Chelsea and Westminster Hospital NHS Foundation Trust

‘Your Health’ Seminar

TOPIC:

How Robotics might help improve knee surgery

Date: 16 October 2018

Robotic knee surgery has arrived by

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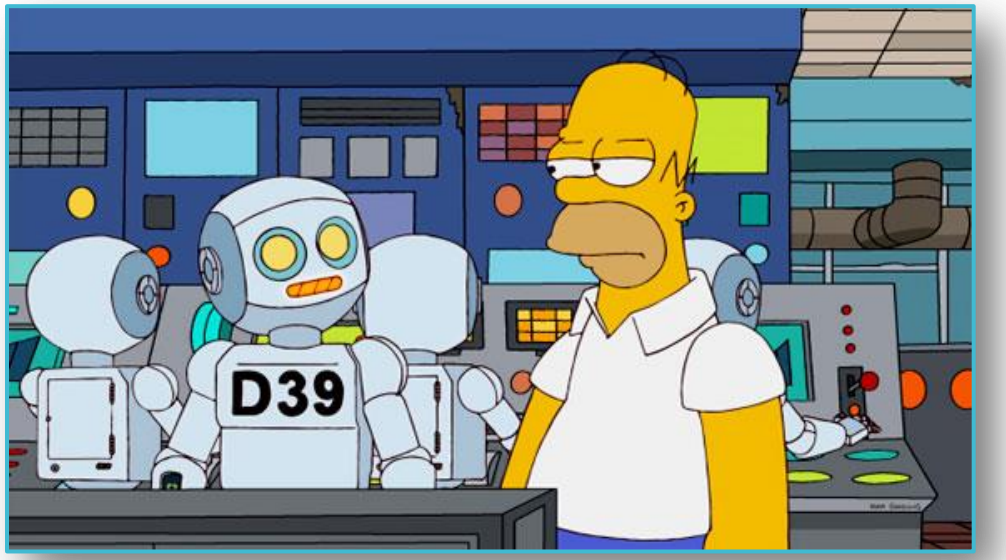
Chelsea and Westminster Hospital NHS Foundation Trust

Tuesday 16th October 2018

Who am I?

- Grew up, live & practice in West London
- Trained in London / Sydney / Barcelona
- Brentford FC
- Computer- / robotic-assisted surgery
- Frugal innovation (Africa / Iraq / Sri Lanka)
- Surgery for most knee & hip problems
- Keen to teach, & keen to keep learning!

Robots… the future?



- Robotics has revolutionized how we work
  - initially simple repetitive tasks, e.g. car assembly lines
  - now can **absorb** data, **respond** to new information & **improve**
- **1.3 million** robots used in industry in 2018

Robots in Industry

- Manufacturing
- Agriculture
- Military
- Food Prep
- Mining
- **Healthcare**

Robotics in Healthcare

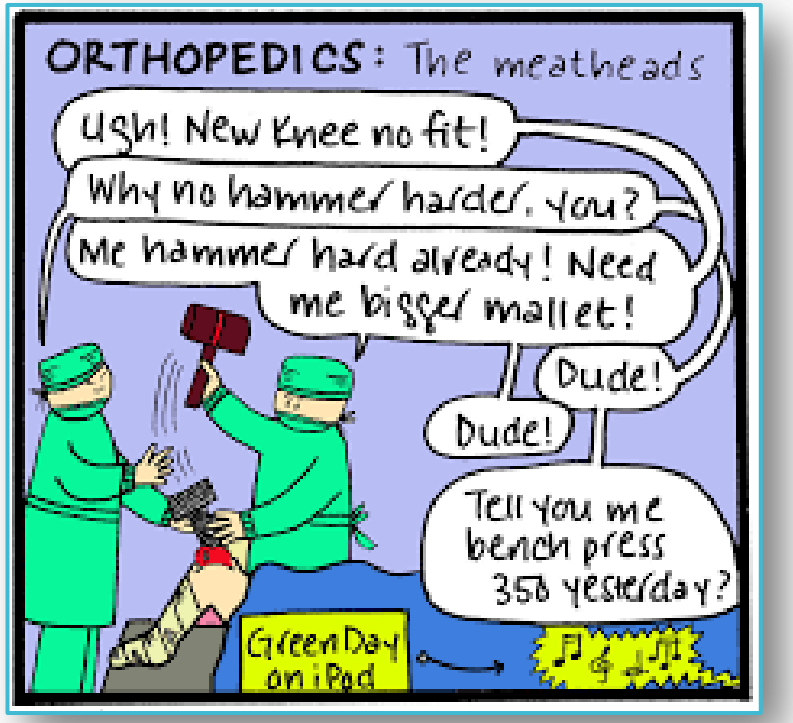
- Robotics currently designed to work *<u>with</u>* health care professionals
- Current applications:
  - help with heavy lifting
  - dementia therapy (Paro)

