Use of Technology in Symptom Assessment of Cancer Patients

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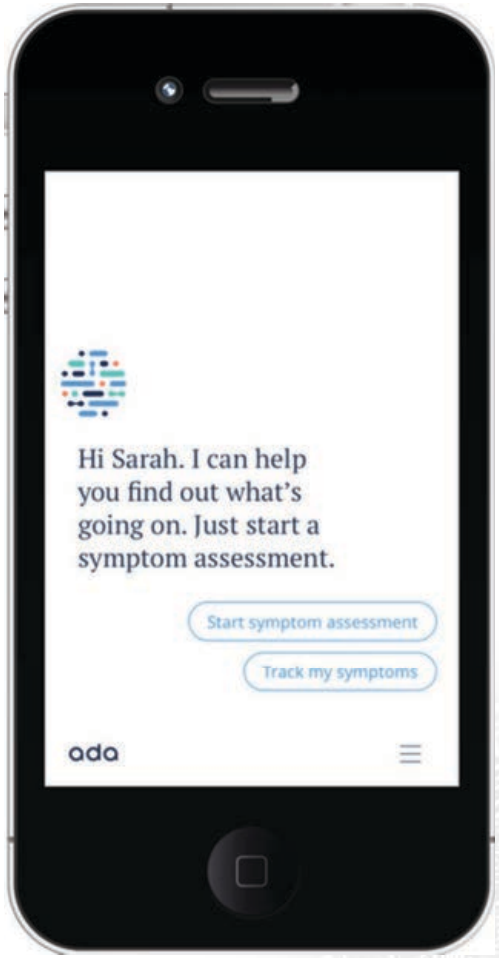
MASCC Meeting – June 2019

Objectives

- Clinical perspectives
  - Findings from a systematic review
  - Edmonton Symptom Assessment System – an exemplar
- Research perspectives
  - Interactive Voice Recording Systems (IVRs)
  - Web-based applications
  - E-Health interventions
- Future considerations
  - Use of sensors
  - Integrated analyses

Rationale for Symptom Assessment

- Multiple co-occurring symptoms from cancer and its treatments
- 10 to 14 unrelieved symptoms
  - Physical
  - Psychological
- Patients only volunteer 25% to 33% of the symptoms they are experiencing when asked the question “How are you feeling?”
- Earlier detection of symptoms are easier to manage
- Symptom assessment itself may be beneficial
- Symptom assessment and management results in increased survival *(Basch et al. JAMA, 2017)*



Symptom Assessment in Clinical Care

Jensen et al. J Oncol Pract 10(4):e215-e222, 2014

- Review of PRO systems and how systems differ
- 33 unique systems implemented in clinical cancer practices (27 provided detailed information)
- Treatment-centered systems (n=8)
  - Monitor patients during active treatment
- Patient-centered systems (n=19)
  - Followed patients across treatment and into survivorship

Symptom Assessment in Clinical Care

Jensen et al. J Oncol Pract 10(4):e215-e222, 2014

- **Reason for development**
  - **Symptom management**
  - **Identify psychosocial problems**
  - **Facilitate patient-clinician communication**
- **Most systems were developed "in house"**
- **Web-based assessments for data collection**
  - **Research funds**
- **85% of systems sent real time alerts to clinic**
- **50% of systems provided patient education**
- **93% of systems provided summary data to clinicians**

Edmonton Symptom Assessment System (ESAS)

- Started in 2006
- Standard of care in Ontario, Canada – population screening
- Employed in Regional Cancer Centers in ambulatory care
- Symptom screening
- Associated algorithms for symptom management
- Goals of ESAS
  - Facilitate communication about symptoms
  - Promote the therapeutic alliance
  - Increase patients' knowledge, empowerment, and self-management

Edmonton Symptom Assessment System

- ESAS kiosks
- Patients complete at each visit
- Histogram of symptom scores over time
- Evaluates 9 symptoms
  - Pain
  - Fatigue
  - Drowsiness
  - Nausea
  - Dyspnea
  - Depression
  - Anxiety
  - Well-being
  - Loss of appetite

Does ESAS Make a Difference in Patient Outcomes?

