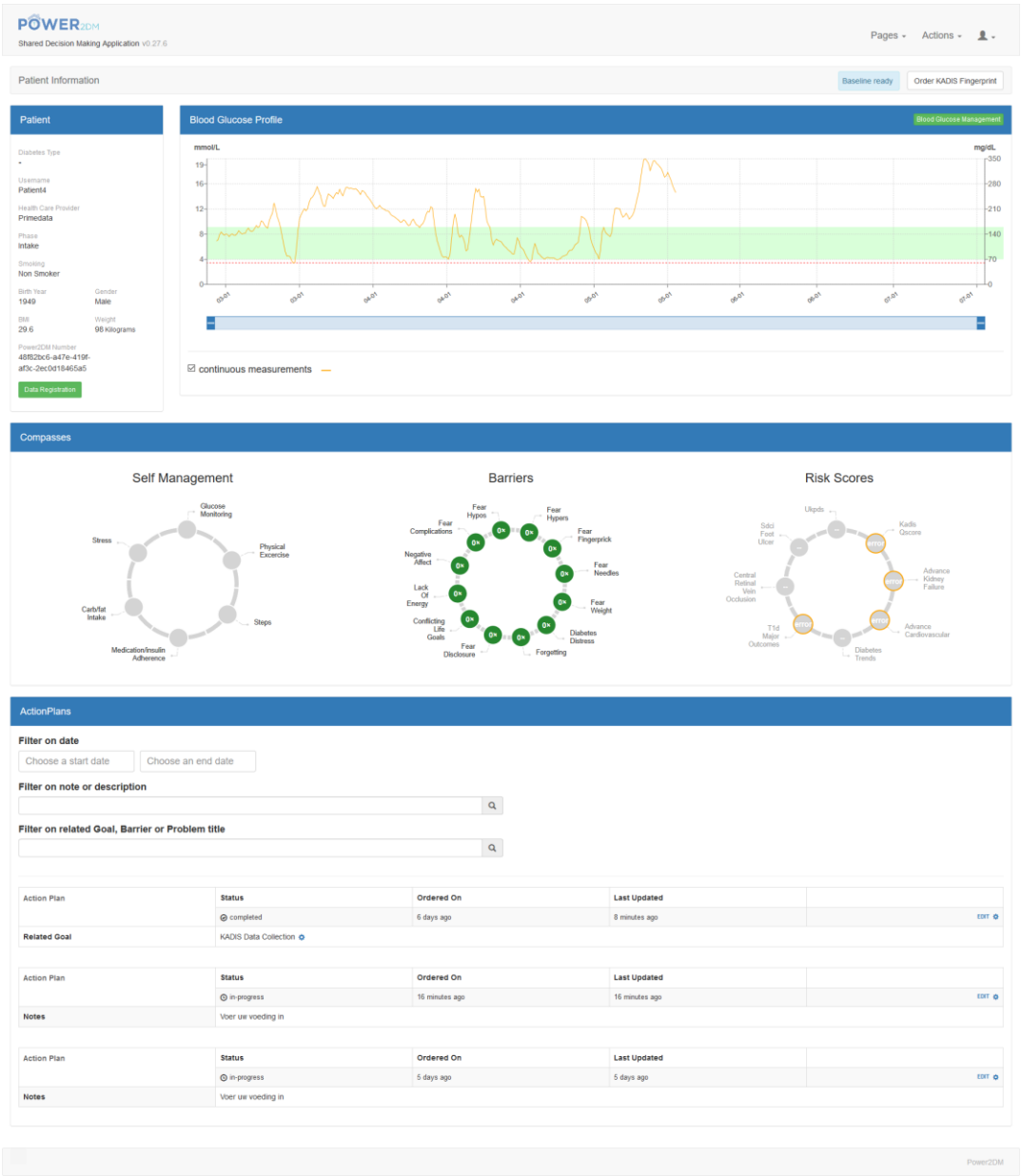

Figure 2 The SDMA main page

2.4 Patient Data Registration

The patient data registration page can be accessed via the button Pages > Registration, or via the green button “Data registration” on the overview page. Here the care provider can input the patient’s data, lab results and questionnaire results. The lab results are imported from the system if they were uploaded earlier via the POWER2DM lab results upload feature (not described here) and may be modified on this page if needed. The questionnaire results are imported from SMSS if the patient has filled the questionnaires. The care provider can modify the questionnaire results on this page if needed. All patient data is stored centrally in the POWER2DM patient data registration system (PDS).

