ProACT: Interventional Strategies to Support Individuals Self-Managing Multiple Chronic Health Conditions Using a Digital Behavioural Change Intervention (DBCI).

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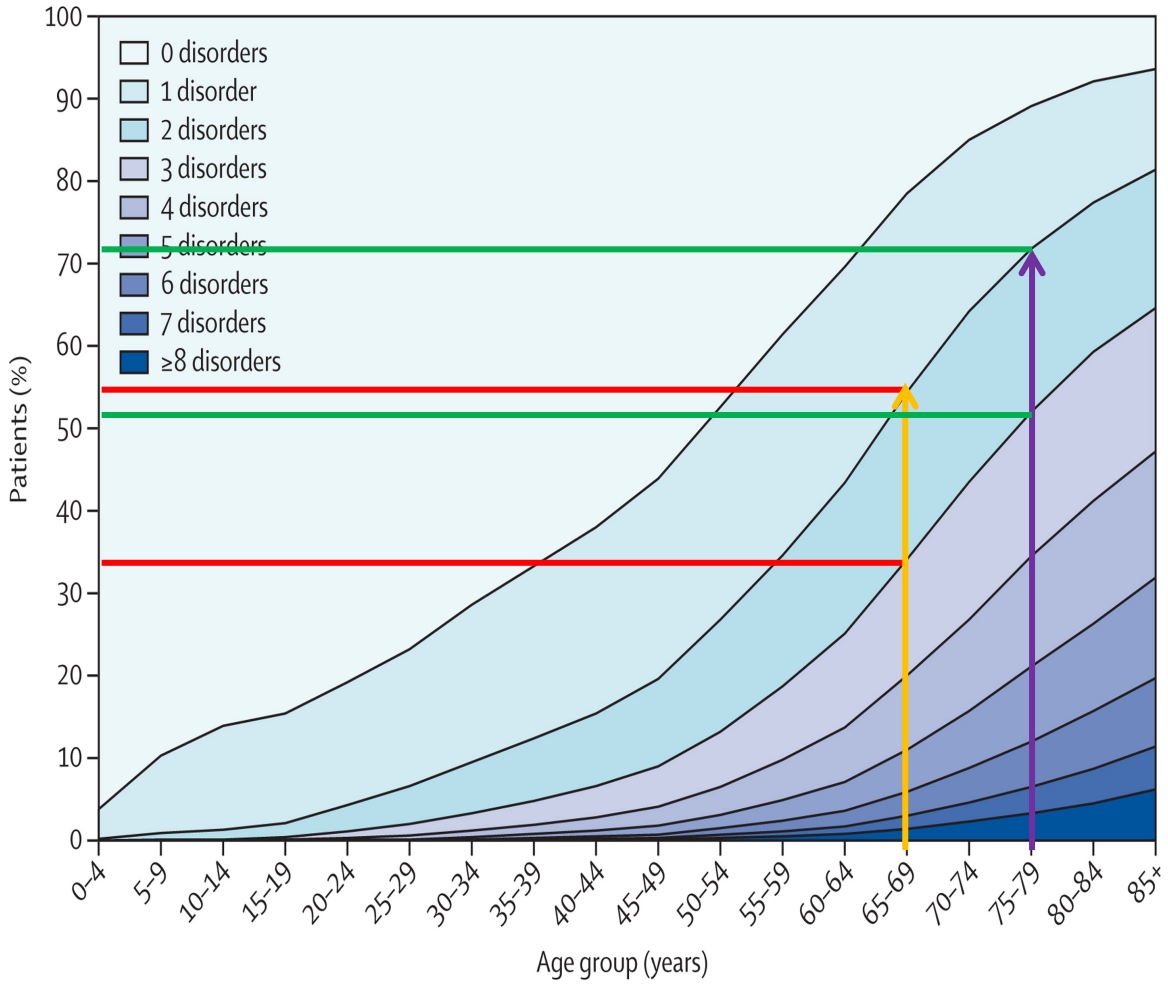
> Age = > Risk of Multimorbidity



Barnet et al. (2012) – Lancet

- Reduce QoL + functional decline
- More likely to die prematurely and be admitted to hospital, and have longer hospital stays.
- Correlated with socioeconomic deprivation
- 50m patients in EU – €700b cost per annum
  Rijken et al. (2013) - Eurohealth Incorporating Euro Observer
- US by 2030 171 million people with chronic disease – 50% with Multimorbidity. 65% of Medicare beneficiaries have multimorbidity

  Wolff JL et al. (2002) - Arch Intern Med
  Anderson G, Horvath J. (2004). Public Health Reports

We do not deal with Multimorbidity

Empower the PwM and their care network to play an active role in managing multimorbidity

