NUFFIELD DEPARTMENT OF SURGICAL SCIENCES

McLaren APPLIED TECHNOLOGIES

Oxford Technology Showcase 2016

Big Healthcare Challenges in chronic disease

Working Towards a Personalised Surgical Pathway

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In collaboration with McLaren Applied Technologies and Oxford University Hospitals NHS Foundation Trust

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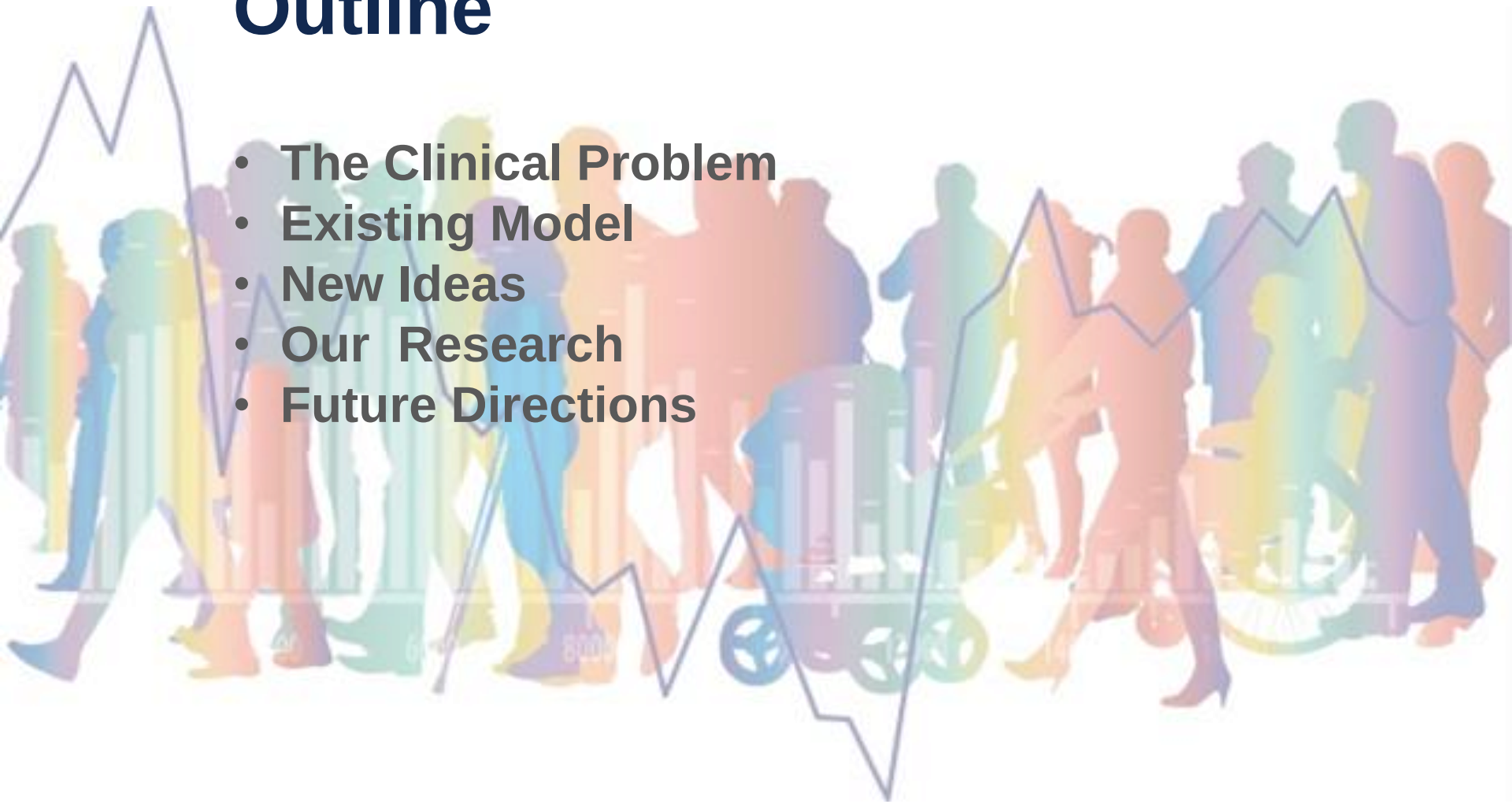
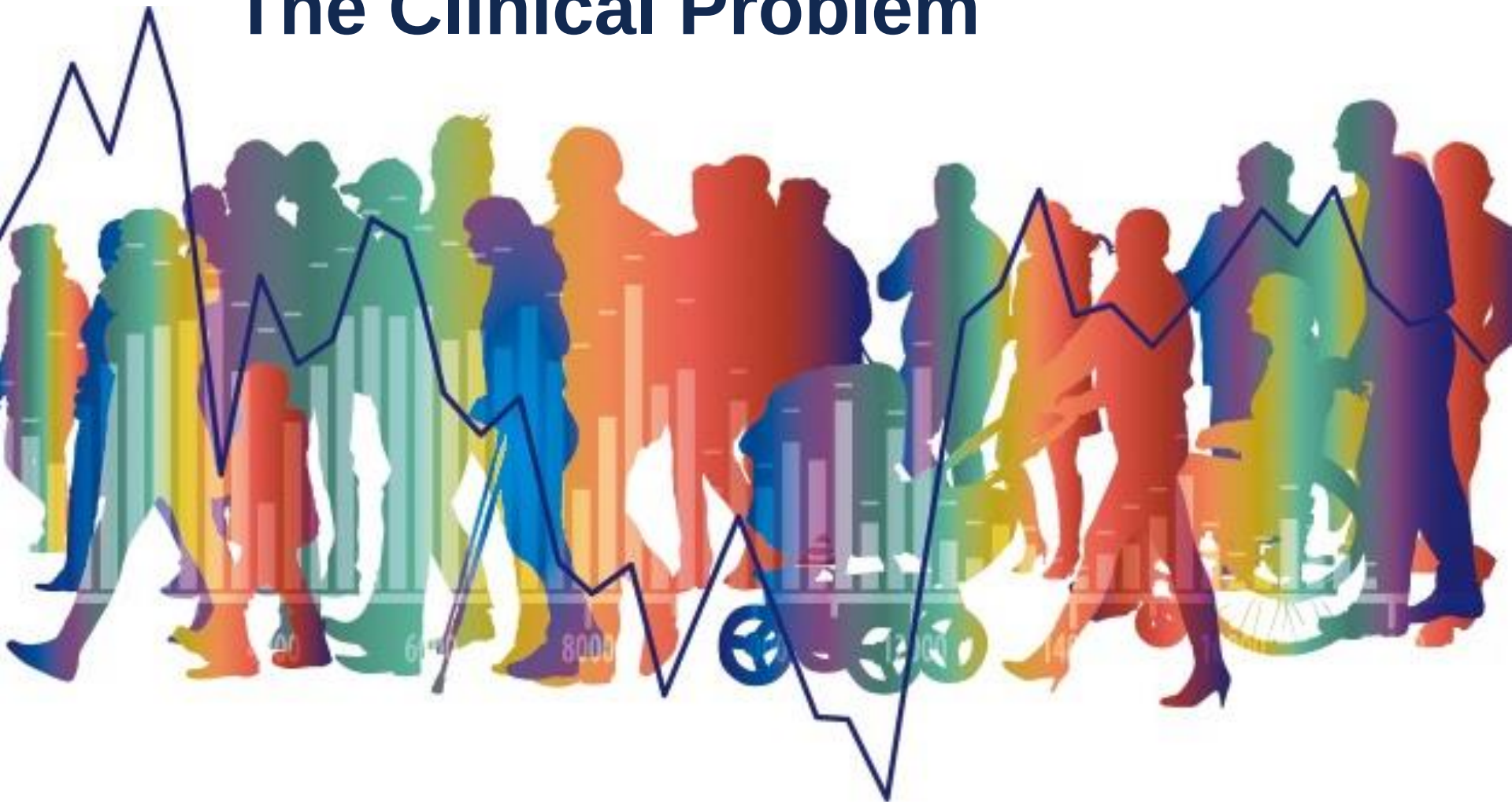
Outline



