Metro North Hospital and Health Service *Putting people first*

Robotic Surgery Plan 2018–2021

Queensland Government

Introduction

Metro North Hospital and Health Service (Metro North) is the largest health service in Australia and has one of the most populous catchments in Queensland with a population over 980,000 people. Metro North provides surgical services for people living in other Queensland Hospital and Health Services as well as northern New South Wales, other Australian jurisdictions and other countries.

There were 46,254 surgical separations in 2016-17 from Metro North facilities. The annual rate of growth from 2014-15 to 2016-17 was 6.6 per cent. As the population continues to grow and age the need for surgery will continue to increase. In addition, as technology advances the ability to undertake more complex surgery will also be enhanced. Metro North recognises the benefits of robotic surgery to the health system and patients. The robotic technology has evolved and its applicability has continued to broaden to include more surgical specialties.

The Metro North Robotic Surgery Plan (the Plan) has a three year horizon 2018 to 2021. The scope of the Plan includes current robotic surgical procedures undertaken in Metro North and potential future robotic surgical procedures in the specialties of, but not limited to, urology, gynaecology, general surgery, colorectal, hepatobiliary, ear, nose and throat, head and neck, thoracic, orthopaedics, neurosurgery and ophthalmology. The Plan aligns with Metro North strategic directions.

Metro North has developed this Plan to ensure access for suitable patients requiring surgical procedure is provided based on best available technology and evidence and delivered in a planned, safe and cost effective manner.

Context

Surgeons have been working with technology companies since the 1980s to develop equipment which enables them to undertake surgical operations with improved outcomes. Techniques to minimise the extent to which patients are exposed to 'open surgery ' for soft tissue procedures, for example, laparoscopic or 'key hole' surgery has been a significant advancement in surgical techniques in recent years as has navigation techniques for orthopaedic procedures. Robotic surgery represents the next step in the development of surgical techniques.

"Robotic surgery" is an imprecise term, but it has been widely used and is now generally accepted. The term refers to surgical technology that places a computer-assisted electromechanical device in the path between the surgeon and the patient. For the purposes of this Plan, robotic surgery is defined as a surgical procedure or technology that adds a computer technology enhanced device to the interaction between a surgeon and a patient during a surgical operation.

There are a number of robotic devices available with different systems focusing on different areas of the body or different procedures. Robotic surgery involving the da Vinci Surgical System focuses on pelvic, abdominal, chest and head and neck procedures. The system uses a computer to guide instruments that are attached to robotic arms. The surgeon sits at a console, typically in the operating room but outside the sterile field, and directs the movement of the robotic arms. A three-dimensional (3D) camera helps guide the surgery and provides visibility for the surgeon. Using hand and foot controls, the surgeon manipulates the camera and instruments inside the patient's body, allowing precise and delicate surgery to be performed through small incisions. The robot serves as a direct extension of the surgeon's own hands. The machine is not capable of independent movement.

Other technology provides the orthopaedic surgeon with a patient specific 3D model of the hip and knee joints. Orthopaedic procedures performed by robotic arm assisted technology joint balancing and bone preparation. Utilisation of this technology to pre plan the procedure enables accurate planning of implant size, orientation and alignment preoperatively.

Victoria pioneered the use of robotic surgery in Australia in 2003. Since then robotic surgery systems have been installed in hospitals across Australia. Initially private hospitals acquired the equipment and it is there that many surgeons honed their skills. As techniques became more refined and the range of procedures that could be undertaken robotically expanded, the benefits of installing robotic equipment in public hospitals were realised.

Robotic surgery quickly spread to Queensland with public and private hospitals adopting the technology. The Royal Brisbane and Women's Hospital (RBWH) purchased a da Vinci robotic device in 2007 and upgraded to the newest model in 2017. Surgeons at the RBWH have performed more than 1000 robotic procedures which were primarily urology procedures, but also combining with colorectal surgery to perform world-first complex pelvic surgery in male patients. Transoral robotic surgery commenced in late 2017. More than 10 specialist surgeons are performing robotic surgery at RBWH.

"ROBOTIC SURGERY" IS AN IMPRECISE TERM, BUT IT HAS BEEN WIDELY USED AND IS NOW GENERALLY ACCEPTED. THE TERM REFERS TO SURGICAL TECHNOLOGY THAT PLACES A COMPUTER-ASSISTED ELECTROMECHANICAL DEVICE IN THE PATH BETWEEN THE SURGEON AND THE PATIENT.

Outcomes

This Plan aims to guide the development of a comprehensive robotic surgery program in Metro North that demonstrates our commitment to delivering the most advanced treatments using the newest minimally invasive technologies.