Inefficient Different clinicians, conflicting advice

Inconvenient Hospital appointments on many different days

Repetitive Multiple appointments; Repeating medical history

Burdensome Hospital appointments on many different days

Confusing Hospital appointments on many different days

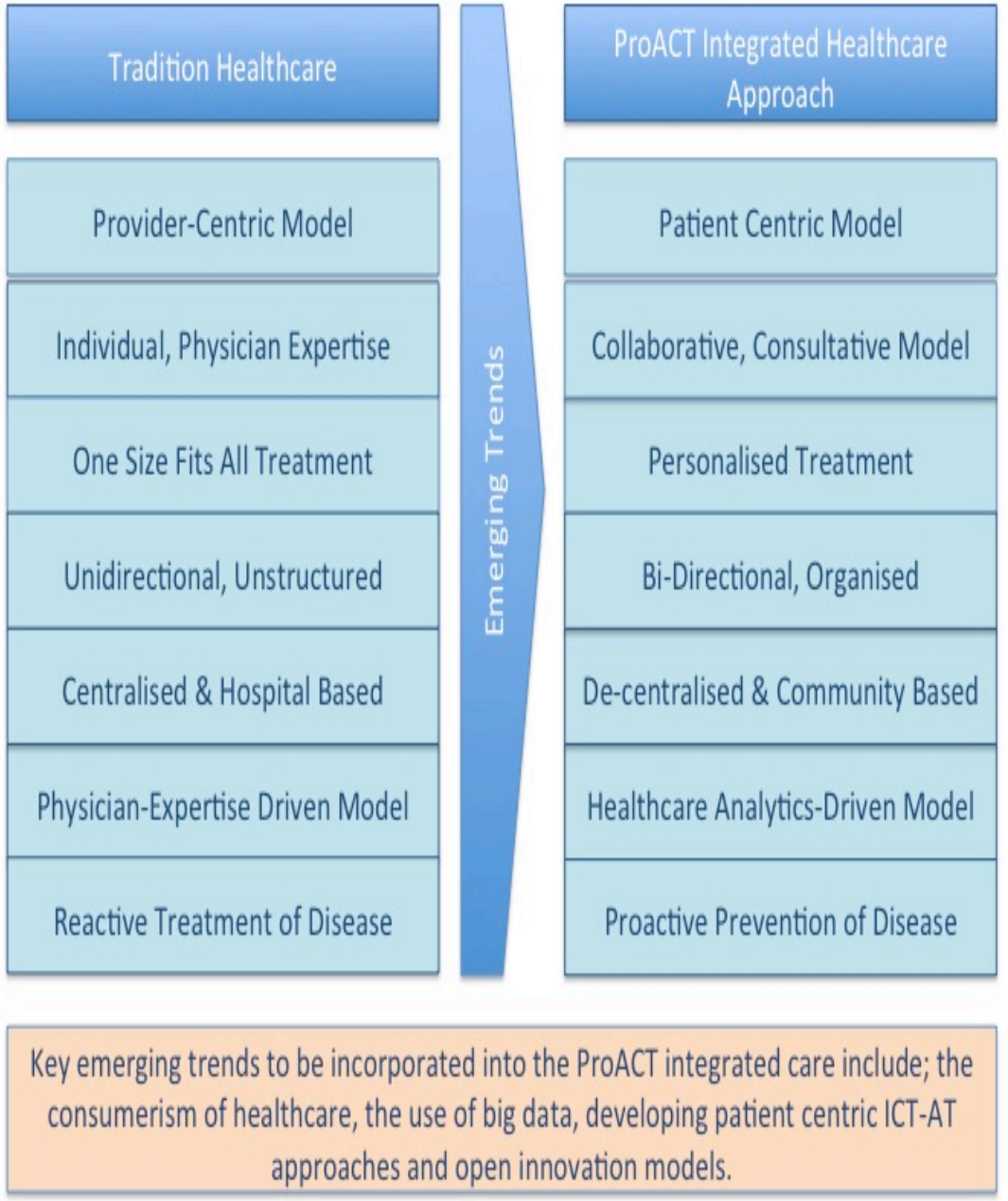
Potentially Unsafe Medication interactions and negative polypharmacy

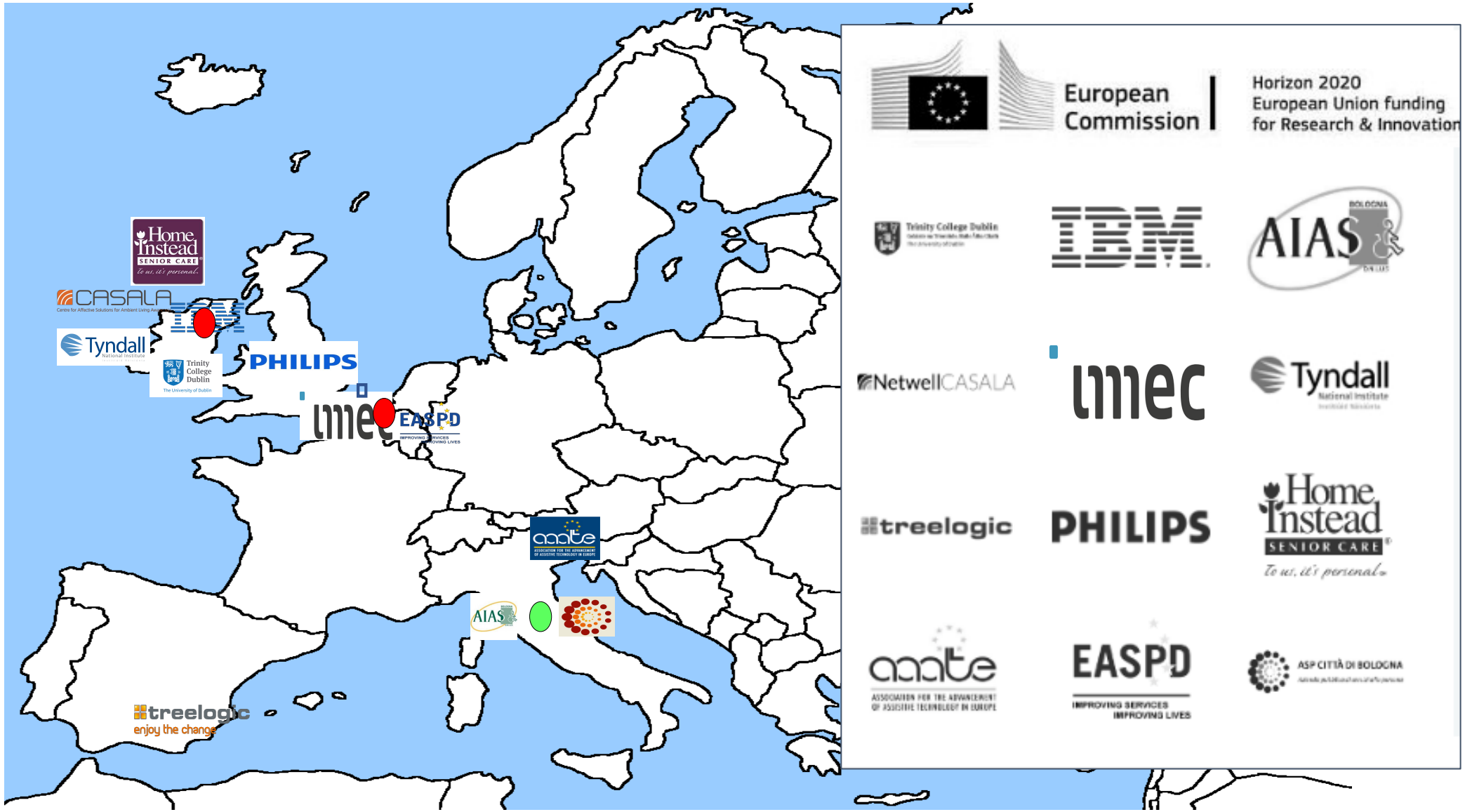
ProACT

AIMS:

1- Challenge the EU focus on supporting a single disease framework of care to create a patient centric integrated care (IC) ecosystem to understand and manage multimorbidity.

2 - ProACT aims to develop and evaluate a cloud based open API to integrate a variety of new and existing technologies to advance ‘home based’ integrated care (IC) for multimorbidity self-management.




Home Instead SENIOR CARE To us, it's personal.
CASALA
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Trinity College Dublin
PHILIPS
imec
EASPD
aaate
AIAS
treelogic
enjoy the change
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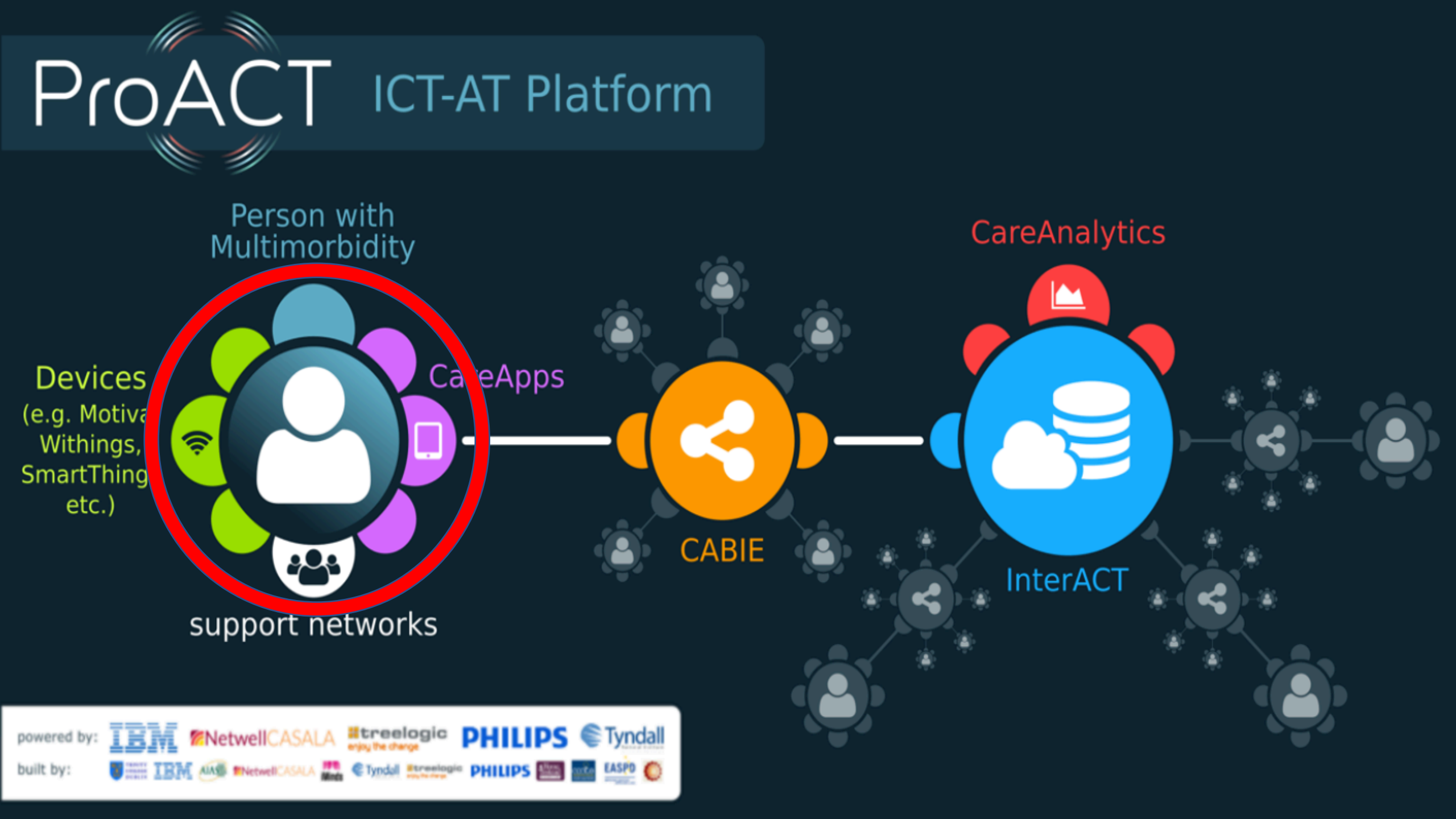
Project Outline (2016-2019)

- Phase 1: User Needs Research and Scoping **(M1-9 complete)**
- Phase 2: System Design, Development and Testing **(M9 – M40)**
- Phase 3: Pilot Trials and further co-design and development **(M14 to M26)**

- Phase 4: Main Proof of Concept Trial **(2018: M26/27 to M37/38)**
  - Ireland: 60 PwM and support actors
  - Belgium: 60 PwM and support actors
  - Conditions: Diabetes, COPD, CHF/CHD (associated conditions e.g. Hypertension
  - **Longitudinal Action Research Design (12 months)**

- Phase 5: Transfer Feasibility Study **(2018: M30 to M36)**
  - Italy: 15 PwM and support actors