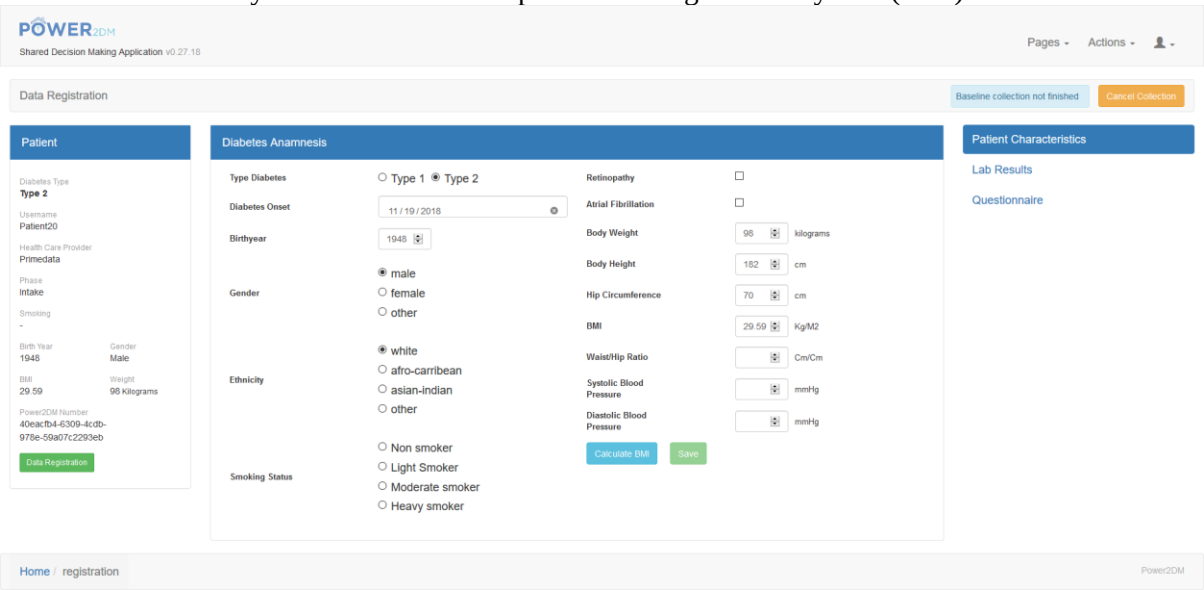

Figure 3 Patient data registration

2.5 Patient barriers

The barriers page is opened via the menu Pages > Barriers, and it shows the barriers the patient is experiencing in the management of his illness. These barriers are identified and added via the questionnaires the patient has filled in SMSS. Also the care provider can add barriers manually in cooperation with the patient. This page gives the care provider insight in the barriers/fears/stress factors affecting the patient.

2.6 Goals

The goals page is opened via the menu Pages > Goals. This gives an overview of the goals the patient has set for himself via SMSS or in discussion with his care provider. Some goals are added automatically, for instance when the care provider plans the 3-day BG data collection period.

2.7 Self-management

The self-management page gives the care provider an overview of the goals (see par. 2.6) the patient has set or generated by the system, and the progress the patient is making towards these goals. The goals are categorized under the themes:

- Physical exercise
- Steps
- Medication Insulin adherence
- Carb/fat intake
- Stress

Each of the categories has its own tab on the page.