Robotics in Surgery

- **Da Vinci** Surgical System: heart, lung, prostate & gynae operations; removing tumours
- In use for **20 years**, performing minimally-invasive surgery
- In use in **70 UK hospitals**
- Patents expired → lots of competitors
- **Versius**
  - Lightweight, portable, 3D glasses, haptic feedback

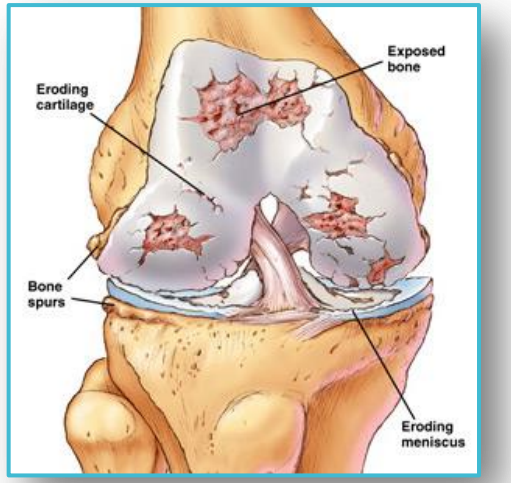
Orthopaedic surgery

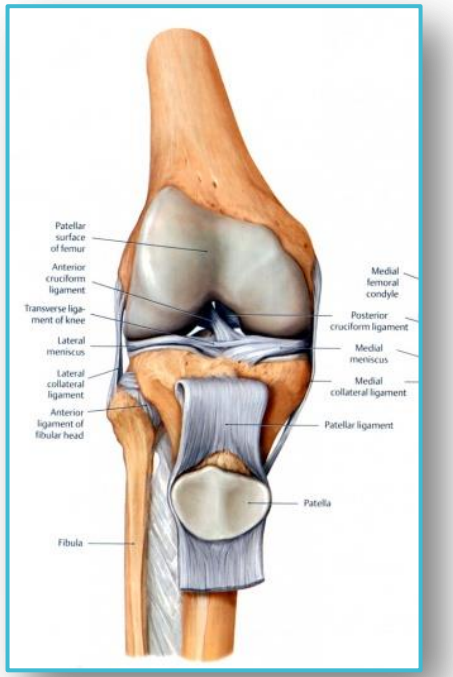
- Fixing **broken bones**
- Replace worn out, painful joints (**osteoarthritis**)
- Repair or reconstruct **injured ligaments** from sports / skiing
- **Clean out infections** in joints
- Medical carpenters!

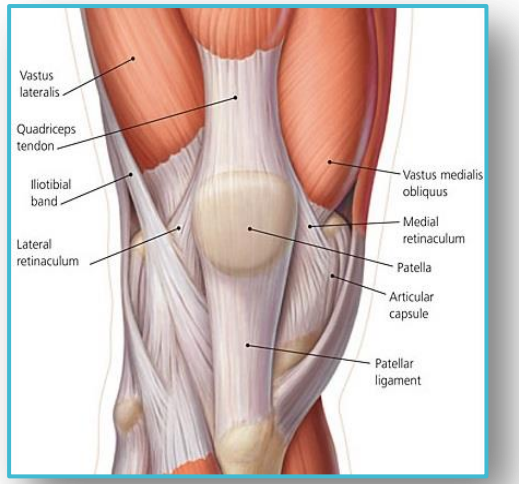


Total knee replacement

- ~**90,700** total knee replacements are performed annually in the UK
- The most performed operation in orthopaedics