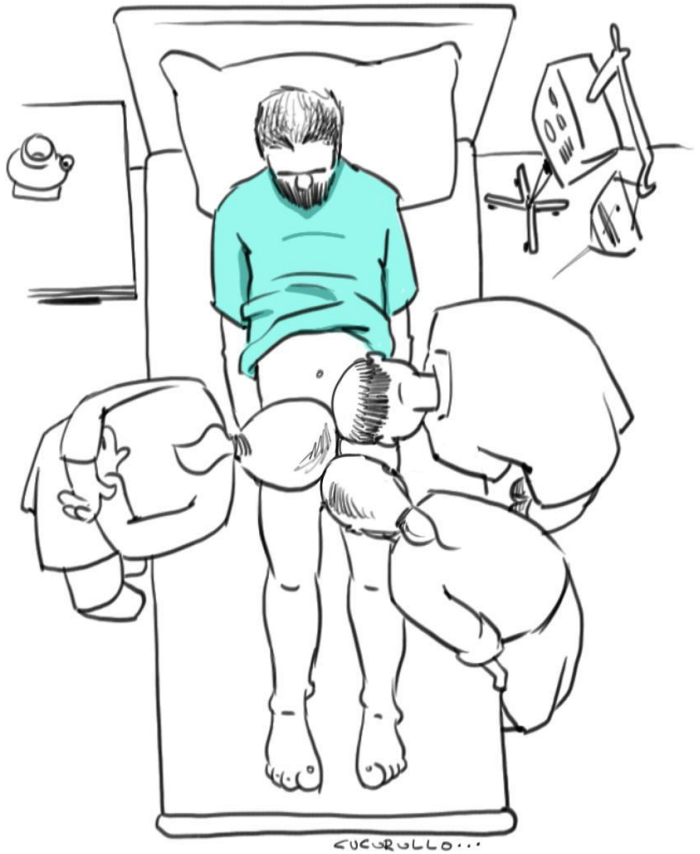
- The Clinical Problem
- Existing Model
- New Ideas
- Our Research
- Future Directions

The Clinical Problem



The challenge of perioperative care: Surgeons treating the patient as a whole!