ProACT ICT-AT Platform



powered by: IBM NetwellCASALA treelogic PHILIPS Tyndall

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Meet Sarah

	Breakfast			Lunch			Dinner			Bedtime		Night
	before	insulin	after	before	insulin	after	before	insulin	after		insulin	
Day / date	blood sugar		blood sugar	blood sugar		blood sugar	blood sugar		blood sugar	blood sugar		blood sugar
Mon 14-15	82	10H	128	109	12H		172	15H	198	205	22H 2H	
Tue 16	92	10		160	13		170	15		206	21 16H	
Wed 17	122	10		158	13		165	15		141	222	
Thu 18	89	10		94	12		189	15		72	22L	
Fri 19	118	11		95	12		212	16		188	22L	65
Sat 20	139	16		148	13		184	15		280	22L 3H	
Sun 21	102	10		96	12		210	16		200	22L 3H	

Sarah is 85

Conditions: Diabetes and Heart Failure

Everyday for the last 5 years she has measured her:

- Weight
- Blood Pressure
- Blood sugar

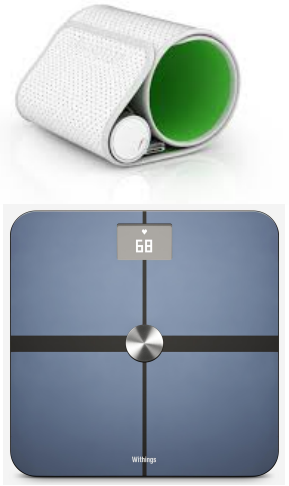
She writes readings in notebooks and brings them with her to her GP and specialist clinics that she attends for her conditions.

Sarah is finding it hard to remember when to take measurements and to write down the different readings into separate notebooks every day.

How Can ProACT Help Sarah

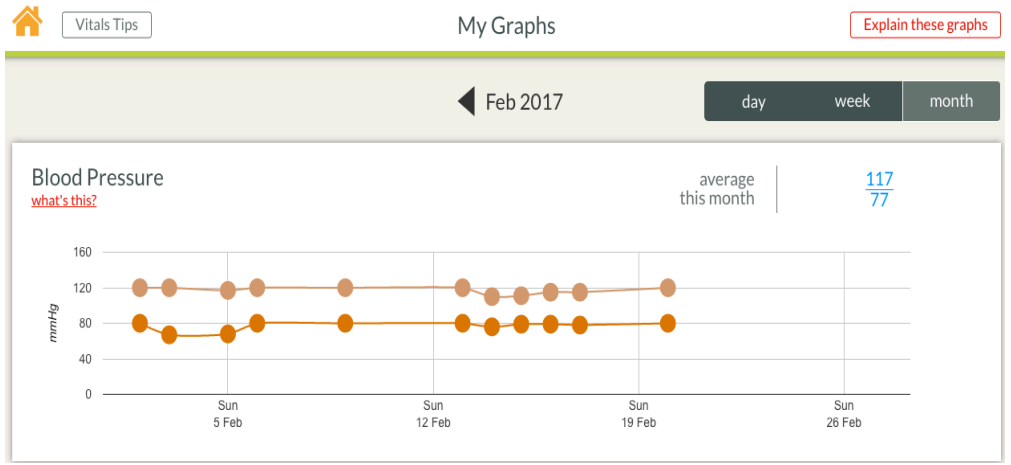
Monitoring Symptoms

- Sarah's GP recommended that she try a new technology to help her monitor her symptoms automatically
- ProACT also help Sarah to keep track of other important parameters such as sleep, activity, mood and breathlessness.



Viewing Symptoms

- Her new devices now send her readings automatically to a tablet where she can view her symptoms over the last day, week or month



Knowledge and Education:

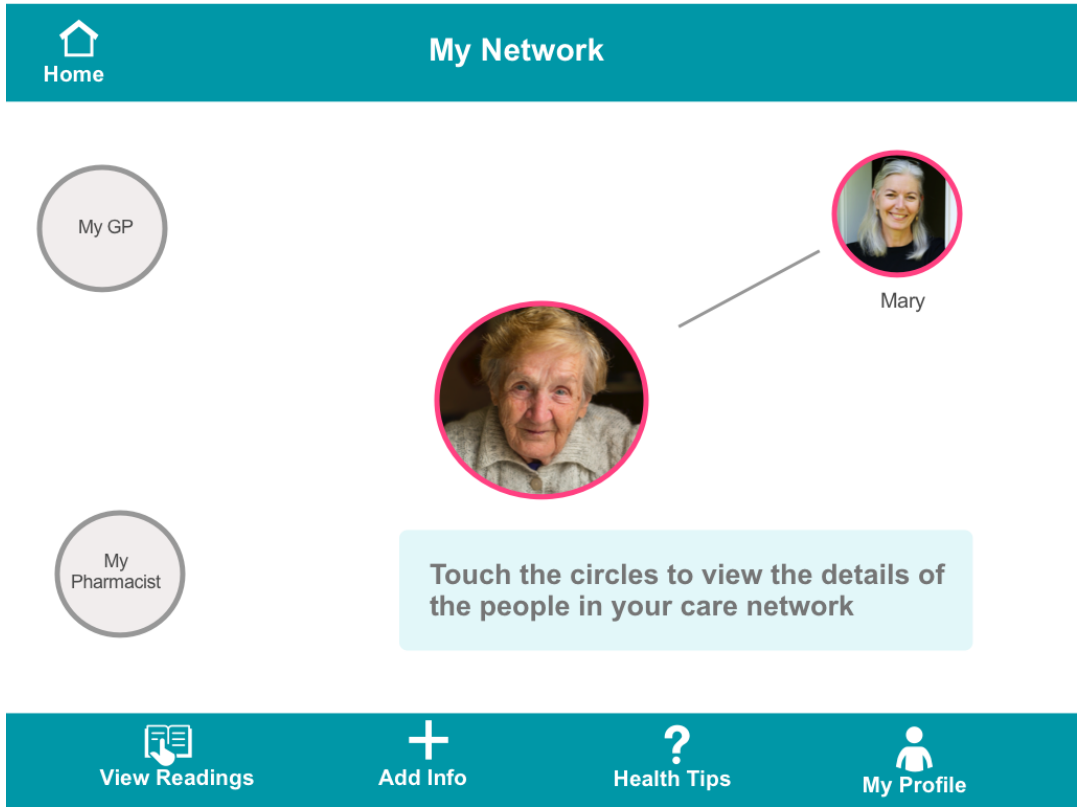
- The system also provides Sarah with tips that might be useful for her to manage her conditions and stay as healthy as possible.