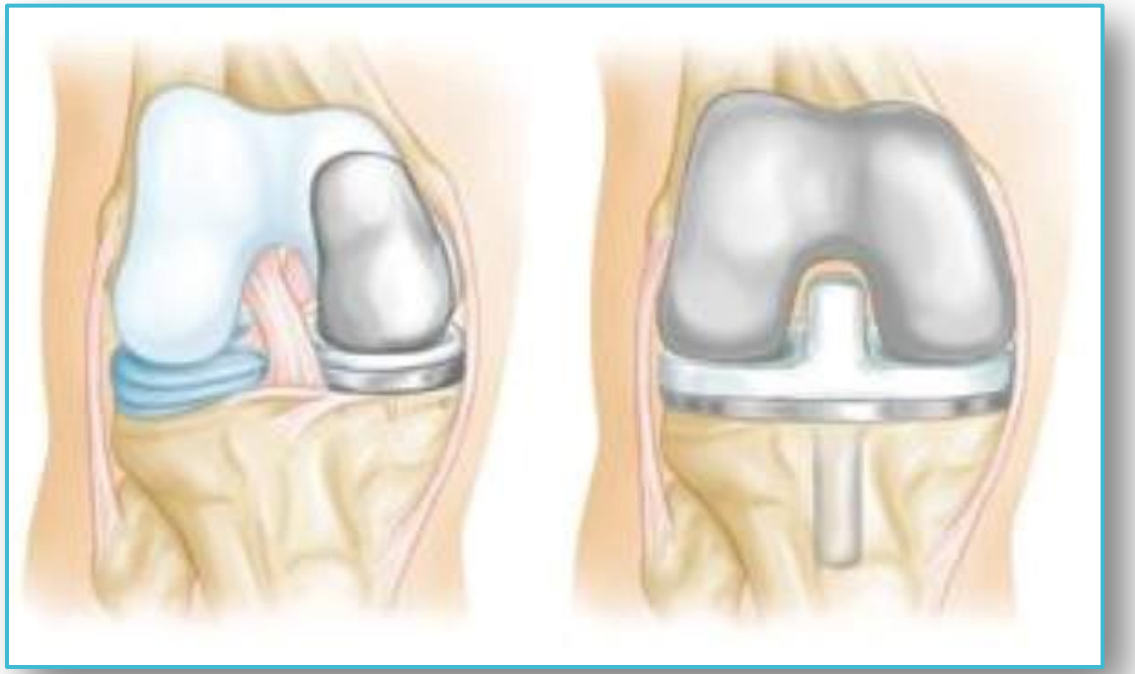






A good operation, not an excellent one

- Systematic review of 208 studies (95,560 patients) shows that **20% are not happy with the procedure**
- Total knee replacement: 5.6% chance of failing in 13 years
- Partial knee replacement: 16% chance of failing in 13 years