Diplock, et al. Support Care Cancer 27:209-218, 2019

- **Compared patients who were and were not using ESAS**
  - **HRQOL**
  - **Patient satisfaction with care**
  - **Supportive care needs**
- **Findings**
  - **No between group differences in any of the outcome measures**
  - **In ESAS group – at the 2nd assessment – decrease in nausea, vomiting, and constipation**
- **Challenges**
  - **Need for patient and HCP training in the use of the ESAS**
  - **Need for disease and treatment specific symptoms**

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Interactive Voice Response System

Cleeland, et al. J Clin Oncol 29(8):994-1000, 2011

- **Thoracotomy patients (n=100)**
  - **IVR alone or IVR + NP**
  - **Called by IVR system - 2x/week for 4 weeks**
  - **Five symptoms – pain (5), distress (5), disturbed sleep (5), SOB (3), constipation (3)**
  - **Alerts were established**
- **Alerts**
  - **IVR detected 100% of alerts**
  - **84% of alerts were acknowledged by HCP**
  - **60% of alerts had a phone consult**
- **Outcomes**
  - **Significantly fewer symptom threshold events**
  - **Significantly greater decline in symptom threshold events**
  - **Significantly less symptom interference**

Interactive Voice Response System

Mooney, et al. Cancer Med 6(3):537-546, 2017

- **Patients receiving CTX**
  - **IVR or IVR + NP**
  - **Patients called by IVR system – before noon on a daily basis over the course of treatment for up to 6 months**
  - **Eleven symptoms – fatigue, trouble sleeping, nausea & vomiting, pain, numbness or tingling, feeling blue or down, feeling nervous or anxious, distress over appearance, diarrhea, sore mouth, trouble thinking or concentrating**
  - **Alerts were established**
  - **Both groups were reminded to call HCP about symptoms**
- **Intervention group**
  - **Automated self-care management interventions**
  - **For 11 symptoms – 29 different responss generated an alert based on severity or response pattern (e.g., increasing symptom severity over time)**
  - **NP called back within 4 hours**
  - **NP prescription integrated into the EHR and notification of HCP**

Interactive Voice Response System

Mooney, et al. Cancer Med 6(3):537-546, 2017

- **Intervention parameters**
  - **Adherence with calls was 90%**
  - **Call length for patients**
    - **4:45 mins in IVR + NP group**
    - **4:19 mins in IVR group**
  - **1756 NP calls**
- **Results**
  - **Significant reduction in overall symptom burden**
  - **Decrease in symptom burden for 10 of 11 symptoms (not diarrhea – had a low occurrence rate)**

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Effects of Web-based Interventions for Symptoms

Fridriksdottier, et al. Support Care Cancer 26:337-351, 2018
Moradian, et al. Support Care Cancer 26:361-374, 2018

- **Summary from two systematic reviews**
  - **Some overlap in studies included in the review**
  - **Approximately 20 studies**
- **Main elements for effective web-based interventions**
  - **Evidenced-based education/information**
  - **Self-monitoring/tracking and reporting of symptoms**
  - **Personalized feedback/tailored information based on data**
  - **Self-management training to cope with physical and psychological symptoms**
  - **Communication with HCPs**
  - **Communication with peers**

Effects of Web-based Interventions for Symptoms

Fridriksdottier, et al. Support Care Cancer 26:337-351, 2018
Moradian, et al. Support Care Cancer 26:361-374, 2018

- **Symptom assessment**
  - 28 instruments across 20 studies
    - HADS – n=5
    - MSAS – n=4
  - QOL was 2nd most common outcome (EORTC-QOL)
- **Symptom outcomes**
  - Psychological distress – n=8, 3 were positive
  - Anxiety and/or depression – n=10, 4 positive for anxiety, 2 positive for depression
  - Somatic symptom severity – n=10, 6 were positive
  - Symptom prevalence – n=2

Effects of Web-based Interventions for Symptoms

Fridriksdottier, et al. Support Care Cancer 26:337-351, 2018
Moradian, et al. Support Care Cancer 26:361-374, 2018

- **Major findings**
  - **50% of studies published between 2013 and 2015**
  - **65% of studies suggested some positive effect**
  - **Interventions with multiple elements reported positive effects**
  - **Large variations in patients use of interventions was found**
  - **Direct interaction with clinicians is an extremely important element of the intervention**

Effects of Web-based Interventions for Symptoms

Fridriksdottier, et al. Support Care Cancer 26:337-351, 2018
Moradian, et al. Support Care Cancer 26:361-374, 2018