- ProACT gives Sarah trustworthy and clear information on managing diabetes and heart failure but also on general topics such as exercise and how to get off the floor safely after a fall.

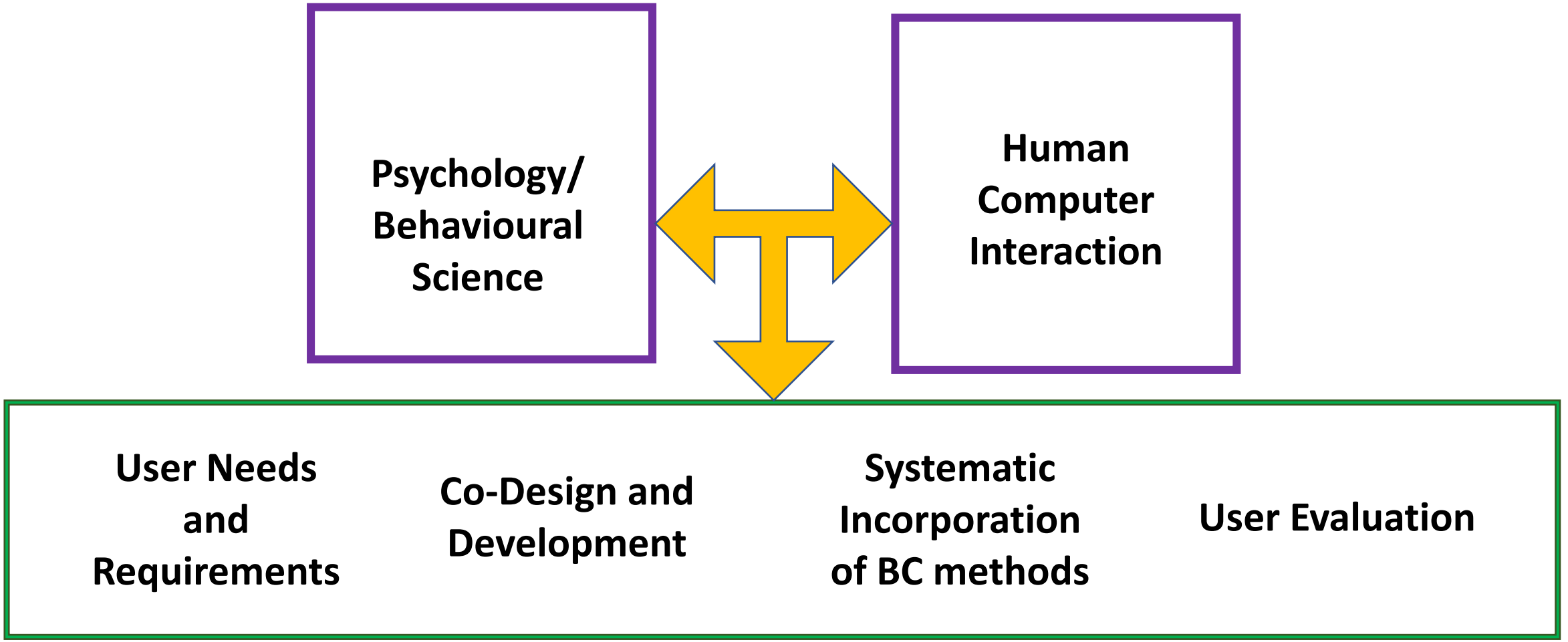
Health and Care Network:

- Person driven modular ability to personalise care network

- Sarah's daughter Mary can view the health readings that she chooses to share with her from her phone.



Developing Interventional Strategies



User Requirements

- Qualitative study
- Interviews and focus groups – semi-structured; 45-120 minutes
- Demographic questionnaires (PwM and informal carer)
- 124 participants across Ireland and Belgium
- Thematic analysis
- Diabetes + CHF/CHD most prevalent
- 57% women
- 21% MCI

	Ireland	Belgium
Person with Multimorbidity	19	19
Informal carer	7	10
Formal carer	11	10
GP	6	5
Community based healthcare Public health nurse; care coordinator	3	1
Hospital based clinician Geriatrician; Clinical Nurse Specialists; Physio; Occupational Therapist; Dietician; Speech and Language Therapist; Cardiologist; Endocrinologist	12	6
Formal care provider	5	2
Pharmacist	4	4
Total	**124**	

We employed traditional user-centred HCI techniques to help to translate this qualitative data into meaningful requirements for design:

47 key requirements across a number of categories to help inform the interventional strategies:

1. Reducing impact of multimorbidity (3)
2. Self-management of multimorbidity (14)
3. Medication management (7)
4. Information, knowledge and education (7)
5. Sources of support (3)
6. Communication (2)
7. Technology use (11)

Designing ProACT as a BC intervention

- **What is the aim of the system?**

  To improve self management skills and support for PwMs using a digital rather than paper based system