- People on average have 4 operations in their lifetime
- Surgery is a high risk intervention
- Surgeons are putting increasing emphasis on improving outcomes for patients and efficiency in addition to the technical aspects of the operation itself



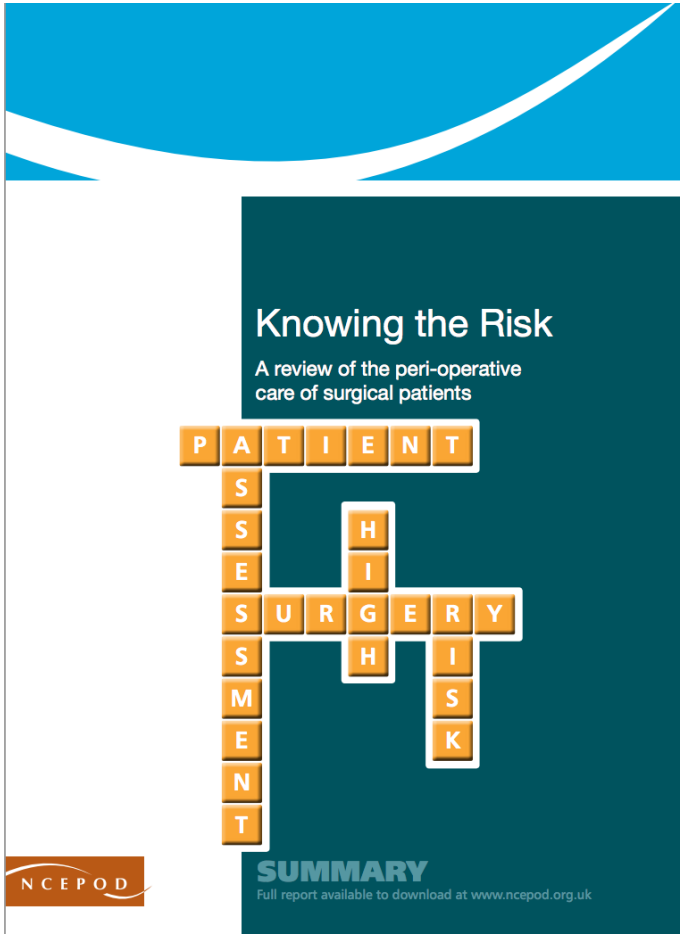
The value of surgery

- Patients need to be informed of the value of surgery for them
- We need to be able to better monitor and assess patients in order to be able to provide individualistic profiles of the benefits and risks of surgery