This Plan sets out the key steps to achieve the following outcomes:

- expanded application of robotics in surgical specialties based on current and emerging evidence
- improved collaboration with other robotic surgery services, training and research centres
- contribute to robotic surgery evidence base through improved data collection and research
- better surgical outcomes for patients
- better patient experience
- increased workforce knowledge and skills in robotic surgery
- improved job satisfaction.

Evidence

A review of literature has identified a range of benefits associated with robotic surgery, however there are also some limitations identified. The reported advantages, benefits, limitations and cost considerations are described below.

Literature suggests the primary clinical advantages of currently available robotic systems, compared to other techniques include:

- magnification and 3D imaging of the operative field
- stabilisation of instruments within the surgical field
- mechanical advantages over traditional laparoscopy e.g. rotational movement of instruments and access to difficult anatomic regions more easily
- preservation of healthy tissue, bone and/or cartilage
- accuracy of positioning the joint implants
- improved ergonomics for the operating surgeon.

System and patient benefits reported include:

- shorter hospital stay
- less pain and discomfort
- less bleeding and a low chance of a blood transfusion
- quicker return to normal activities
- reduced surgical complications
- lower risk of infection
- less scarring and improved cosmetics
- reduced trauma to the body
- avoidance of other morbid treatments such as radiation therapy and/or chemotherapy, particularly in the head and neck speciality improving quality of life and reducing health care costs
- reduced need to convert to major incision (“open” surgery) over laparoscopic.

Robotic surgery also provides closer observation of the procedure and surgical techniques enhancing surgical teaching and training.

The potential advantages of robotic surgery extend across many surgical specialties.

Urology: robotic surgery has shown substantial advantages over conventional minimally invasive surgery in several urological procedures including radical prostatectomy, cystectomy, pyeloplasty, nephrectomy (partial, complete and donor) and ureteral reimplantation.

Gynaecology: robotic surgery has shown benefits in hysterectomy for both malignant and benign disease, as well as myomectomy. It is also beneficial for tubal reconstruction and may provide potential advantages for sacrocolpopexy and pelvic reconstructive surgery.

General Surgery: with present technology, robotic surgery is best suited to procedures that present challenging access: specifically those requiring fine dissection, microsuturing or reconstruction. Procedures where there are potential advantages include gastric resection for cancer, biliary reconstructive surgery, oesophageal surgery, ventral hernia surgery, distal pancreatectomy with splenic preservation, pancreatic head resection, hepatectomy, right hemicolectomy, rectopexy and lower anterior resection. In resections for cancer, robotic surgery may help to enhance the completeness of lymph node dissection and there are significantly lower conversions to “open” surgery for mainly overweight/obese male patients with cancer of the rectum and continuity of the bowel is able to be re-established thereby avoiding a permanent bag or colostomy. Reports have been published with use for cholecystectomy, but with no findings of improved outcomes nor safety. Reports for solid organ surgery, such as adrenalectomy, have not found particular advantage, noted increased cost, but did prove feasible.

Otorhinolaryngology/head and neck: robotic surgery for transoral resections of malignant and benign lesions of the pharynx and larynx is supported by preliminary data. Oncologic resections of the supraglottis, tonsil and tongue base have been shown to be feasible with advantages compared to traditional approaches. Limitations of the present technology preclude transnasal and otologic procedures because of instrument size and functionality. Further use of robotic surgery in the head and neck and skull base will await the clinical availability of smaller instruments and more flexible robotic tools recently developed.

Thoracic: robotic surgery offers clear benefits in the resection of solid thoracic tumors, particularly those located in the apex of the chest.

Orthopaedic: hip and knee joint replacement surgery using robotic assisted techniques have proven increases in the accuracy of component placement when compared to conventional manual techniques. This has led to increases in partial knee replacement procedures, revision rates lower than previously reported in historic registry data as well as higher patient satisfaction scores. Many of the technical challenges and increased adverse events associated with non-robotic partial and total knee and hip replacement have been shown to be reduced with the use of robotic arm assistance.

ROBOTIC SURGERY PROVIDES CLOSER OBSERVATION OF THE PROCEDURE AND SURGICAL TECHNIQUES ENHANCING SURGICAL TEACHING AND TRAINING.

ROBOTIC SURGERY IS LIKELY TO BE COST BENEFICIAL IN TERMS OF REDUCED HOSPITAL STAY, REDUCED PAIN AND IMPROVED QUALITY OF LIFE, PROVIDED CERTAIN CONDITIONS ARE MET INCLUDING CASE SELECTION AND CASE LOAD.