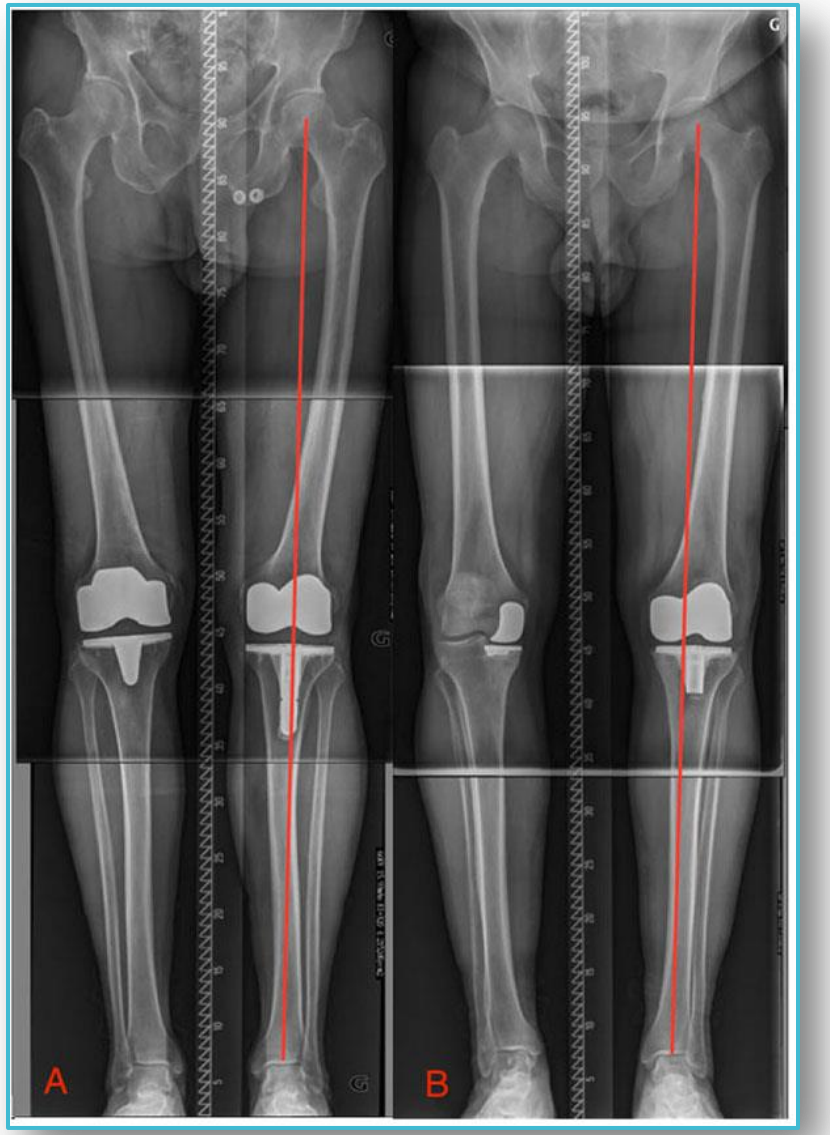
Why are some patients unhappy?

- Implants are **not customized** to the patient's individual anatomy or bone shape
- All patients currently have the same **ligaments removed**, that are not really replaced

- The surgery does not take into account each patient's individual **walking pattern (gait), natural stance**, or **joint elasticity**
- The traditional method of surgery uses tools and guides (jigs) to cut the bone - this may lead to **variation** in where the worn bone is cut and where the artificial parts are placed
- We still don't know **where** to place a knee replacement

What is our target for a knee replacement?

Should we make everyone the same or keep you as nature intended?