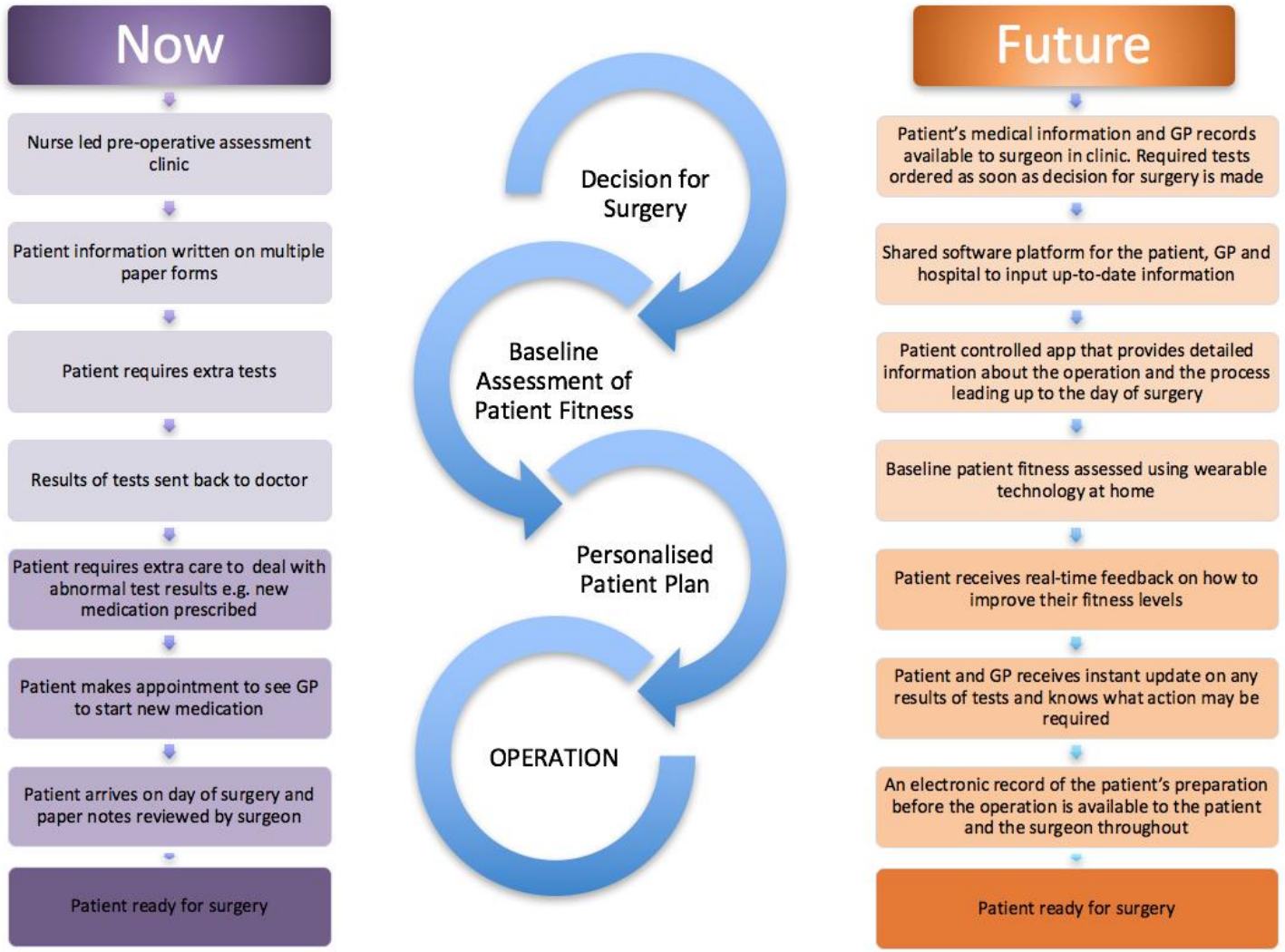
The clinical problem: preoperative care

This report contains cogent evidence that today's patients are more challenging than those the NHS dealt with even ten years ago. Two thirds of them were overweight. A substantial number had significant comorbidities (Figure 3.7). It is to be expected that the patients we study are getting older, like the population they represent: six of these patients were centenarians, the oldest being 104. 184 patients aged 91 or over underwent surgery and I was interested to see that a third of them were regarded as low risk by their anaesthetists (see Figure 3.5).

- The preoperative period offers a golden opportunity to prepare patients for surgery. To do this we need to know their risk for surgery and how to lower them before surgery



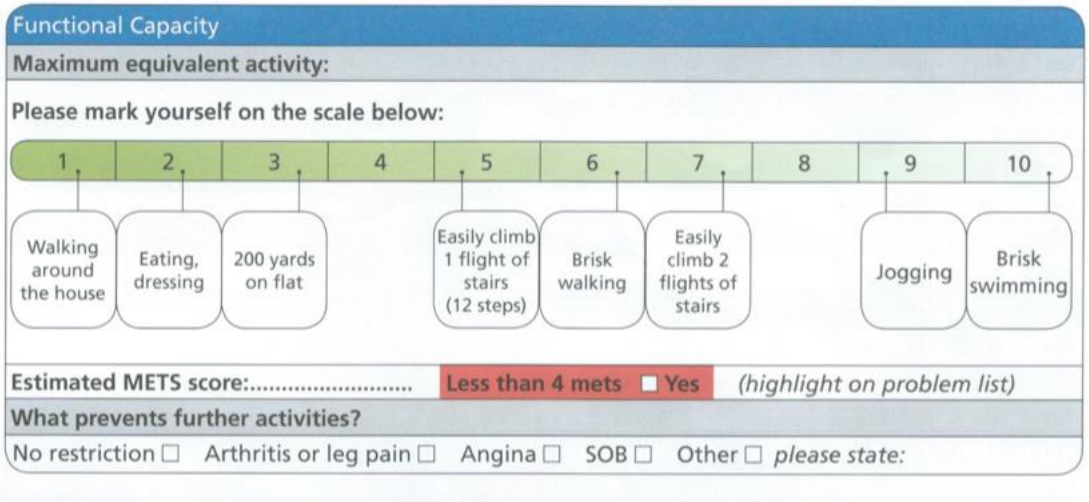
Your Surgical Pathway: The Future



Existing Model

Existing solutions

- Preoperative assessment
  - Nurse / doctor led clin
  - Questionnaires
  - Blood tests
  - Imaging investigations
  - Cardiopulmonary Exercise Testing and other specialist investigations
- Postoperative care
  - Enhanced recovery program
- Postoperative rehabilitation
  - Continued care in the community
  - Assessment of Patient Reported Outcome Measures (PROMS)



New Ideas

Collaboration with McLaren Applied Technologies

McLaren Applied Technologies partners with the University of Oxford to optimise patient care

Monday, 23 Mar 2015

McLaren Applied Technologies and the University of Oxford have announced a new partnership that aims to improve the efficiency of patient care and

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Formula One Technology Used In Drug Trials

The 3D accelerometers give detailed data on patient movement and help assess whether new drugs are having an effect.