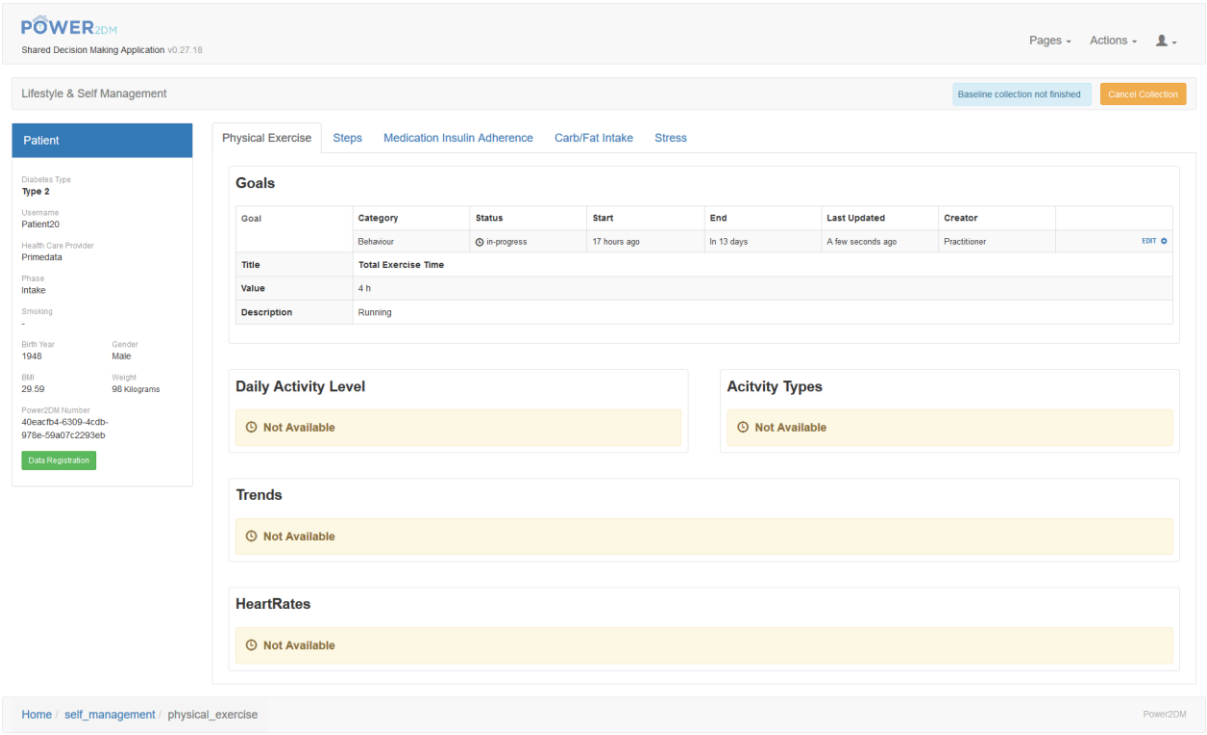

Figure 4 Patient Self-management page

2.7.1 Fitbit data

The physical exercise tab also shows the data gathered by the patient's Fitbit device. It will show an overview of the Daily activity level, the types of activity the device has recorded and any trends it detects. All this data is drawn from the patient's Fitbit account. The patient must allow the POWER2DM system access to his/her patient account via the POWER2DM authorization management system.

2.8 Risk models

The SDMA integrates the medium- to long-term predictive components of the MARVEL system developed by TNO (See D2.2 - D2.2.1. Mid- and Long-term Predictive Component). Based on the input by the care provider the system will calculate the risk for this patient of any of the included conditions diabetes patients typically are at risk of (See **Error! Reference source not found.**). These conditions include:

- UKPDS identified conditions:
  - non-fatal and fatal coronary heart disease
  - fatal coronary heart disease
  - non-fatal and fatal stroke
  - fatal stroke
- Kidney failure
- Risk of T1D major outcomes:
  - major CHD,
  - stroke
  - end-stage renal failure
  - amputations
  - blindness
  - all-cause death
- Central retinal vein occlusion
- Foot ulcer