- **Additional considerations**
  - **No cost effectiveness analysis**
  - **More information needed on survival benefit**
  - **Need information on the active ingredient in the intervention**
    - **What components are most useful to patients?**
    - **How are alerts implemented in clinical practice?**
  - **Need more information on HCPs' level of adherence with responding to alerts**
  - **Need to use valid and reliable PROs**

Effects of Web-based Interventions for Symptoms

Fridriksdottier, et al. Support Care Cancer 26:337-351, 2018
Moradian, et al. Support Care Cancer 26:361-374, 2018

- **Additional considerations**
  - Need to determine the most appropriate outcomes for the intervention
    - Various dimensions of the symptom experience
    - QOL
    - Overall level of distress
    - Overall level of interference from symptoms
  - E-communication between patients and HCPs was the most valuable component
    - How is this component operationalized?
    - How is this component integrated into workflow and care processes?
    - How are clinicians educated to respond
  - Workability of the intervention in clinical care
    - Slow clinician behavior change and increased workload
  - Patient satisfaction and willingness to participate
    - Attrition was ~46%

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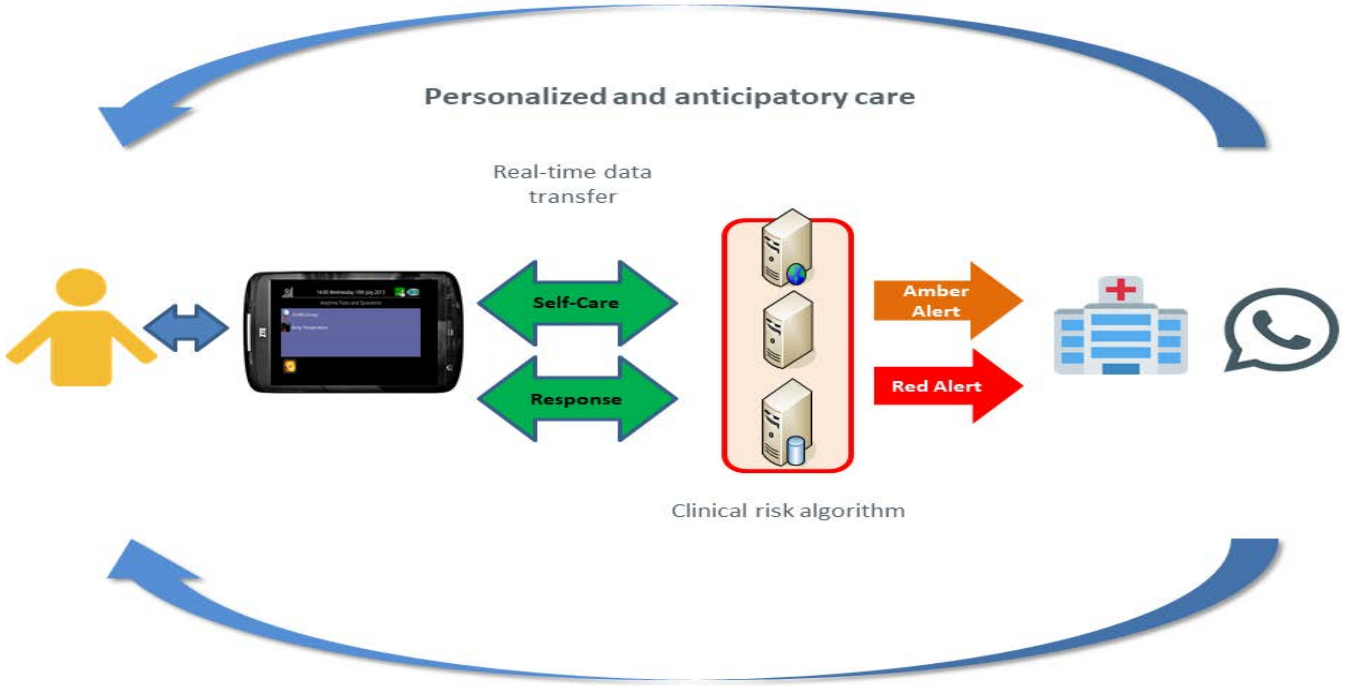
E-Health Interventions for Symptoms

Cooley, et al. BMC Medical Informatics and Decision Making 18:31, 2018



Decision support systems are imbedded within symptom assessment and management programs