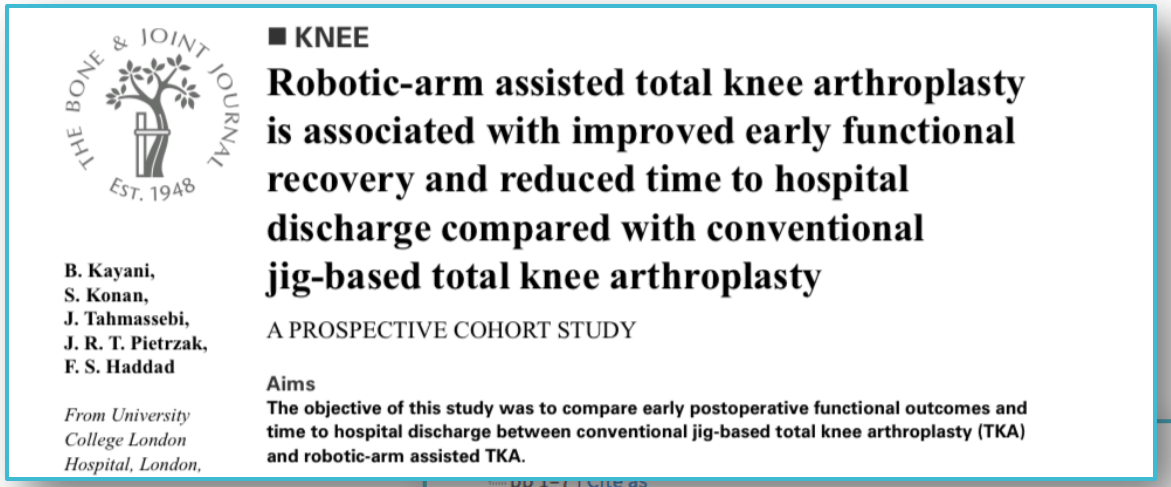
… we still don’t know

Robotics can potentially help

- We can **choose our target**, e.g. where to place the knee replacement
- Make a **plan in real time** - during surgery - **based on the patient's anatomy, natural flexibility and stance**
- See what **results** that might have
- **Change the plan** until we are happy
- Execute the plan with **precision** and **reproducibility** to within 0.1mm / 0.1 degree
- **Conserve bone** and avoid drilling large holes in the bone marrow

Sounds good but does it work?

- Very little scientific evidence to prove this technology is cost-effective or clinically effective… yet



THE BONE & JOINT JOURNAL EST. 1948

■ KNEE

Robotic-arm assisted total knee arthroplasty is associated with improved early functional recovery and reduced time to hospital discharge compared with conventional jig-based total knee arthroplasty

A PROSPECTIVE COHORT STUDY

B. Kayani,
S. Konan,
J. Tahmassebi,
J. R. T. Pietrzak,
F. S. Haddad

From University College London Hospital, London,

Aims

The objective of this study was to compare early postoperative functional outcomes and time to hospital discharge between conventional jig-based total knee arthroplasty (TKA) and robotic-arm assisted TKA.

pp 1–7 | Cite as

Faster return to sport after robotic-assisted lateral unicompartmental knee arthroplasty: a comparative study

Authors | Authors and affiliations

R. Canetti, C. Batailler, C. Bankhead, P. Neyret, E. Servien, S. Lustig

Knee Arthroplasty
First Online: 21 September 2018

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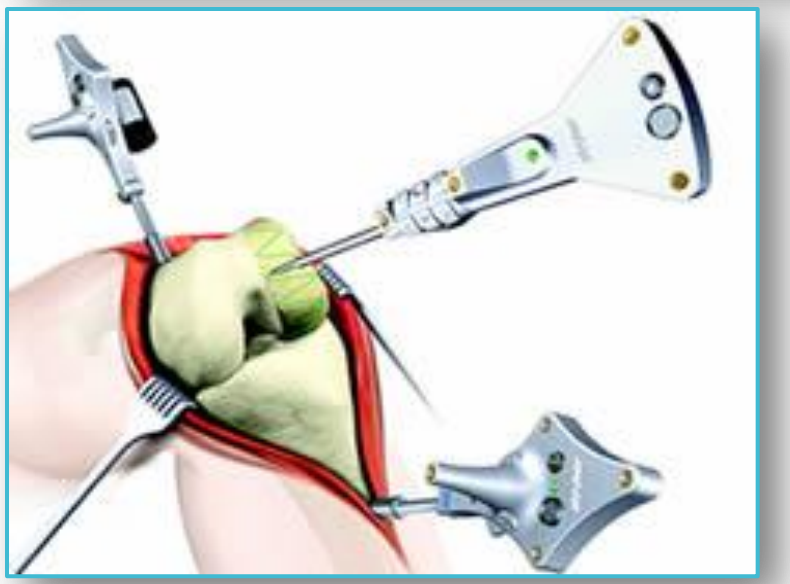
Downloads

The West Middlesex Experience



- I have performed computer-guided knee replacement surgery since I was appointed in August 2015
- Optical tracker, computer, infrared light

The West Middlesex Experience

Robotic-assisted knee surgery

- An evolution
- Surgeon controls a mini, robotic smart tool
- Began in 2018
- **3rd NHS hospital in the UK** to use the technology

