

A perfect match: The story of robotics in gynaecology

Dear Editor,

The first use of surgical robotics started in the domain of orthopaedic and urological surgery. However, it was the initial concept of using a robot in performing remote damage control surgeries on the battlefield that sparked the commercialisation of robotic surgical technology for use in operating rooms.¹ The use of robotic surgery in gynaecology has been rapidly adopted worldwide over recent years, resulting in a shift from open procedures to minimally invasive surgery (MIS).

The benefits of robotic surgery include three-dimensional stereoscopic vision, tremor-free handling, and increased agility with wristed instruments. The technology allows for greater surgical precision and a more intuitive way to operate, which translates into shorter hospitalisations compared to conventional laparoscopy.² Furthermore, an important factor for the successful adoption of robotic surgery is its ability to shorten learning curves in MIS. Research has suggested that about 50 robotic procedures are required before a surgeon achieves proficiency.³ Significantly, proficiency must not be mistaken for mastery, which is a buildable, continuous process rather than an endpoint. Singapore's experience with robotic surgery in gynaecology has demonstrated this paradigm—that surgeons proficient in complex open surgery can efficiently transition from open surgery to MIS without compromising patient outcomes in the process.⁴

Robotic surgery has been especially beneficial for patients with gynaecological malignancies. In endometrial cancer, randomised control trials have demonstrated that laparoscopic surgery is non-inferior to open surgery when considering recurrence of the disease.⁵ In a systematic review, robotic surgery for endometrial cancer was associated with lower complication rates, with reduced blood loss and conversion rates compared to conventional laparoscopy.⁶ Robotic surgery as a potentially safe and effective modality for surgical management of obese patients with endometrial cancer has also been explored.⁷ In ovarian cancer, MIS techniques have gained momentum over recent years. This is especially so in the setting of interval debulking surgery after neoadjuvant chemotherapy for advanced ovarian cancer. Optimal cytoreductive surgery may be achieved in a highly selected group of patients with low tumour burden following neoadjuvant chemotherapy.⁸ Early-stage cervical cancer is treated primarily with radical hysterectomy with nodal assessment. The

Laparoscopic Approach to Cervical Cancer (LACC) trial published in 2018 reported that MIS was associated with poorer disease-free survival and overall survival compared to open surgery.⁹ However, since 90% of MIS procedures in the LACC trial were performed via conventional laparoscopy, one question is whether these results could be extrapolated to robotic surgery. Further trials that are ongoing may provide guidance in deciding the mode of surgery for early cervical cancer.

There is growing use of robotic surgery for benign gynaecological conditions such as hysterectomy, myomectomy, sacrocolpopexy, endometriosis surgery and tubal surgery. In a multicentre analysis comparing different routes of hysterectomy, robotic hysterectomy performed by high-volume surgeons saw lower perioperative complication and readmission rates.¹⁰ Robotic assistance in benign gynaecology can facilitate more complex surgeries safely with comparable outcomes to laparoscopy. There needs to be more well-powered, randomised trials to compare both techniques.

Our journey in surgical robotics began in 2008, when the National University Hospital (NUH), Singapore was, to our knowledge, the first in Southeast Asia to perform robotic procedures for gynaecological cancer. The introduction of the Gynaecologic Robot-Assisted Cancer and Endoscopic Surgery (GRACES) programme at NUH filled the service gap of MIS for gynaecological cancer then. Leveraging the advantages of the da Vinci Surgical platform (Intuitive Surgical, Sunnyvale, CA, US) and the shorter learning curve, the transition rapidly proceeded from open surgery to MIS, with robotic surgery becoming the standard of care for our patients with early endometrial cancer.

The introduction of robotic surgery in NUH was not without its challenges. In Singapore's mixed-financing healthcare system where patient's out-of-pocket cost contribute to a sizeable proportion of their healthcare expenses, large bill sizes were the initial barrier to more patients accessing the benefits of robotic surgery. As the robotic surgical load grew, operating theatre utilisation became more efficient and patient outcomes improved. This resulted in savings, which lowered the overall cost of robotic surgery and improved patient access. In 2017, the hospital bill for robotic hysterectomy was lower than open hysterectomy for endometrial cancer.¹¹ Since 2016, patients who undergo robotic hysterectomy have been discharged on the same day. This has reduced the length of stay and cost of care

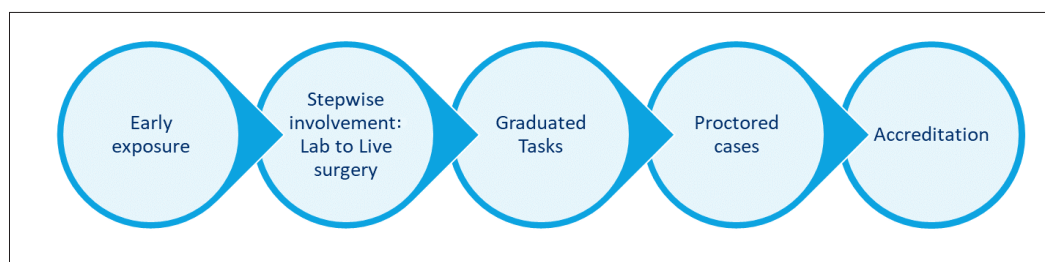


Fig. 1. Stepwise progression of trainees in robotic surgery during residency.

without compromising patient safety. Our experience demonstrates that surgical load and not per-case-amortisation is the foundation of a clinically relevant robotic surgical programme accessible to patients. The success of robotic surgery in gynaecological cancer has led to the increased adoption of robotic surgery in benign gynaecological surgery.

Training is one of the first tasks in introducing use of any new technology. Proficient open and conventional laparoscopy surgeons underwent “conversion” training modules using simulation, and proctoring by existing surgeons proficient in robotics both in Singapore and overseas. Training and assessment of competency should be incorporated into the residency programme to ensure safe and sustained growth in robotic surgery. In NUH, residents undergo a structured robotic surgical training and accreditation programme starting from their inception into residency (Fig. 1). Trainees begin with simulation-based training to gain competency under realistic conditions without compromising patient safety. Before moving on to live surgery, they need to undergo training in patient-side surgery, proper patient positioning, docking the robot correctly, and assisting in the robotic procedure. Only after attaining competence in both robotic surgical and non-technical skills can they progress to console time under supervision and with accreditation for independent practice. At the end of their residency training, the trainees are required to complete 5 proctored hysterectomies with good patient outcomes.

With the promotion of MIS techniques, the overall proportion of gynaecological procedures performed by laparotomy may reduce. There is growing evidence on the safety of robotic procedures to perform more complex gynaecologic procedures in patients with equivalent or reduced perioperative complications compared to laparoscopy. As robotic technology continues to rapidly advance, such as through the development of single-port robotic systems and artificial intelligence systems, the potential for surgical innovation is limitless. By training the next generation of gynaecologic surgeons in robotic surgery, more patients in the future can benefit from improved clinical outcomes.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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