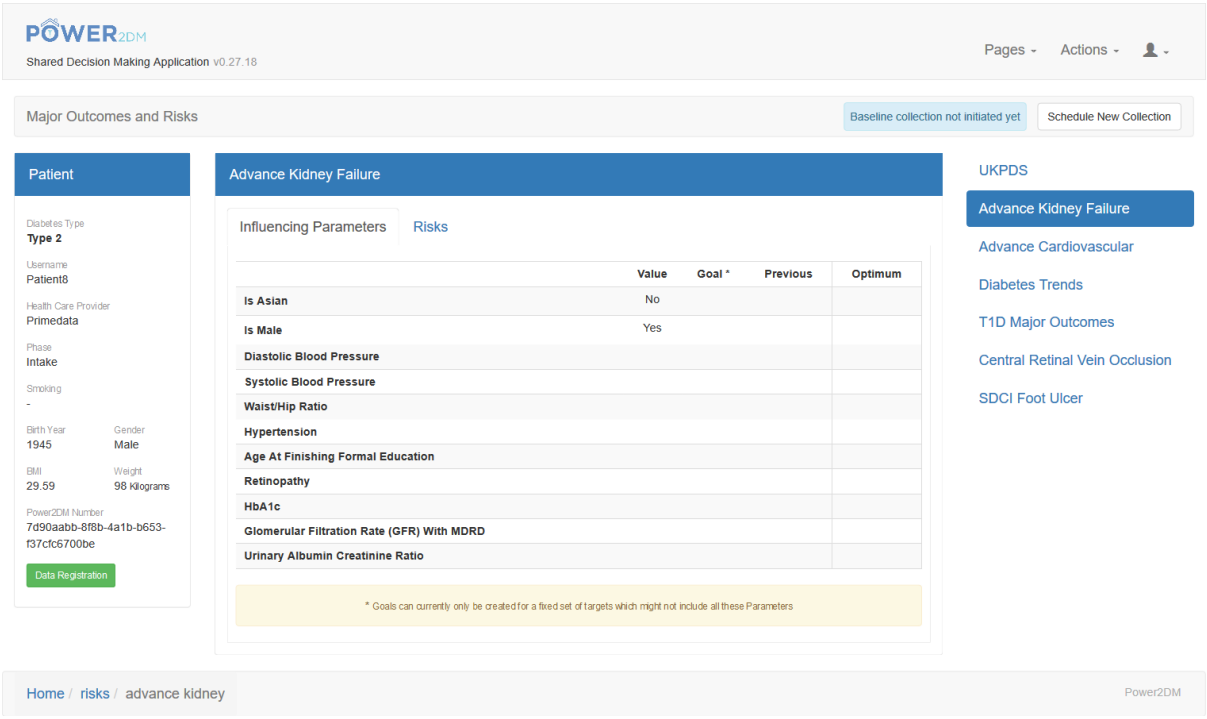

Figure 5 Available risk models, parameters for kidney failure risk calculation

The input parameters are all taken from the central patient data store (PDS). For each condition, the page will show the influencing parameters. When the care provider opens the risks tab the system will calculate the risk this patient has for developing the selected condition.

2.9 Blood glucose management

The blood glucose management page is intended to provide the care provider with an overview of the patient's Blood glucose profile and any factors affecting it. The BG management page consists of the BG profile, BG summary and an overview of the patient's current treatment plan.

2.9.1 Blood glucose profile

The blood glucose profile graph (Figure 6) shows the real-world blood glucose values collected by the patient via his mobile app and/or CGM devices.