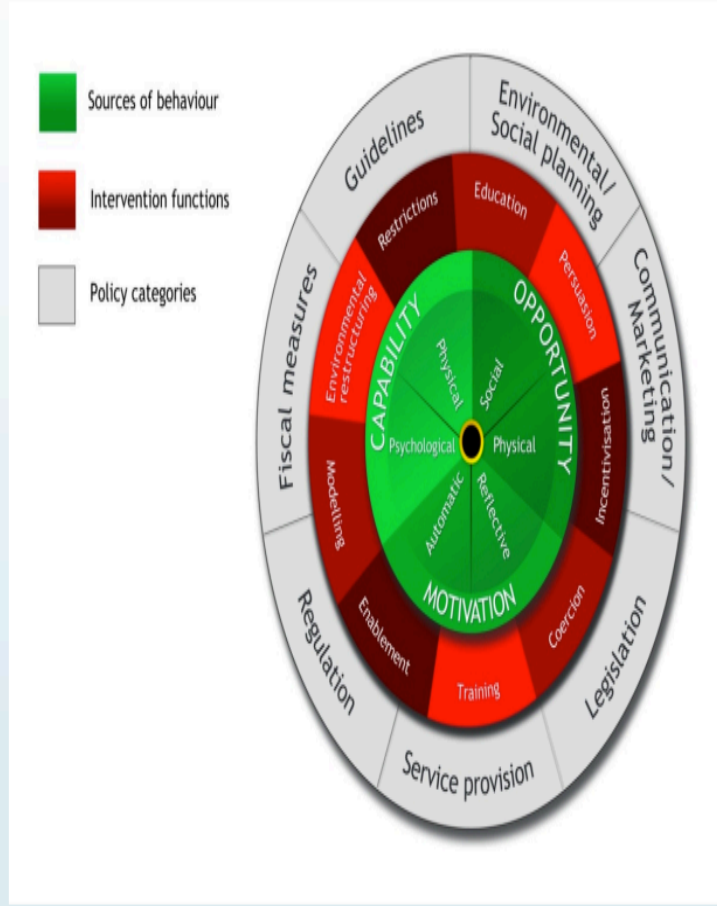
- **What is the behaviour that needs to change to do this?**

  PwM - needs to change their behaviour from managing their conditions using memory and paper based strategies to a digital self management tool

- **Systematic approach to address this?**

  The Behavioural Change Wheel approach involves an 8-stage process for developing behavioural change diagnoses and targeted interventional strategies.

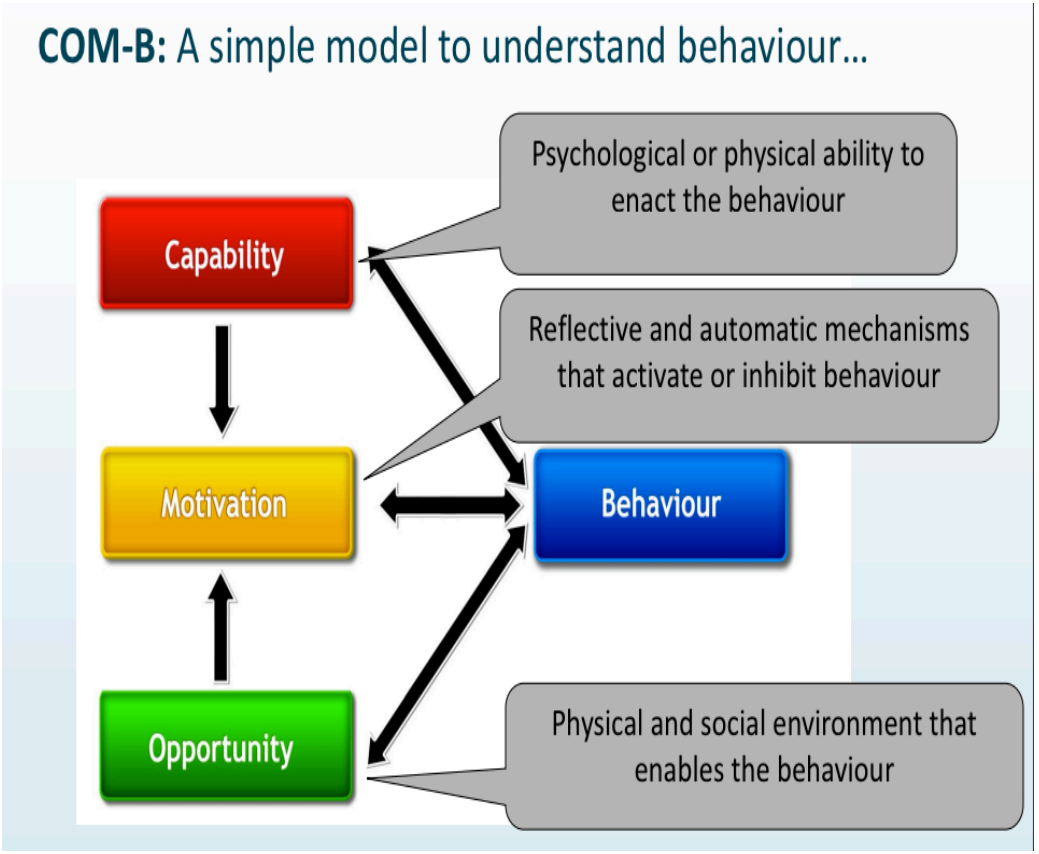
- Synthesis of 19 frameworks to classify interventions (health, environment, culture change and social marketing)
- Centre: COM-B model
- Inner ring: Nine intervention functions (what purpose(s) we the intervention serves)
- Outer ring: Seven policy categories



(Michie, Atkins and West, 2014)

Why apply the BCW model?

- Enabled us to design ProACT technology as a behaviour change intervention
- Understanding target behaviours within the framework of COM-B provides the first steps in selecting appropriate intervention strategies to bring about the desired change.
- Process allowed us to provide a framework for evaluation
- Behaviour change interventions may fail because the wrong assumptions have been made about what needs to change (Michie, Atkins and West, 2014).



(Michie, Atkins and West, 2014)

COM-B model component (Michie et al., 2014)	ProACT Example
Physical Capability	Have the skill to be able to use the technology (e.g. ability to use an iPad and a BP monitor)
Psychological Capability	Be able to understand the impact symptom monitoring, knowledge of conditions and recording information could have on self management
Reflective Motivation	Hold the belief that ProACT will help with management of conditions
Automatic Motivation	Have established routines and habits for self managing conditions
Physical Opportunity	Have an Internet connection to be able to use ProACT
Social Opportunity	Availability of support and recommendations from wider care and health network to use ProACT

Behaviour Change Targets

1**. Measure and view key symptoms on regular basis using the ProACT system (PwM):** This target is designed to evaluate if participants adopted the system into their self management routine.