Video: F1 Technology Used In Drug Trials

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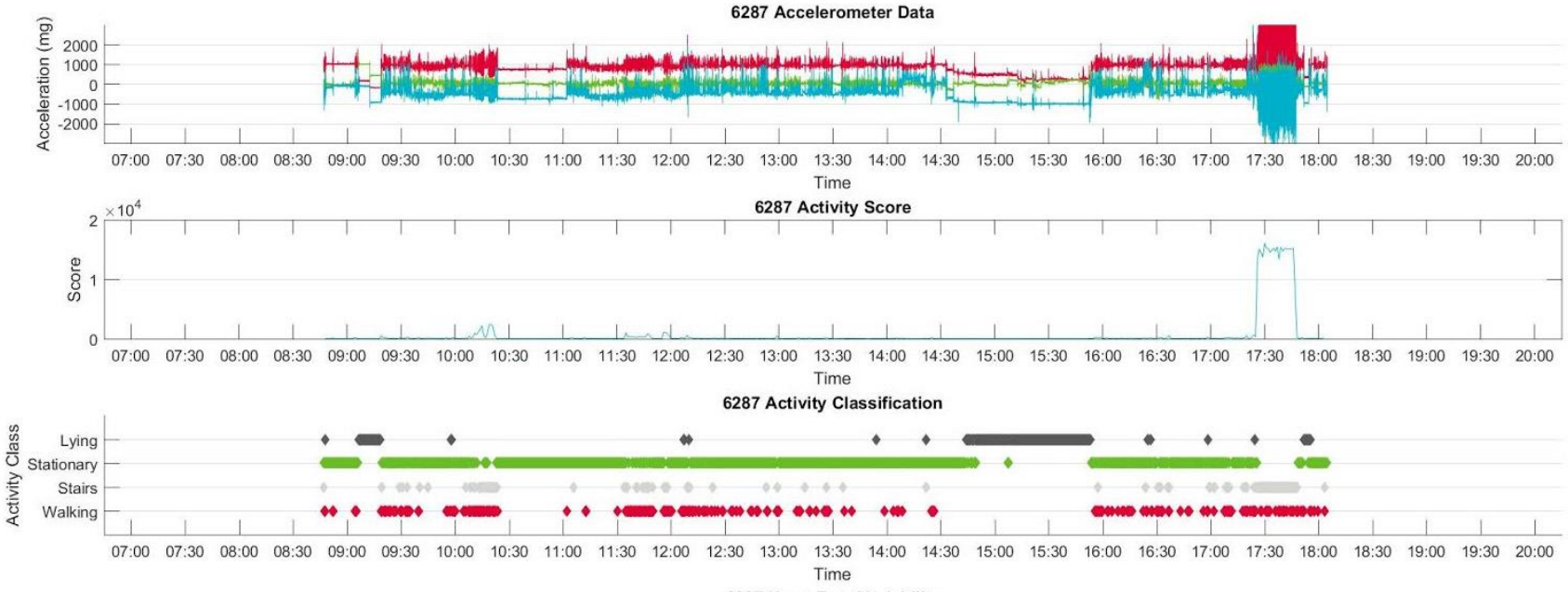
Activity Monitoring using Accelerometers



Preoperative Assessment: Cardiopulmonary Exercise Testing (CPET)

- Cycling test conducted by anaesthetist
- Assessment of functional reserve
- Main end-points measured are anaerobic threshold (AT) and peak oxygen consumption (Peak VO_2)

