Efficient visualisation approaches for making sense of data collected during self-management

Enjie Liu, Youbing Zhao, Farzad Parvin Zamir, Department of Computer Science and Technology, University of Bedfordshire, Luton, UK
Stefanos Roumeliotis, Eleni kaldoudi, School of Medicine, Faculty of Life Sciences, Democritus University of Thrace, Alexandroupoli, Greece

Introduction

Patients with chronic disease are required to self-manage their conditions. Patients are normally advised to adapt to healthier life-style, and in the meantime to continuingly monitor the relevant biomarkers. Recent technology advances in monitoring devices, such as activities waist bands and glucose sensors, made it much easier for the patients to monitor the level of activity and biomarker in home environment. However, interpreting the meaning of the monitored data is a challenging task for an ordinary patient. Interpreting data includes, for example, understanding the data trend over a period of time; and more importantly and more difficult task is to make sense of the monitored data in accordance with their disease progression.

CARRE visualisation methods

Our work in EC FP7 CARRE project targets patients with cardiorenal syndrome. Primary disorders of one of these two organs often result in secondary dysfunction or injury to the other. We use the following approaches to visualise sensor data, Personal Health Record (PHR) and risk associations:

1) *make medical knowledge available for patients* by retrieving the risk association models from the latest research publications (i.e. PubMed) and setting up a Risk Prediction Model (RPM) for cardiorenal diseases and its comorbidity.

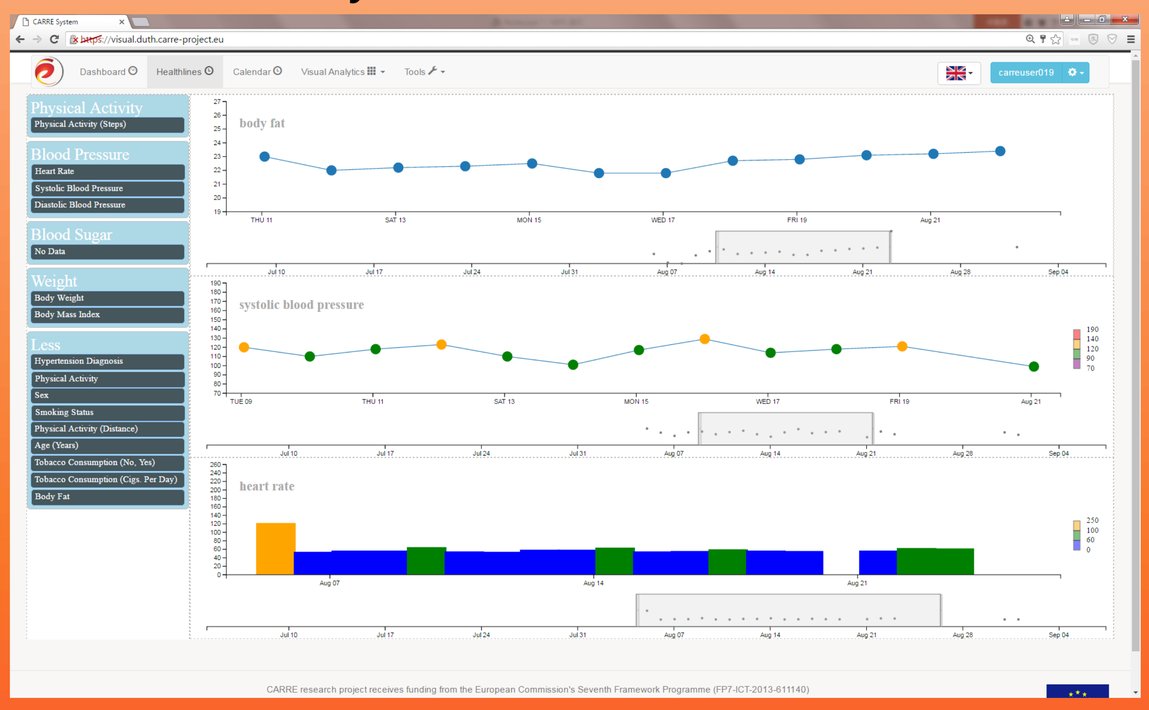


Figure 1 function of exploring monitored data

2) *build data visualisation function to visualise personal risks based on continuing monitored biomarkers.* The visual analytics system is a web-based framework for hosting visual analysis components, which enable users to: explore the activities and measurement data; visualise the retrieve RPM; explore the changes of the personalised risks of disease development based on individual's conditions, i.e., the monitored data. The system distinguishes itself from the existing ones in not only providing tool to explore the collected data, but also providing meaningful explanations of the data by comparing it with the RPM.

