PAMBAYESIAN: Patient Managed decision-support using Bayesian Networks

Goal:

- To create a new generation of intelligent medical decision support systems for direct patient use with real-time monitoring for chronic conditions, based on expert-built Bayesian Networks
- To increase patient independence and decrease reliance on direct consultation
- To allow more autonomous care at home and reduce associated health care cost

Case Studies:

- Gestational Diabetes:
  - To help pregnant women with diabetes, in partnership with their health practitioners
  - To manage both lifestyle and appropriate pharmacotherapy
- Musculoskeletal problems:
  - To help patients with inflammatory joint disease
  - To optimise care of fluctuating disease
- Atrial Fibrillation:
  - To help patients with irregular heartbeat and reduce the risk of stroke due to blood clots forming in the heart

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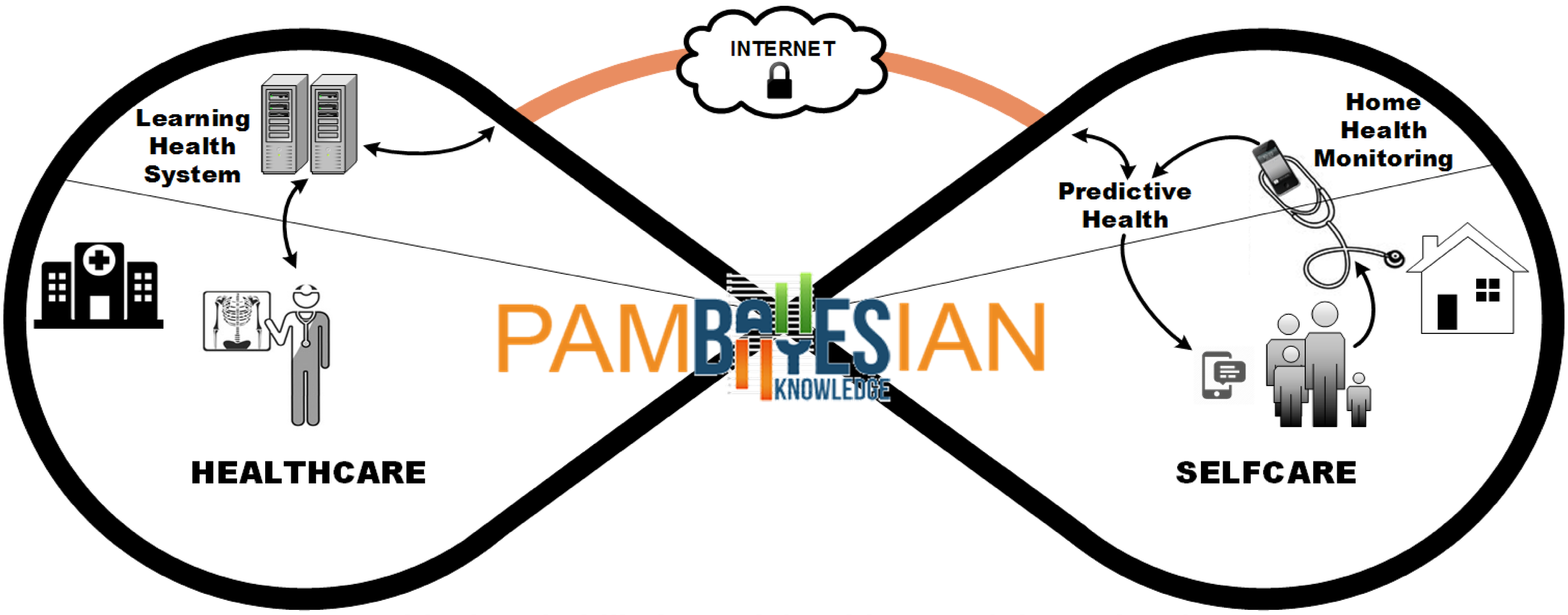
PAMBAYESIAN is an **EPSRC** funded project awarded to **Queen Mary** (value £1,538,497 for a 3-year programme June 2017-May 2020)

This project is also supported by digital health firms with extensive experience developing patient engagement tools for clinical practice, including:

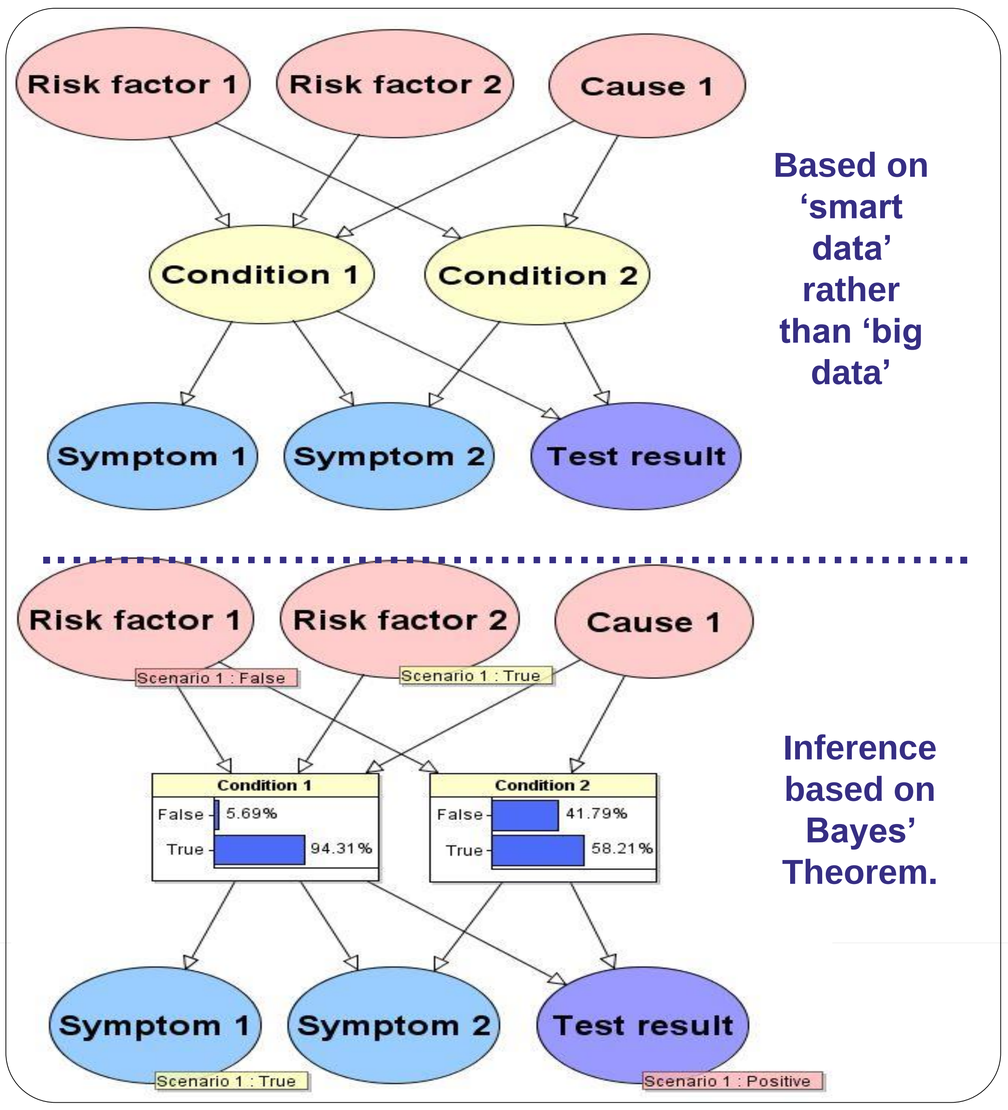
BeMoreDigital, Mediwise, Rescon, SMART Medical, uMotif, IBM UK, Hasiba Medical and **Agena.**



Graphical probabilistic models with causal dependencies

Some of our Bayesian network applications:

- Predict the likelihood of acute traumatic coagulopathy in the Emergency Department [1].
- Predict the likelihood of survival for an injured soldier in successive stages of the patient's care [2].
- Determine whether a prisoner is suitable for release based on the risk of serious re-offence [3].
- Compare risks of alternative medical diagnosis [4].
- Many more general applications include operational risk, transport safety, sports prediction, legal arguments and forensic evidence interpretation [5].



Questions answered by Bayesian Networks:

Decision: Given these symptoms and the patient attributes, what is the best treatment?

Risk: If I do nothing, what is the probability that my symptoms will get worse in the next 24 hours?

Intervention: What are the chances that increasing this medication now will treat the current symptoms?

Counterfactual: If I hadn't taken this medication last week, what is the probability that I would have gotten well on my own?

Explanation: Why am I being told that there is an 80% change that this course of treatment will manage my illness?

1. Yet B., Perkins Z., Fenton N., Tai N. & Marsh W. (2014). "Not just data: a method for improving prediction with knowledge.," Journal of biomedical informatics, vol. 48, pp. 28–37.
2. Kyrimi E. (2017). Integrated decision making in trauma medicine (Unpublished doctoral dissertation). Queen Mary University of London.
3. Constantinou, A. C., Fenton, N., Marsh, W., & Radlinski, L. (2016). "From complex questionnaire and interviewing data to intelligent Bayesian Network models for medical decision support", Artificial Intelligence in Medicine, 2016. Vol 67 pages 75-93.
4. Fenton, N. and Neil, M. (2010). "Comparing risks of alternative medical diagnosis using Bayesian arguments." Journal of Biomedical Informatics, 485-495.
5. BAYES-KNOWLEDGE (2017) , European Research Council Project ERC-2013-AdG339182-BAYES_KNOWLEDGE, http://bayes-knowledge.com/