Postoperative recovery

A Pervasive Body Sensor Network for Measuring Postoperative Recovery at Home

O. Aziz, L. Atallah, B. Lo, M. ElHelw, L. Wang, G.Z. Yang and A. Darzi

SURG INNOV 2007 14: 83
DOI: 10.1177/1553350607302326

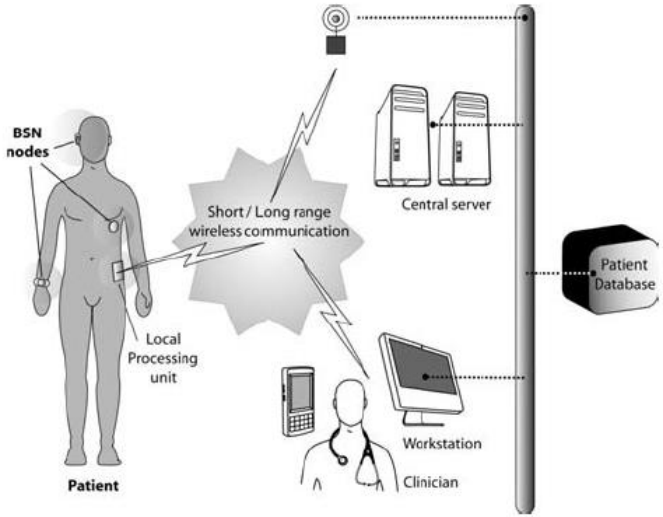
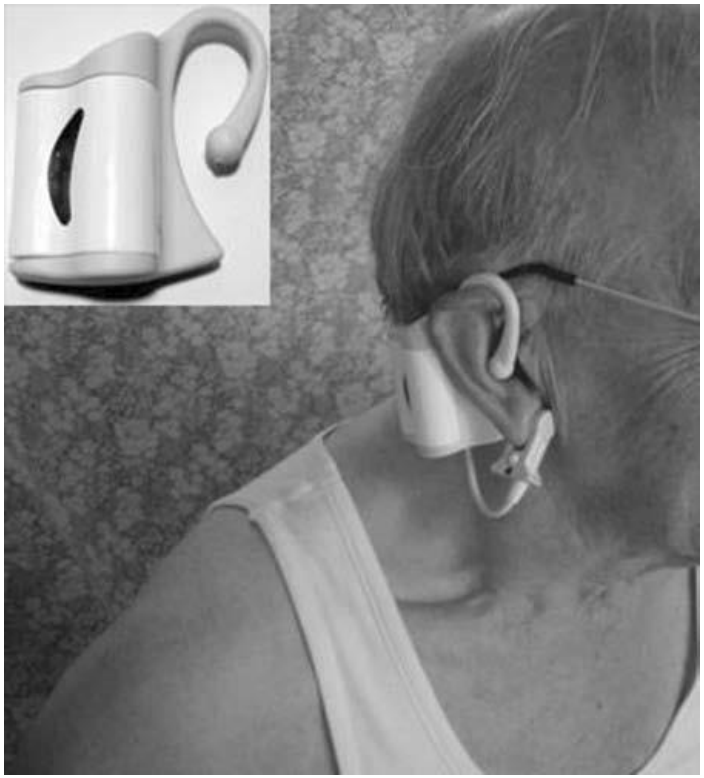


Figure 1. A diagrammatic representation of the body sensor network (BSN) system as would be worn by a patient, connected wirelessly to central servers where this information can be accessed by the clinician.



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Our Research

Our research

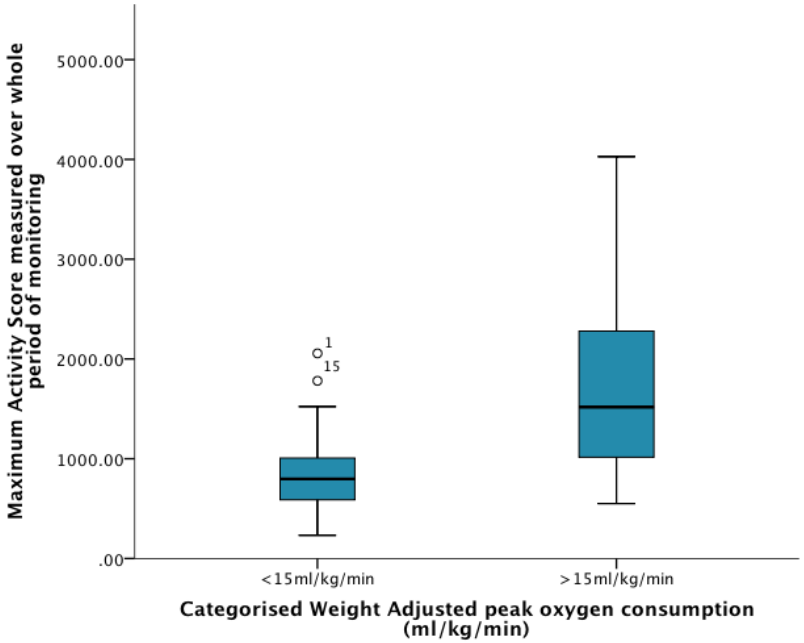
- Clinical feasibility study of 50 patients
- Conducted at Oxford University Hospitals
- Undergoing major elective surgery and cardiopulmonary exercise testing (CPET) as part of care
- Also undergoing home activity monitoring for 3 days before and after the operation
- Aims:
  - Explore activity monitoring parameters that reflect daily activity and have relation to functional reserve as measured by CPET
  - Assess whether activity monitoring can indicate patients at higher risk preoperatively

Results: Identification of activity parameters that are clinically useful

- Rather than just using one summary measure for total activity in a day we have tried to delineate a number of summary parameters that correlate with clinically used standards of physiological fitness as measured during the cardiopulmonary exercise test
- By using a combination of parameters including Mean Activity Score, Maximum Activity Score, variance of Activity Score, and percentages of time spent lying, stationary or active we can build a better understanding of a patient's baseline fitness.
- McLaren Applied Technologies have trained algorithms to be able to identify these periods of activity and inactivity as well as their relative intensities to be able to process large amounts of accelerometer data quickly and accurately.