E-Health Interventions for Symptoms

Cooley, et al. BMC Medical Informatics and Decision Making 18:31, 2018

- **Ensure patient safety**
  - Screening questions for each symptom
  - Algorithm logic is based on evidenced-based clinical practice guidelines
  - Check if recommended therapy is prescribed
  - Check with HCP for a new prescription
- **Communicate clinical concepts effectively**
  - Cognitive testing of questions with patients
  - Addition of graphics to support text
  - Explanations and lists of additional information
  - Need for explicit questions
  - User friendly interface

E-Health Interventions for Symptoms

Cooley, et al. BMC Medical Informatics and Decision Making 18:31, 2018

- **Promote communication with clinicians**
  - **Explicit suggest to call HCP**
  - **Script for patients/FCs to use**
- **Support patient activation**
  - **Personalized and actionable instructions**
  - **Content to help patients understand why certain questions were asked**
- **Facilitate navigation and use**
  - **Minimize burden of data entry**
  - **Include a progress bar**
  - **Allow patients to change answers +/or pause the session**
  - **Accommodate vision, hearing, tactile limitations**

The Advanced Symptom Management System (ASyMS)

- Mobile phone based remote monitoring PROMS system
- One of the most evolved and evaluated mHealth systems in Cancer Care
- Evidence based
- Developed in conjunction with people with cancer and cancer care experts (inductive development) - accessibility
- Rigorous framework for intervention development (MRC Complex Interventions Framework, 2008):

✓ Prototype development
✓ Feasibility and acceptability
✓ Pilot studies
✓ Large scale trials in UK
✓ *European RCT (eSMART)

Evidence Based ePROMS system

Patient completes ePRO symptom questionnaire on mobile phone on a daily basis and whenever he/she feels unwell

Real-time

Data transferred to server and subject to clinical risk algorithm

Real-time **Real-time**

E-Library

Symptom graphs

Evidence-based self-management advice

! Amber alert (moderate symptoms)

!! Red alert (severe or life-threatening symptoms)

Real-time

Alerts transmitted to clinician's handset

Clinician logs onto website to review alert and contacts patient

Evidence Based: CTAQ – clinical PROM

- Developed with experts and evidence review
- Incidence, severity and distress
- Severity informed by CTCAE descriptions (transferability and interpretation within clinical practice)
- Reliability and validity testing

ORIGINAL ARTICLE

Development and preliminary testing of a brief clinical tool to enable daily monitoring of chemotherapy toxicity: The Daily Chemotherapy Toxicity self-Assessment Questionnaire

Roma Maguire, Grigorios Kotronoulas, Peter T. Donnan, Catherine Paterson, Lisa McCann, John Connaghan, David G. G. Di Domenico, Nora Kearney

First published: 11 July 2018 | https://doi.org/10.1111/ecc.12890

Evidence Based:
Clinical risk model and algorithms

- Systematic reviews
- Expert input and consensus
- Close alignment with UKONS

European Journal of Oncology Nursing 26 (2017) 63–82

Contents lists available at ScienceDirect

European Journal of Oncology Nursing

journal homepage: www.elsevier.com/locate/ejon

The assessment and management of chemotherapy-related toxicities in patients with breast cancer, colorectal cancer, and Hodgkin's and non-Hodgkin's lymphomas: A scoping review

Patricia Fox [a,*], Andrew Darley [a], Eileen Furlong [a], Christine Miaskowski [b], Elisabeth Patiraki [c], Jo Armes [d], Emma Ream [e], Constantina Papadopoulou [f], Lisa McCann [f], Nora Kearney [g], Roma Maguire [f]

Cancer Follow Up

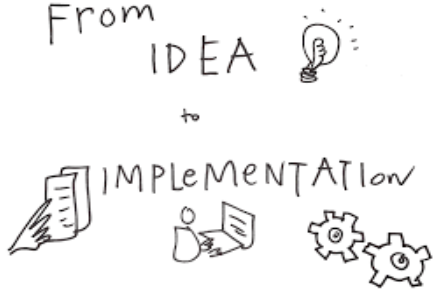
University of Strathclyde Science

Real World Support and Implementation

University of Strathclyde Science

- Training videos
- Booklets – patients and professionals
- Training power point presentations
- 24/7 technical reporting and response service