Limitations

Limitations of current robotic technology for soft tissue procedures include, among other technical constraints, lack of haptics (force feedback), size of devices, instrumentation limitations (both size and variety), lack of flexibility of certain energy device cost, training issues and lack of outcome data in some areas. These limitations will likely ease as robotic devices evolve.

Cost

The cost/benefit analysis of robotic surgery involves a complex combination of numerous variables. Costs of the surgical robot include capital acquisition, infrastructure modification, limited use instruments, team training expenses, equipment maintenance, equipment repair and operating room setup time.

Robotic surgery is likely to be cost beneficial in terms of reduced hospital stay, reduced pain and improved quality of life, provided certain conditions are met including case selection and case load.

Complications have shown a significant impact on the cost of care. It is reported that the use of robotics shortens the learning curve for acquiring complex surgical skills. There are studies suggesting that robotic procedures performed by experienced robotic surgeons have less complication rates than other techniques.

The cost analysis of operating room time includes multiple variables: room setup time, time for draping and docking the robot, skin to skin procedure time, undocking/ storage time and room turnover time. These factors are improved by effective team training, attention to efficient procedures, surgeon and team experience and initial patient selection. Small increases in overall operating room time become significant only when additional personnel are required, overtime is paid, or fewer cases per shift can be accomplished.

In addition, a reduction in variability of patient outcomes which comes with robotic orthopedic surgery and subsequent reduction in the need for more costly revision surgery makes use of a robotic arm economically viable. Furthermore, a reduction in readmission rates provides another cost incentive. Robotic hip and knee replacement for those patients, who need it, as opposed to traditional methods, typically requires less rehabilitation, results in fewer post-operative complications and offers patients better quality of life.

The future robotic surgery program in Metro North

Over the next three years Metro North will further its commitment to robotic surgery and establish a comprehensive robotic surgery program. Working together across Metro North and with external partners and industry, Metro North will provide high quality robotic surgical services. This Plan sets out four aspirational goals to guide the development and delivery of robotic surgical services.

1. **Metro North will be a leader in robotic surgery and inspire innovation.**

2. **Metro North will be a significant contributor to the published evidence base related to robotic surgery and increase translational research.**

3. **Metro North will become an education and training centre for robotic surgeons and be an integral part of educating the workforce of the future.**

4. **Metro North will provide a personalised patient journey using the best medical technology to deliver the best patient outcomes.**

OVER THE NEXT THREE YEARS METRO NORTH WILL INCREASE ITS COMMITMENT TO ROBOTIC SURGERY AND ESTABLISH A COMPREHENSIVE ROBOTIC SURGERY PROGRAM.

Priority areas

Metro North is well placed to respond to the needs of our population and the broader Queensland population. To implement new and emerging best practice techniques and technology, to contribute to the evidence base for robotic surgery and provide safe, high quality services the following priority areas for action have been identified.

1. Governance
2. Training
3. Credentialing
4. Service delivery
5. Research

The following sections detail the actions required to deliver on the goals of Metro North in each of the priority areas.

TO ENSURE OPTIMUM TRAINING IS UNDERTAKEN IT WILL COVER TWO BROAD ASPECTS:

1. TECHNICAL TRAINING AND CAPABILITY. THIS WILL INVOLVE A PATHWAY OF ROBUST TRAINING, CREDENTIALING, ONGOING EDUCATION AND CONTINUOUS QUALITY AUDITS.

2. USE OF THE ROBOT FOR SPECIFIC PROCEDURES.

1. Governance

A shared vision across Metro North and appropriate governance is important and necessary for a successful robotic surgery program. Governance will assist in maintaining the strategic intent, development and implementation of the robotic surgery program; detect and address risks and issues; advocate for the robotic surgery program within the broader Metro North agenda; ensure inclusion of a wide range of people; and establish transparent and effective accountability mechanisms.

Number	Action
1.1	Establish a Metro North robotic surgery steering committee
1.2	Continue the Metro North robotic surgery working group
1.3	Establish a part time Clinical Director of robotic surgery position
1.4	Establish a robotic surgery support team including a nurse coordinator, data manager and administration support
1.5	Develop and implement procedures for introducing a new device, procedure and clinician into the robotic surgery program
1.6	Establish regular reporting and review processes including robotic morbidity and mortality meetings

2. Training

To maintain the highest quality patient care we must ensure the entire robotic surgical team have appropriate skills to competently use the robot safely and efficiently.