Results

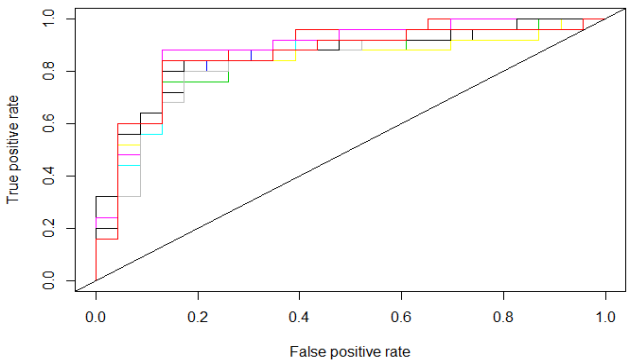
Activity monitoring parameters can discriminate for those at higher risk for surgery based on CPET results



Binary logistic regression analyses

Identification of three activity parameters as covariates to predict for the dependent variable of VO_2 peak <15ml/kg/min showed an overall accuracy of 83% (95% CI: 80% to 86%), with a sensitivity of 81% and specificity of 86% after cross-validation.

Identification of three different activity parameters as covariates to predict for AT<11ml/kg/min had an overall accuracy of 80% (95% CI: 76% to 83%), with a sensitivity of 77% and specificity of 83% after cross-validation.



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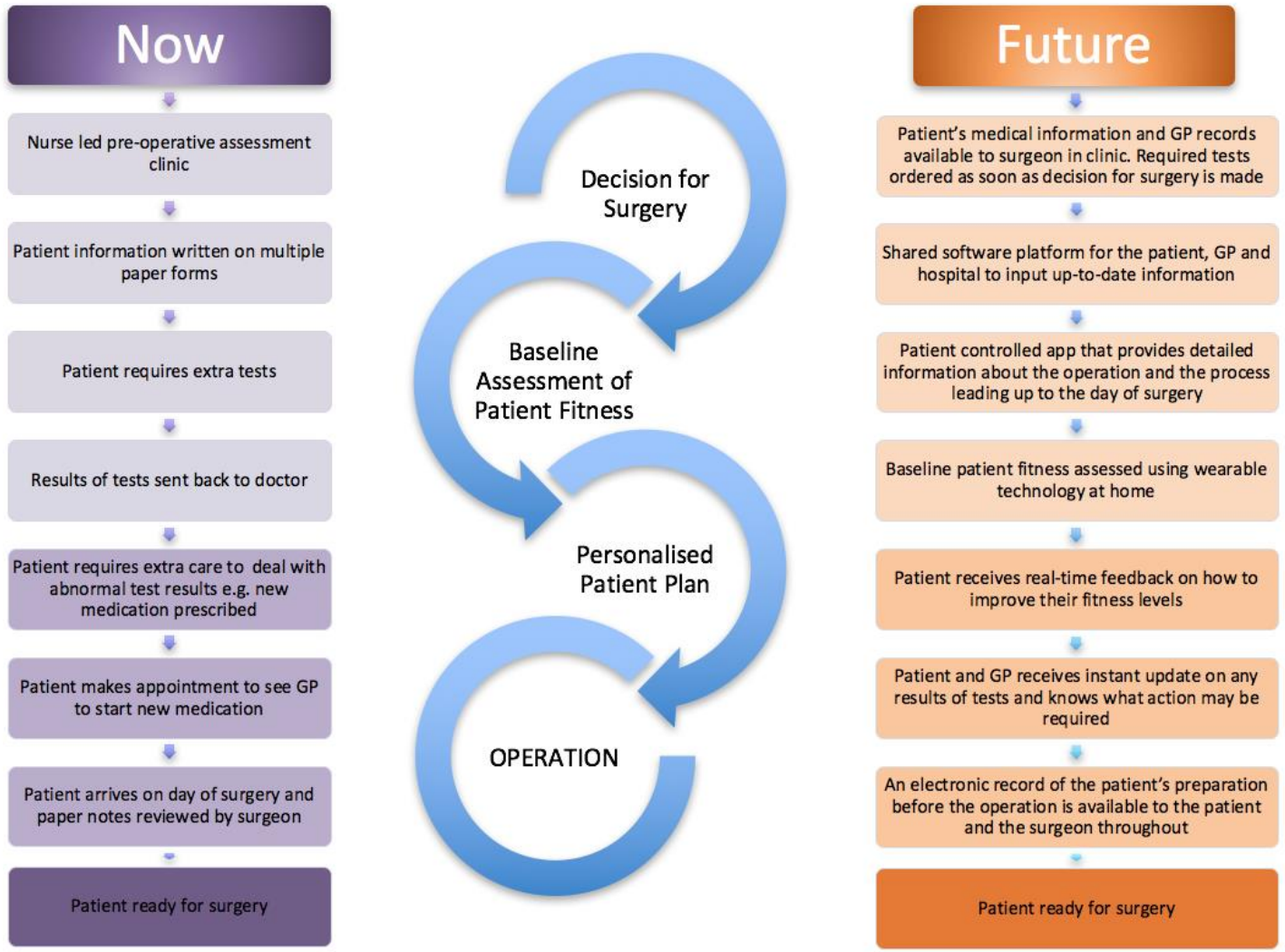
Future Directions