2. **Recognise and record changes in symptoms from baseline readings (PwM):** This target is designed to evaluate whether PwMs engaged with their key symptoms over time in order to enhance self management skills for multiple conditions.

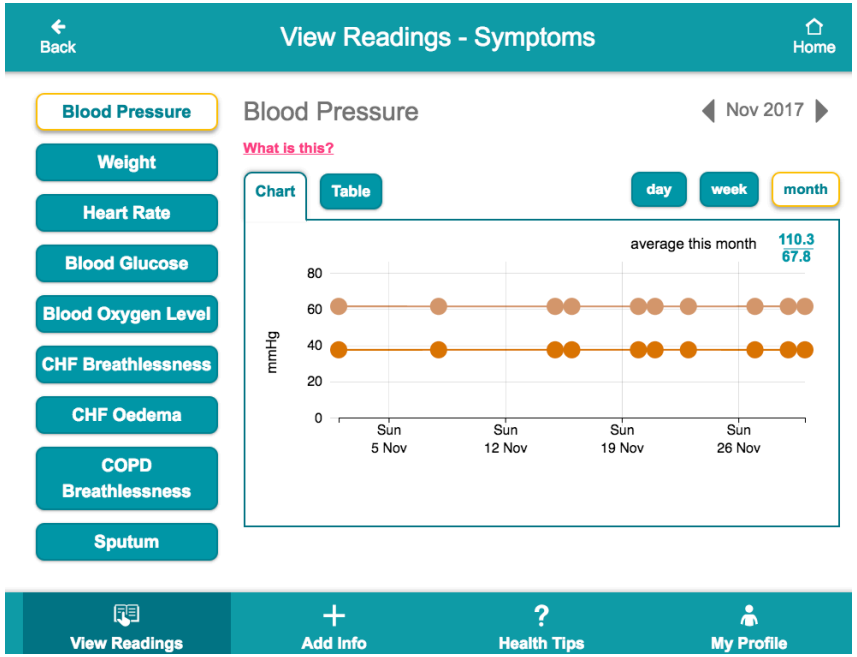
3. Confirm viewing of key symptom readings on ProACT (care network participants i.e. informal carer or HCP): This target is designed to evaluate if key support actors have viewed symptom readings for the person that they are caring for.

Target 1: Measure and view key symptom readings on ProACT (Person with Multimorbidity)

Intervention functions	COM-B components served by intervention functions	BCTs to deliver intervention functions
Education	Psychological capability Reflective motivation	5.1 Information about health consequences 1.2 Feedback on behaviour 2.7 Feedback on outcome(s) of the behaviour 7.1 Prompts/cues
Training	Psychological capability Automatic Motivation	4.1 Instruction on how to perform a behaviour. 6.1 Demonstration of the behaviour 8.3 Habit Formation.
Environmental Restructuring	Physical opportunity	12.5 Adding objects to the environment 12.1 Restructuring the physical environment.
Persuasion	Reflective motivation	9.1 Credible source
Enablement	Social opportunity	**3.1 Social support**
Incentivisation	Reflective motivation	**10.4 Social reward**

BCW: Informed the UI Design

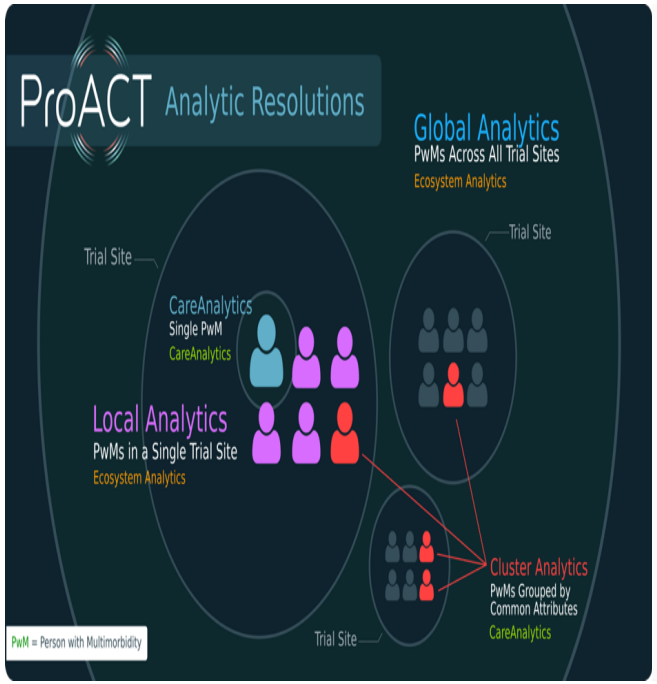
- Through the process of creating intervention strategies for each of the targets, we have translated intervention functions into additional application features.
- It has also helped us to understand the importance of features within the system that we may not have otherwise focused on (such as habit formation, social support etc.)
- Understand and pin-point BC functions and techniques in the system and helping us to define how to evaluate them and the system as a DBCI



BCW: Implications for Analytics

- BCW has highlighted the importance of *User Engagement metrics and analytics* to help us to evaluate ProACT as a BC intervention

- The BCW has highlighted the need for the *personalisation* of behaviour change techniques and interventions which we have considered in the design of our CareAnalytics (PROACT Artificial Intelligence - IBM)



1. Data cleaner
2. Probabilistic Health and Wellness Profile Builder
3. Goal Recommender
4. Education Recommender
5. User Engagement Analyser

GOAL SETTING

- **Presents particular challenges and complexities** for multimorbidity. Due to link with age additional conditions impact on ability to achieve goals.

- **S.M.A.R.T goals (Doran, 1981) were not common practice** for PwM or care network. Goals were general and not measureable.