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Hannah Crouch

2 March 2018

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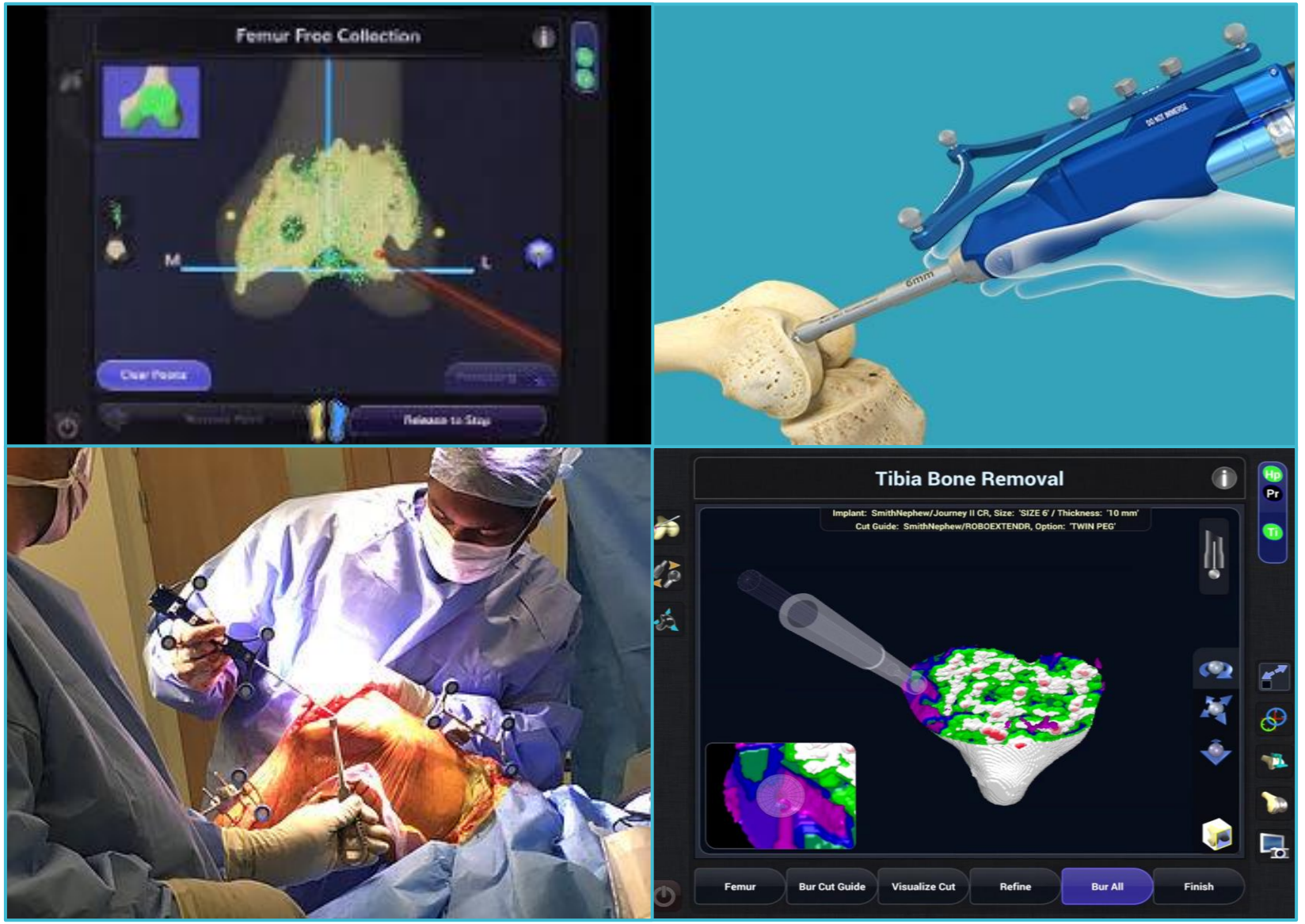

Precise, bone-conserving, bespoke to your anatomy

Europe’s first day surgery, robotic-assisted total knee replacement at The West Middlesex Hospital

Problems with uptake of robotics in healthcare

- **Cost**
- **Who** should pay for it?
- **Who** should be able to access it?
- What is the **evidence** it makes any long-term difference?

Questions?