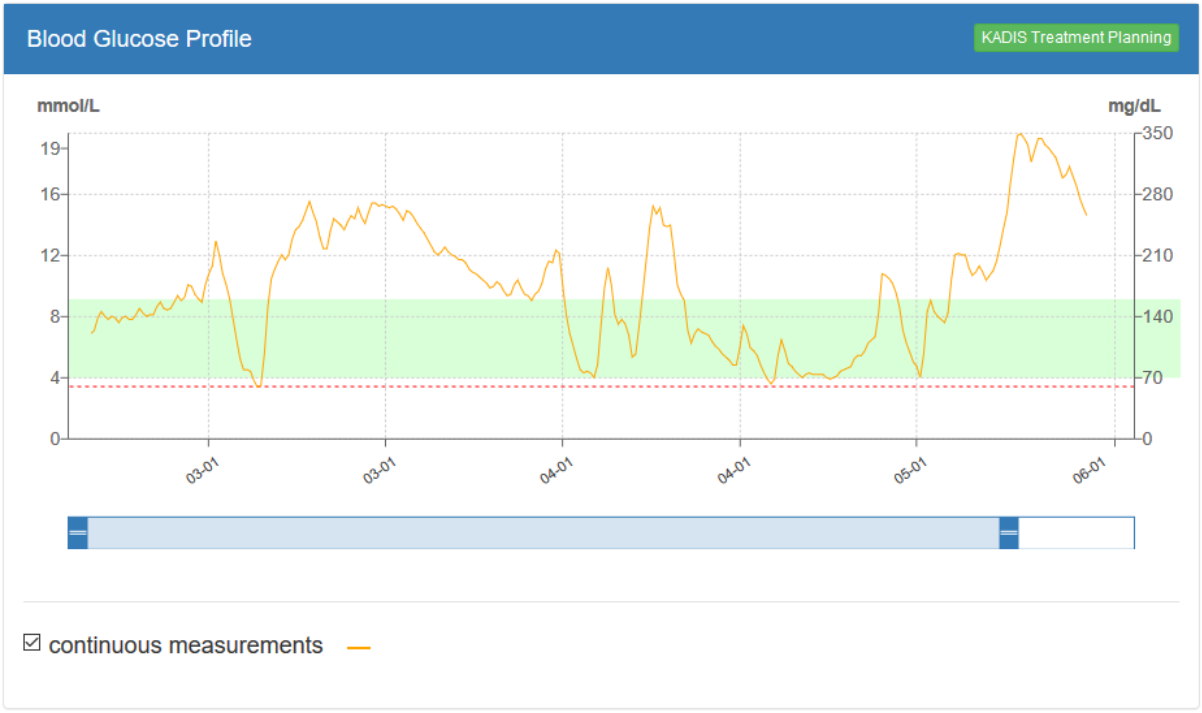

Figure 6 Blood glucose profile graph

2.9.2 Blood glucose summary

The blood glucose summary view (Figure 7) gives the care provider an overview of the patient's most recent lab results as recorded in PDS. It focusses on the current HbA1c value and lets the care provider set a target HbA1c value by creating a goal for the patient. The patient can then adopt this goal and monitor it via SMSS.