RealWorld



University of Strathclyde Science

- University of Strathclyde
- University of Surrey
- University of Dundee
- University of California, San Francisco
- Medical University of Vienna, Austria
- NHS 24
- Kings College London, UK
- University of Athens, Greece
- University of Dublin, Ireland
- Innlandet Hospital Trust, Norway
- The European Cancer Patient Coalition (ECPC)
- Docobo

- **EU FP7 funded €6M**
- **RCT: ASyMS remote patient monitoring intervention in Europe (chemotherapy)**
- **11 European and 1 US partner**
- **842 patients recruited across 5 countries in Europe**
- **Lead Consortium: University of Strathclyde**
- **Results July 2019**

SEVENTH FRAMEWORK PROGRAMME

THEME [HEALTH.2013.2.4.1-3] [Investigator-driven supportive and palliative care clinical trials and observational studies]

Open Access Protocol

BMJ Open

The eSMART study protocol: a randomised controlled trial to evaluate electronic symptom management using the advanced symptom management system (ASyMS) remote technology for patients with cancer

Roma Maguire,[1] Patricia A Fox,[2] Lisa McCann,[1] Christine Miaskowski,[3] Grigorios Kotronoulas,[1] Morven Miller,[1] Eileen Furlong,[2] Emma Ream,[1] Jo Armes,[4] Elisabeth Patiraki,[5] Alexander Gaiger,[6] Geir V Berg,[7] Adrian Flowerday,[8] Peter Donnan,[9] Paul McCrone,[10] Kathi Apostolidis,[11] Jenny Harris,[4] Stylianos Katsaragakis,[5] Alison R Buick,[2] Nora Kearney[1]

eSMART: Patient participation overview

Part 1: Feasibility testing

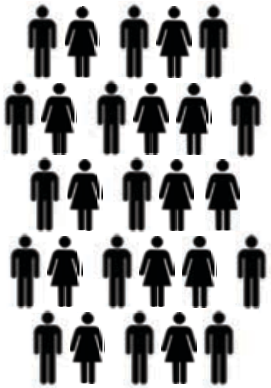
Part 2: RCT and Follow-up

2

patients per diagnostic group (i.e. breast cancer, colorectal cancer or lymphoma)

Use the Advanced Symptom Management System (ASyMS) for 1 cycle of chemotherapy

Technical preparedness of clinical site is confirmed; then clinical site opens to RCT



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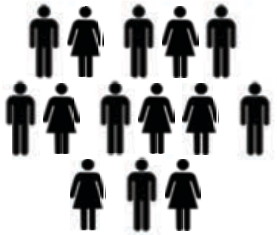
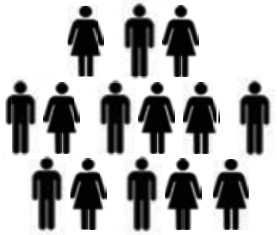
patients with breast cancer, colorectal cancer or lymphoma

Random allocation, stratified by clinical site and cancer type



Intervention group

Uses the Advanced Symptom Management System (ASyMS) for up to 6 cycles of chemotherapy



Control group

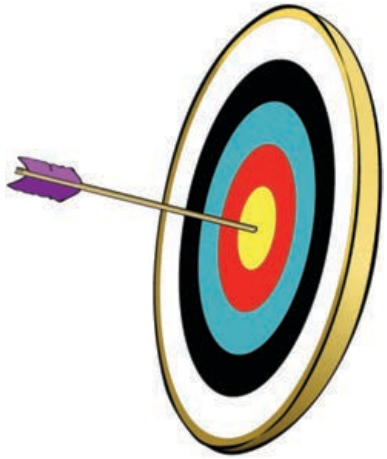
Receives care as per the clinical site's standards

Both groups are followed up for up to 1 year

Primary and secondary objectives

- **Primary OUTCOMES:**

↓ Symptom burden during CTx (baseline, each cycle of CTx)



- **Secondary OUTCOMES**

↑ HR-QoL (CTx and/or f/u)
↓ Supportive care needs (CTx and/or f/u)
↓ Anxiety
↑ Self-efficacy (CTx and/or f/u) Anxiety (CTx and/or f/u)
↓ Work limitations (CTx and/or f/u)
↓ Health service organisation and costs