Your Surgical Pathway: The Future



Patient feedback

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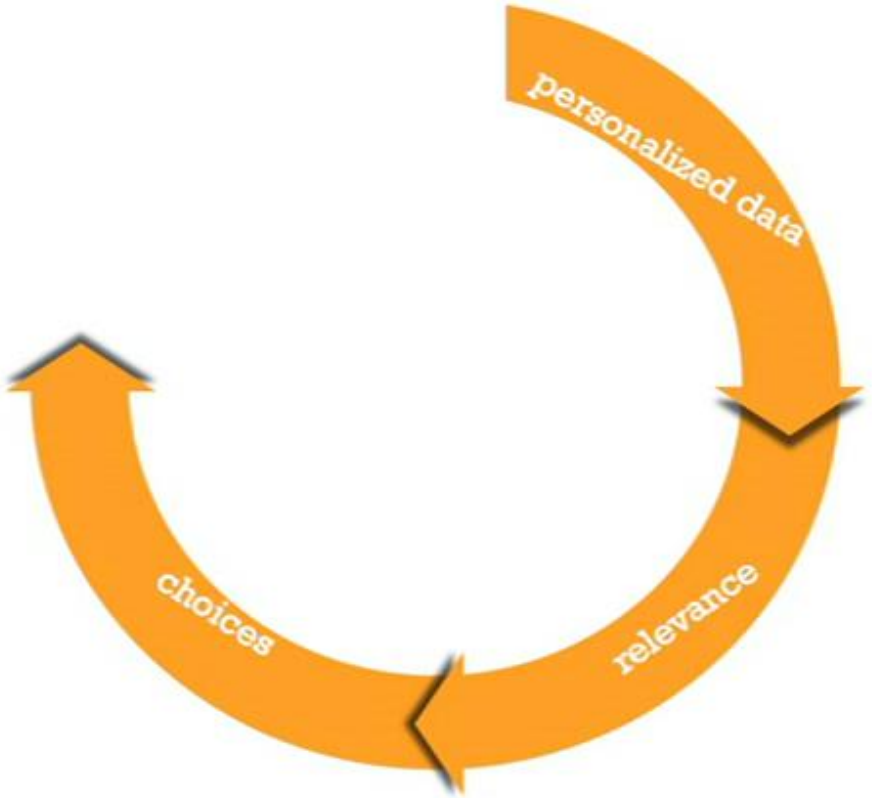

Patient feedback

Patient interface

- Making a hardware and software package that is acceptable and easy to use by patients without relying on need for a laptop or internet connection.
- Easy to wear for long periods of time, and data is remotely accessible to the clinical and easy to interpret by the patient.

Medical Devices

Fitbit faces cost and regulatory obstacles as it races into med tech: Analyst

by *Emily Wasserman* | Apr 18, 2016 9:59am

Courtesy of Fitbit

Fitbit ($FIT) wants to move toward med tech and away from consumer-facing products, following in the footsteps of some of its big-name peers, such as Apple ($AAPL). But the fitness wearables company could face some cost and regulatory hurdles along the way, according to some analysts.

Shifting gears toward healthcare makes sense in the long-term, analysts said. But it will take a lot of time and money to get there, Leerink analyst Steven Wardell told *Bloomberg*, especially as the company encounters a tougher regulatory environment for its products.

"The health-care market is still early-stage and is going to be more expensive to develop than the consumer market," Wardell said. "If they choose to make clinical claims and seek FDA approval, then they'll probably find that it will cost more and take longer."

Fitbit is already coming under fire for one of its new medical-facing technologies. Consumers in several states filed a class-action lawsuit claiming that the company's heart-monitoring tech is "wildly inaccurate" and could harm individuals because it under-counts heart rates by as much as 75 beats per minute, *Bloomberg* reports. And slogans on the product like "every beat counts" make consumers believe that they could rely on the device for accurate readings, the plaintiffs said in their suit.

Thank you

- Oxford University Hospitals NHS Foundation Trust:
  - Ben Turney
  - John Griffiths
  - Freddie Hamdy
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