The Rise of Robotic Renal Transplantation

- Challenges
- Potential solutions

Mr Dan Wilby FRCS(Urol)
Consultant Urological Surgeon

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Declaration of interests

- Proctor for intuitive surgical Ltd

Key Surgical Advantages

- Direction of travel
  - >200 systems in UK
  - C3500 procedures in 2014, c36000 in 2024
- Akin to adoption of lap surgery in 90's (a dying art)
- • Enhanced precision
- • Superior visualisation
- • Tremor filtration
- • Better access in difficult anatomy

Challenge 1: Learning Curve

- Combines transplant, vascular and robotic surgery
- Requires mastery of intracorporeal vascular anastomosis
- Longer early operative times
- Increased warm ischaemia risk

Solutions?: Learning Curve

- Structured simulation training
- Cadaveric and dry lab practice
- Mentorship from experienced centres
- Fellowship exposure
- Careful early case selection

Challenge 2: Cost

- Expensive robotic systems
- Maintenance contracts
- Disposable instruments
- Specialist theatre staff

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Solutions?: Cost

- Long-term value from fewer complications
- Shared robotic platforms multi-speciality
- High-volume centre efficiency
- Need stronger health-economic studies

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Challenge 3: Ischaemia Time

- • Longer vascular anastomosis may increase warm ischemia
- • Risk of delayed graft function
- • Acute tubular injury
- • Poorer graft survival

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Solutions?: Ischaemia Time

- Regional hypothermia
- Standardised approach
- Machine perfusion technologies
- Robotic Experience

Challenge 4: Limited Patient Eligibility

Contraindications may include:

Severe cardiovascular disease

Extensive vascular calcification

Prior major abdominal surgery

Hostile abdomen

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Solutions?: Patient Selection

- Multidisciplinary assessment
- Shared decision-making
- Clear institutional selection protocols

- Right operation for the right patient
- Robotic approach is not for everyone – patient and surgeon alike

Challenge 5: Deceased Donor Transplantation

- Unpredictable timing
- Emergency theatre access
- Overnight staffing
- Robot availability
- Increased logistical complexity

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Solutions?: Deceased Donor RAKT

- 24/7 institutional readiness
- Standardised transplant pathways
- Centre specialisation

Ethical and Equity Concerns

- Risk of technology-driven inequality
- Resource diversion from basic transplant access
- Avoiding two-tier transplantation

Where to start?

- Donor nephrectomy
- Established robotic centres
- Developing RAKT within an experienced robotic centre improves safety, efficiency, and sustainability….why?....

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….Existing Surgical Expertise

- Robotic console skills
- Nephrectomy
- Pelvic dissection
- Intracorporeal suturing
- Managing robotic complications

- <u>Shortens learning curve</u>

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….Established Theatre Infrastructure

- • Trained robotic scrub teams
- • Experienced bedside assistants
- • Familiar anaesthetic teams
- • Optimised theatre setup

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…Better Management of Challenges

- Experienced centres manage:
- Unexpected bleeding
- Difficult vascular anatomy
- Urgent conversion to open surgery

- Improves operative confidence

…the non-clinical

- • Executive support
- • Funding pathways
- • Easier robotic access
- • Better research infrastructure

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Future of Robotic Renal Transplantation

- Improved robotic platforms
- AI-assisted planning
- Image-guided vascular mapping
- Remote surgery - mentoring

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Final Key Messages

- The greatest danger is not the robot itself.
- It is poor selection, inadequate training, and delayed decision-making
- Technology is only as good as the team behind it

Thank you

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