- \+ Effects on processes of care delivery and clinical practice/the workforce
- \+ Examine age/gender-related differences in symptom prevalence and intervention implementation

- Outcomes measured during treatment and for up to one year post-treatment (3 monthly intervals)

University of Strathclyde Science

nature > scientific reports > articles > article

SCIENTIFIC REPORTS

Article | OPEN | Published: 19 February 2019

Network Analysis of the Multidimensional Symptom Experience of Oncology

Nikolaos Papachristou, Payam Barnaghi, Bruce Cooper, Kord M. Kober, Roma Maguire, Steven M. Paul, Marilyn Hammer, Fay Wright, Jo Armes, Eileen P. Furlong, Lisa McCann, Yvette P. Conley, Elisabeth Patiraki, Stylianos Katsaragakis, Jon D. Levine & Christine Miaskowski

PLOS ONE | PUBLISH ABOUT BROWSE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Learning from data to predict future symptoms of oncology patients

Nikolaos Papachristou, Daniel Puschmann, Payam Barnaghi, Bruce Cooper, Xiao Hu, Roma Maguire, Kathi Apostolidis, Yvette P. Conley, Marilyn Hammer, Stylianos Katsaragakis, Kord M. Kober, Jon D. Levine, Lisa McCann, [...], Christine Miaskowski [view all]

Published: December 31, 2018 • https://doi.org/10.1371/journal.pone.0208808

Clinical utility of PRMs in the delivery of precision cancer care? Real World Use?

- Patient and professional focus groups across each European country
- Utility – how will this information be used in the real world?
- Do patients and health professionals find this information helpful?
- How would they use it?