Due to the configuration of some robotic surgery systems, a surgeon may be physically separated from the patient and the operating theatre staff which has the potential to impact on communication and decision making in the operating theatre, which can impact on patient safety. The development of a high functioning team is critical to the success of a robotic surgery program.

To ensure optimum training is undertaken it will cover two broad aspects:

1. Technical training and capability. This will involve a pathway of robust training, credentialing, ongoing education and continuous quality audits.

2. Use of the robot for specific procedures.

Number	Action
2.1	Establish training pathways for new robotic trained surgeon and assistants in all relevant specialties
2.2	Establish minimum robotic training case volumes for specialties and/or procedures
2.3	Partner with device companies to provide individual and group training to: - medical officers – surgeons, fellows, registrars - nurses - other theatre staff
2.4	Establish a mechanism for surgeons, technicians, nurses and manufacturing representative to meet on a periodic basis to maintain currency of practice, learn of updates or changes to the hardware or software and to discuss emerging problems
2.5	Partner with universities to support nursing training for robotic surgery first assist

2.6	Establish training pathways for robotic surgery fellowship program and post fellowship program
2.7	Investigate training and simulation opportunities to be delivered within Metro North i.e. Clinical Skills Development Centre, Medical Engineering Research Facility
2.8	Establish partnerships with porcine and cadaver robotic training centres to facilitate required training program

3. Credentialing

The purpose of credentialing is to minimise risks to patients through ensuring medical practitioners have the right skills, qualifications and experience to work in Metro North within a defined scope of clinical practice. Clear pathways for credentialing staff involved in robotic surgery will support the delivery of a safe and high quality program. Credentialing will be granted by the individual facility where the robotic surgery is undertaken.

Introduction of new technologies poses a risk in deskilling surgeons in conventional surgical techniques. Conventional techniques are still required if new technologies are unsuccessful or a conventional technique is the best technique to use in particular cases therefore surgeons must be credentialed in the relevant specialty.

Number	Action
3.1	Establish a credentialing pathway for new and experienced robotic trained surgeons
3.2	Establish credentialing requirements for a robotic surgery proctor
3.3	Establish a process to monitor minimum annual robotic procedure volumes for surgical specialties and/or procedures (performed in public or private hospitals) and non-robotic cases
3.4	Document nurse credentialing requirements for robotic surgery first assist

A SHARED VISION ACROSS METRO NORTH AND APPROPRIATE GOVERNANCE IS IMPORTANT AND NECESSARY FOR A SUCCESSFUL ROBOTIC SURGERY PROGRAM.

4. Service delivery

Implementation of surgical robots into practice has been variable across jurisdictions. The evolution of the technology now allows expansion into new specialties. To more fully test and realise the benefits of robotic surgery expansion of the program is required. Metro North will establish robotic surgical procedures, where there is good clinical evidence of safety and effectiveness and assess the feasibility, safety and effectiveness to achieve key patient outcomes of unproven procedures in a structured research environment.

Number	Action
4.1	Develop a theatre schedule at RBWH to support the expansion of the robotic surgery program
4.2	Urology: increase the throughput of allocated robotic sessions in operating theatre at RBWH
4.3	Colorectal: introduce robotic surgical procedures at RBWH
4.4	Gynaecology: introduce robotic surgical procedures for malignancies at RBWH
4.5	Gynaecology: introduce robotic surgical procedures for complex non-malignancies at RBWH
4.6	ENT: increase allocated session time for robotic surgical procedures at RBWH
4.7	ENT: expand scope to include skull base robotic surgical procedures at RBWH
4.8	Hepatobiliary: introduce robotic surgical procedures at RBWH
4.9	General surgery: explore the opportunity to introduce other surgical procedures
4.10	Thoracic: explore the opportunity to introduce robotic surgical procedures
4.11	Neurosurgery: explore the opportunity to introduce robotic surgical procedures
4.12	Ophthalmology: explore the opportunity to introduce robotic surgical procedures
4.13	Orthopaedic: investigate the introduction of an orthopaedic surgical robot in Metro North
4.14	Investigate evidence for other surgical speciality robotic surgery procedures
4.15	Identify when a second soft tissue surgical robot is required in Metro North based on demand
4.16	Confirm a robotic surgery model for Metro North i.e. centralised robotic surgery centre or decentralised
4.17	Investigate support to and/or provision of remote robotic surgery with other HHSs
4.18	Develop a mechanism to support and monitor the patient's robotic surgery journey from surgery to recovery, including but not limited to appropriate education, utilisation of screening tools and access to coordinated services

DUE TO THE CONFIGURATION OF SOME ROBOTIC SURGERY SYSTEMS, A SURGEON MAY BE PHYSICALLY SEPARATED FROM THE PATIENT AND THE OPERATING THEATRE STAFF WHICH HAS THE POTENTIAL TO IMPACT ON COMMUNICATION AND DECISION MAKING IN THE OPERATING THEATRE, WHICH CAN IMPACT ON PATIENT SAFETY.