3) *localise visualisation service* by supporting multi-language systems. The localisation work includes localisation in the visual interface and the localisation in the data repositories. The visual interface localisation involves text messages in the HTML web pages while the data repository localisation involves key messages in the public and private data repositories, such as the name of the risk elements.

Personalised Risks

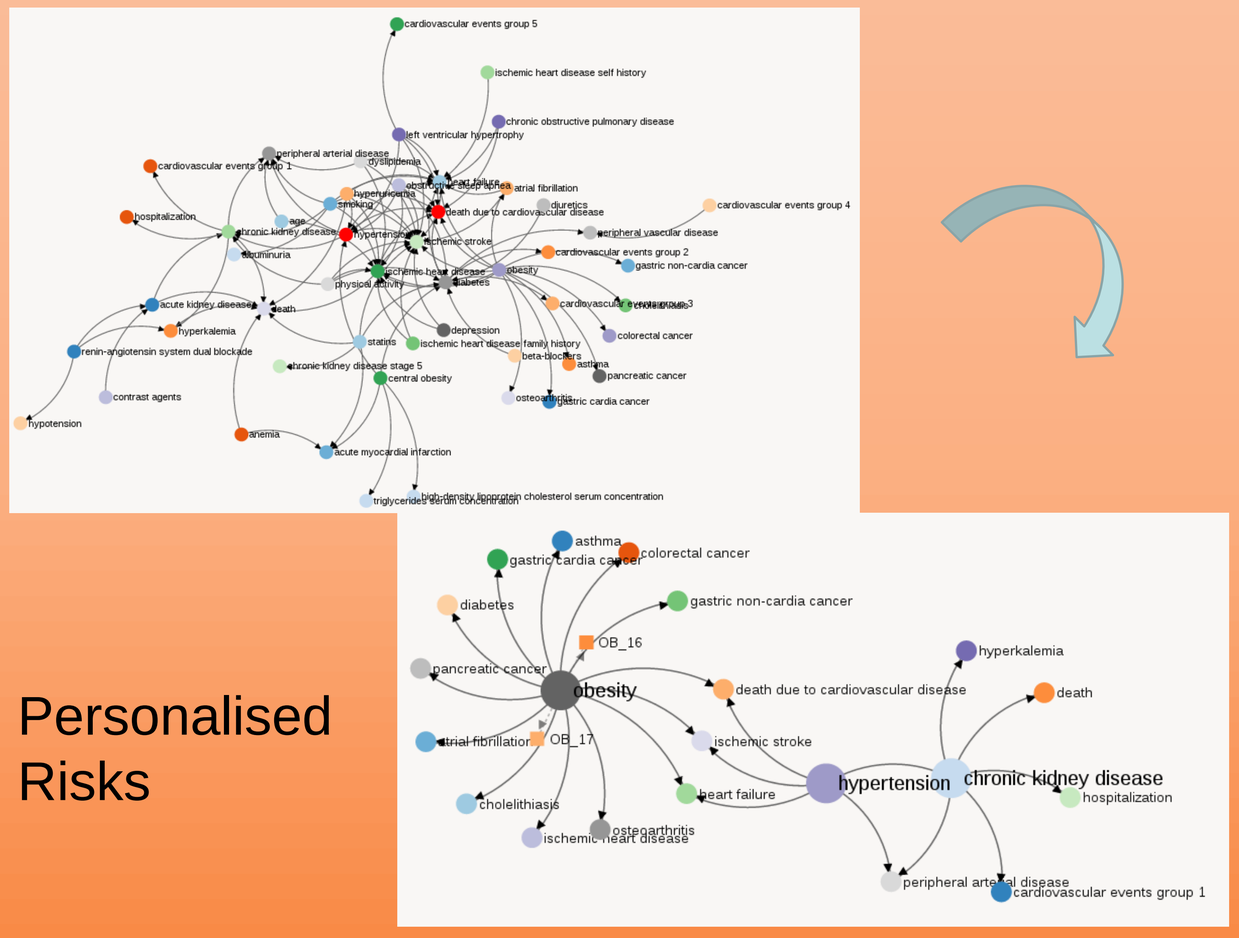
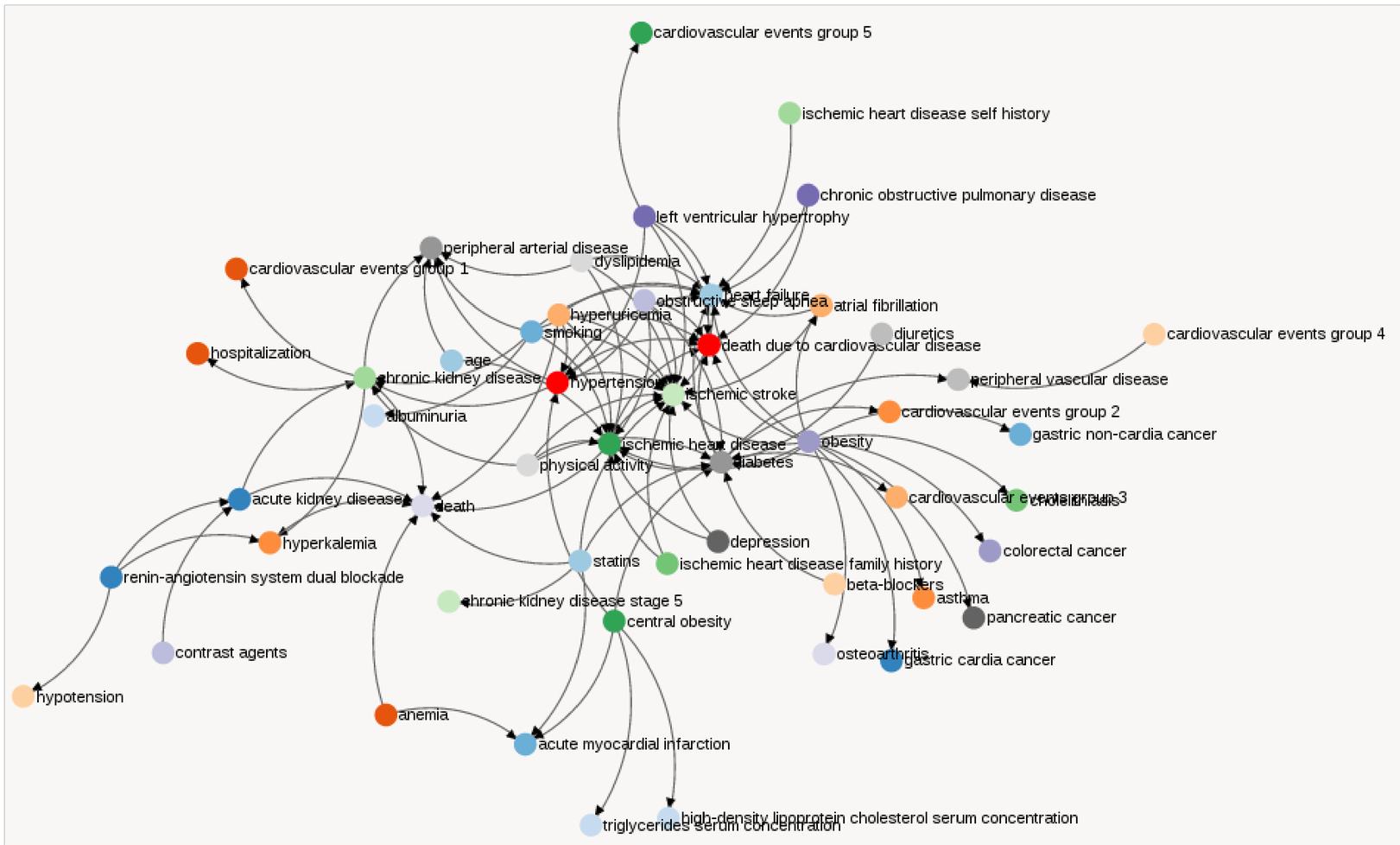
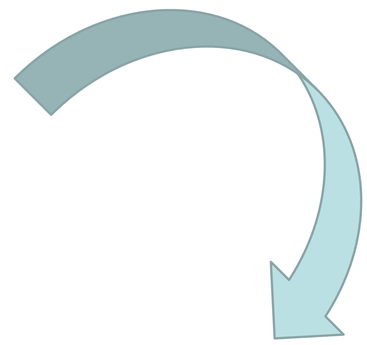


Figure 2 personalised RPM when users input their monitored data during the self-management

Conclusions

We applied data visualisation technique to compare data collected during self-management with the disease progression model. Our work provides for patients to visualise this data in an easy-to-understand way with additional benefit of multi-language support. Our work aims to improve general public's understanding of the health literacy and to increase efficiency of the self-management.





Personalised Risks