Thank you

(clinicaltrials.gov) NCT02356081

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www.esmartproject.eu

@eSMART_EU

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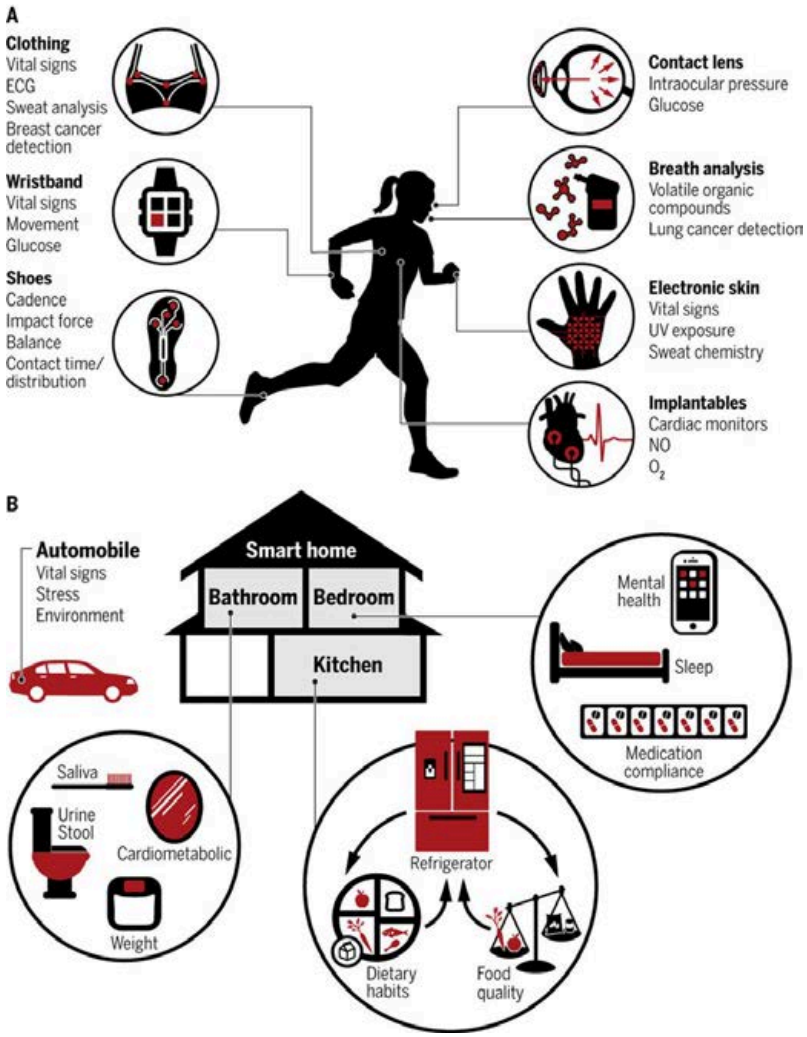
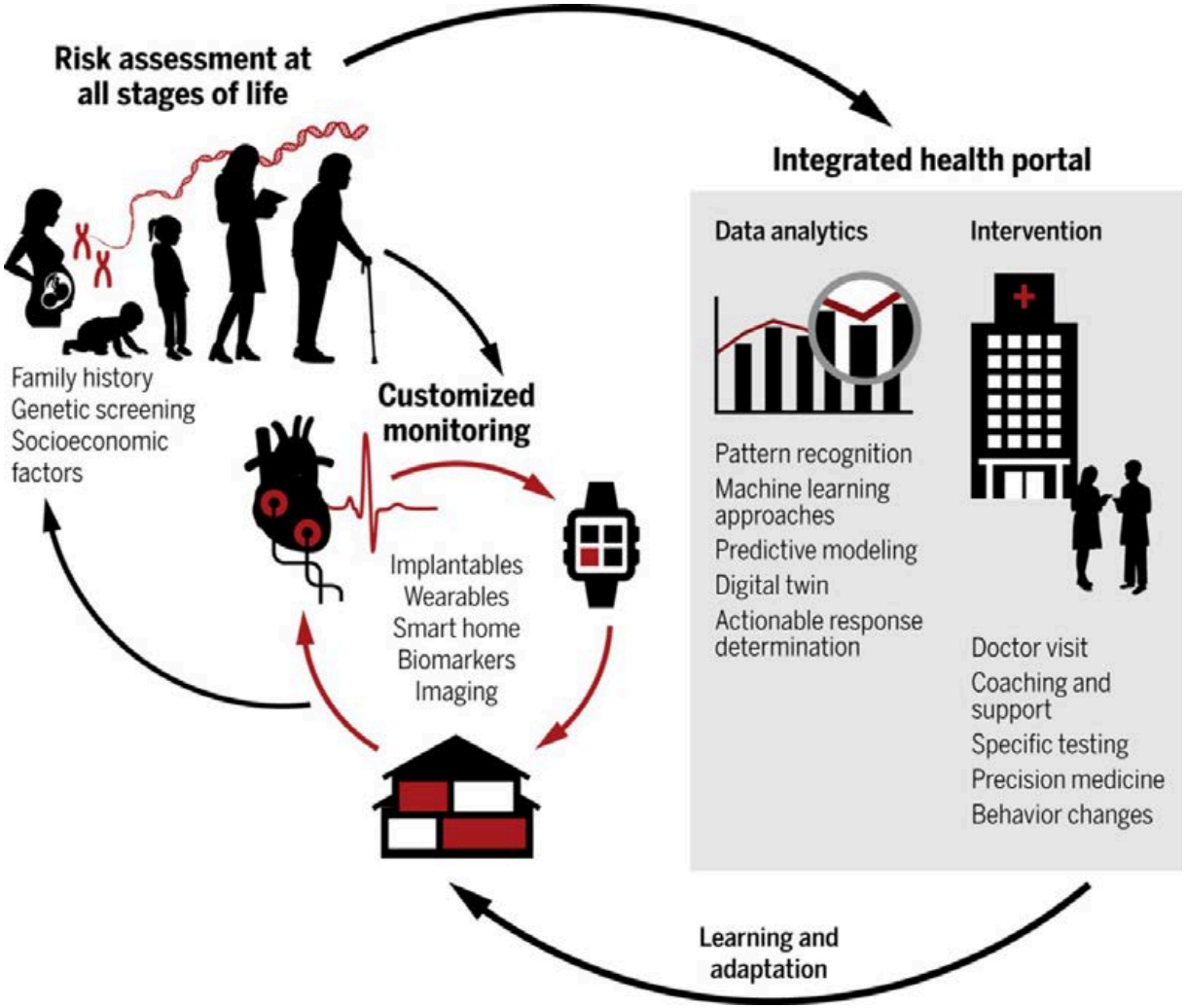
Fig. 2 Monitoring on the body and in the home.



Sanjiv Sam Gambhir et al., Sci Transl Med 2018;10:eaao3612

Fig. 1 Precision health care overview.



Sanjiv Sam Gambhir et al., Sci Transl Med 2018;10:eaao3612