- **Issue:** Lack of awareness around types of realistic goals to set, lack of support from care network (time, not wanting to overload PwM, sense PwM should self direct, care network insufficient data to inform goals). Peer rather than clinical support a key motivator.

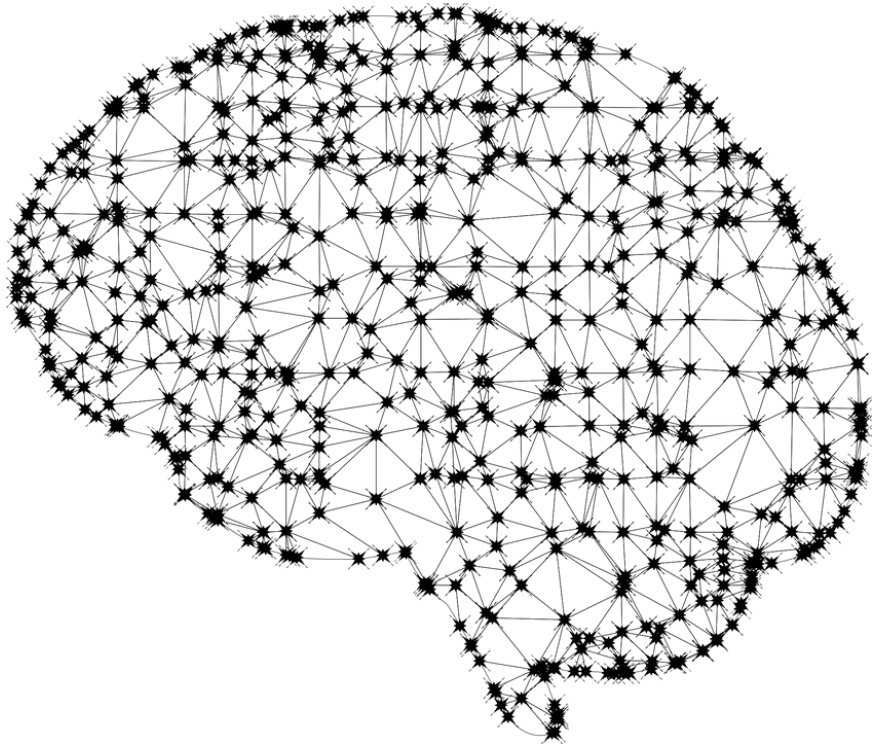
1. Present PwM Goal Suggestions **taking into account their complete profile** and health and well-being status

2. Education to understanding **how to set realistic goals themselves** based on data feedback

3. System to support **true collaborative goal settings**, initiated by PwM

4. System can **support single disease if necessary** when acute difficulty with one condition is identified.

5. **Flexibility of goal revision** - to account for bad and good health days



Evaluating ProACT as a BC Intervention

Each of the BC targets will be evaluated by:

- **Analysing system usage statistics** – how participants engage with specific features of the system i.e. measuring symptoms, recognising change, view education content
- **Quantitative trial assessment data (assessment measures)**
- **Qualitative interview data** – Thematic Analysis - Understand experiences

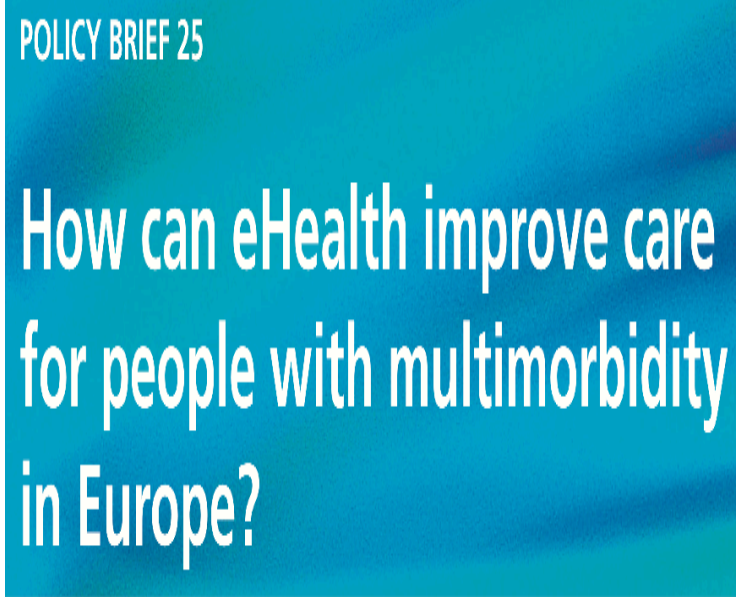
23 key metrics including: Session length, dashboard time, reflection screen time, view readings time, view reading screen responses health tips time, my info time, button presses on each screen, daily app opens etc.

19 Assessments including: Usability (T2;T3;T4), Burden (T2;T3;T4), technology proficiency (T1;T4), social connectedness (T1, T4), QoL (T1-T4), self efficacy (T1-T4, illness perceptions (T1-4), self-management (T1-T4), Demo (T1), med lists (T1;T4)

Interview schedules, reflect key assessment areas above.

Conclusions

- Digital health **holds promise** but designing and delivering DBCI's is **challenging**
- Key to our success is to design interventions based on a **strong theoretical foundation**
- **The BCW provides** a solid, systematic and theoretical framework in which to inform the design of complex intervention for multimorbidity management
- **Technology advances rapidly** - Agile, iterative methodologies are needed to develop strong PoC's before larger studies
- **Multimorbidity/Comorbidity –** May unlock how we can manage diseases on a single platform




Council of the European Union

Brussels, 28 November 2017
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SAN 399
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NOTE

From:	General Secretariat of the Council
To:	Council
No. prev. doc.:	14076/17 SAN 398 TELECOM 271 DATAPROTECT 176
Subject:	**Employment, Social Policy, Health and Consumer Affairs Council meeting on 8 December 2017** Draft Council conclusions on Health in the Digital Society - making progress in data-driven innovation in the field of health – Adoption

ProACT

Thank You!

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