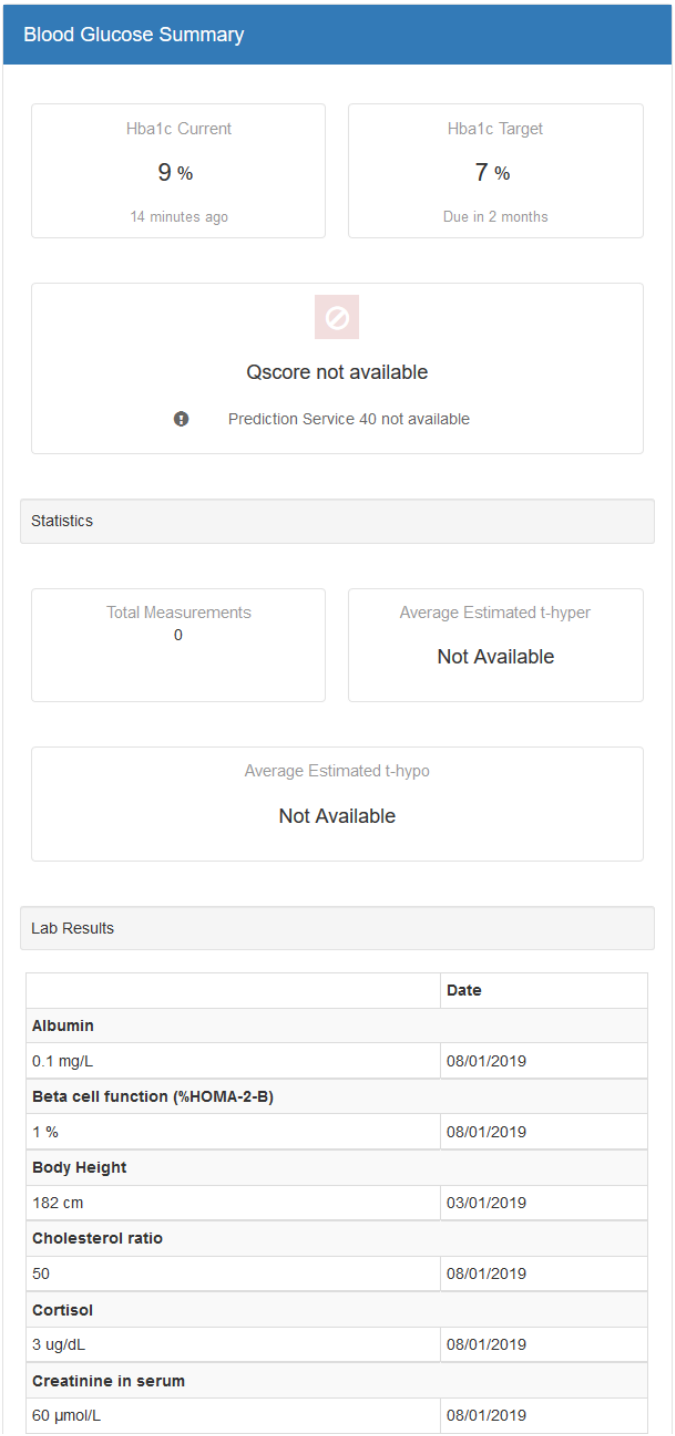

Figure 7 Blood glucose summary

2.9.3 Current treatment plan

This view shows the current treatment plan for the patient. For a detailed description of the treatment plan see referenced document Deliverable 2.6 - D2.4.2.

2.10 KADIS treatment planning

The KADIS treatment planning page is discussed in detail in Deliverable 2.6 - D2.4.2. This page integrates the medium- and long-term prediction facilities built for POWER2DM.

2.11 Settings

Lastly the settings page allows the care provider to set his/her preferences for units, currently only the BG concentration to mmol/L or mg/dL. Here the care provider can also select which of the risk scores for the risk conditions (par. 10) SDMA should show.

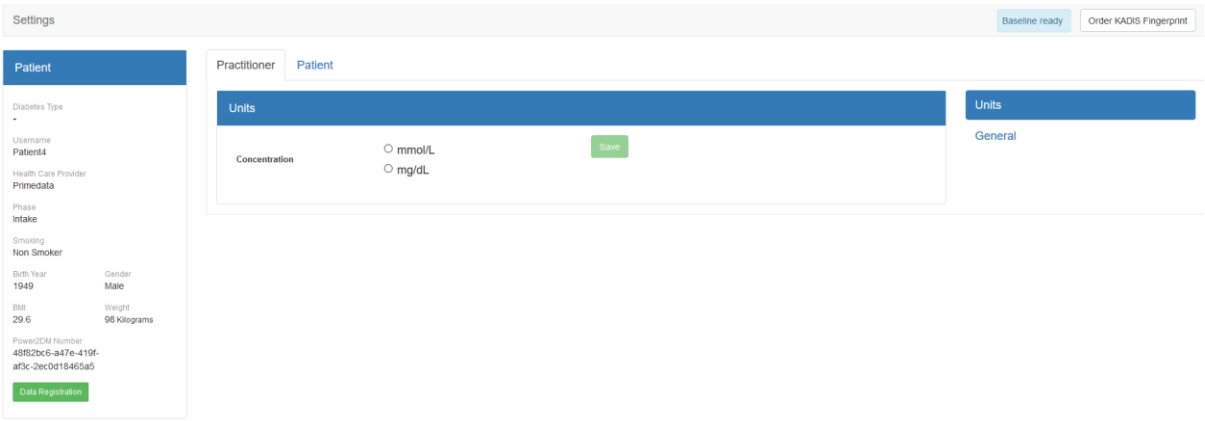

Figure 8 The settings page

3 CONCLUSION

This deliverable describes the results of task 4.5 Implement e-Health system functionalities. This task resulted in the SDMA application. The SDMA integrates the central patient data collected from the patient mobile devices, sensors, Fitbit and questionnaires filled by the patients themselves in the SMSS. All these data results in simulation and prediction graphs which provides support to the clinician and patient to decide on a treatment plan.