5. Research

Patient safety and clinical outcomes must remain foremost in clinical practice and future research efforts. The Metro North robotic surgery program aims to extend existing knowledge of the benefits, limitations and costs of robotic surgery across all relevant surgical specialties. To adequately assess the risks and benefits of robotic surgery now and in the future and to assist in guiding future research efforts, it is essential to have a data registry for robotic surgery.

Number	Action
5.1	Establish a robotic surgery data registry with minimum generic data elements and specific surgical speciality data elements
5.2	Establish regular reporting processes for the robotic surgery program
5.3	Establish a research framework for the robotic surgery program including templates and protocols to help streamline research protocol development, ethics and governance approval processes
5.4	Optimise partnerships/collaborations across Metro North
5.5	Establish partnerships/collaborations with other public sector robotic surgery services
5.6	Establish partnerships/collaborations with academic and research organisations
5.7	Develop and undertake research on specific robotic surgery procedures, staff experience, learning curves and training processes
5.8	Undertake research on the implementation of the robotic surgery program
5.9	Initiate and participate in national and international robotic surgery clinical trials

PATIENT SAFETY AND CLINICAL OUTCOMES MUST REMAIN FOREMOST IN CLINICAL PRACTICE AND FUTURE RESEARCH EFFORTS.

Performance measures

The following key performance indicators will be measured to ensure the robotic surgery program is delivering on the agreed outcomes and actions in this Plan.

1. The number of allocated robotic sessions utilised for robotic procedures per 4 week period
2. The number of robotic procedures undertaken for each specialty per annum
3. Data collection completed for all robotic procedures
4. Service line theatre throughput number equal to or more than baseline
5. The same or fewer patient complications compared with conventional open or laparoscopic procedures
6. Equal to or reduced readmission rates within 28 days compared with conventional open or laparoscopic procedures
7. Reduced length of stay between conventional open or laparoscopic and robotic procedures
8. Measure and report on patient reported outcomes
9. The cost per robotic surgery procedure compared with conventional open or laparoscopic procedures
10. The number of experienced robotic surgical staff – medical and nursing
11. Increased staff satisfaction
12. The number of publications related to robotic surgery
13. The number of patients participating in a clinical trial.

Implementation

Implementation of this Plan is a shared responsibility involving Metro North executives, clinicians, patients and partner organisations. The Metro North robotic steering committee will oversee the Metro North robotic surgery program and implementation of the Plan. This will include:

- provision of strategic advice on the robotic surgery program and the implementation of this Plan to the Metro North Operational Leadership Team
- monitoring clinical outcomes associated with robotic surgery
- oversight of agreed performance targets and metrics in line with evidence based practice and Metro North goals
- monitoring of processes to ensure access to robotic equipment is fair and reasonable
- endorsement of standards for training and credentialing the clinical workforce in robotic surgery
- support or provide advice on submissions and opportunities for clinical research
- provision of advice on risk management and mitigation to the Metro North Operational Leadership Team
- endorsement of funding submissions in line with agreed priorities.

The role of the robotic working group is to:

- provide expert clinical advice to the robotic surgery steering committee and robotic surgery unit on robotic surgery practice and for specific surgical specialties
- assist with the development and review of protocols and procedures related to the robotic surgery program
- identify continuous quality improvement and management of risks and issues related to the robotic surgery program and escalate within service line, robotic surgery unit and robotic surgery steering committee as appropriate
- review clinical outcomes, performance targets and metrics from the robotic surgery data registry
- identify research opportunities and assist with development of proposals
- assist with development of funding submissions.

Implementation of this Plan will occur in line with available resources. Actions that can be progressed within existing resources will be progressed as a matter of priority. Actions that require resourcing will be subject to normal budgetary processes within Metro North and will be progressed in line with resource approval.

Review and evaluation

Monitoring, evaluating, reporting and reviewing the implementation of the Plan will be key to the success of the program. Quarterly activity reporting will be provided to the robotic surgery steering committee and working group, including reporting on progress towards achieving the Plan.

This Plan will be reviewed on an annual basis and revised based on implementation progress, performance against key performance indicators and any new available evidence. Evaluation of the robotic surgery program will occur through review of data collection and reported in an annual robotic surgery report to the Metro North executive.

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