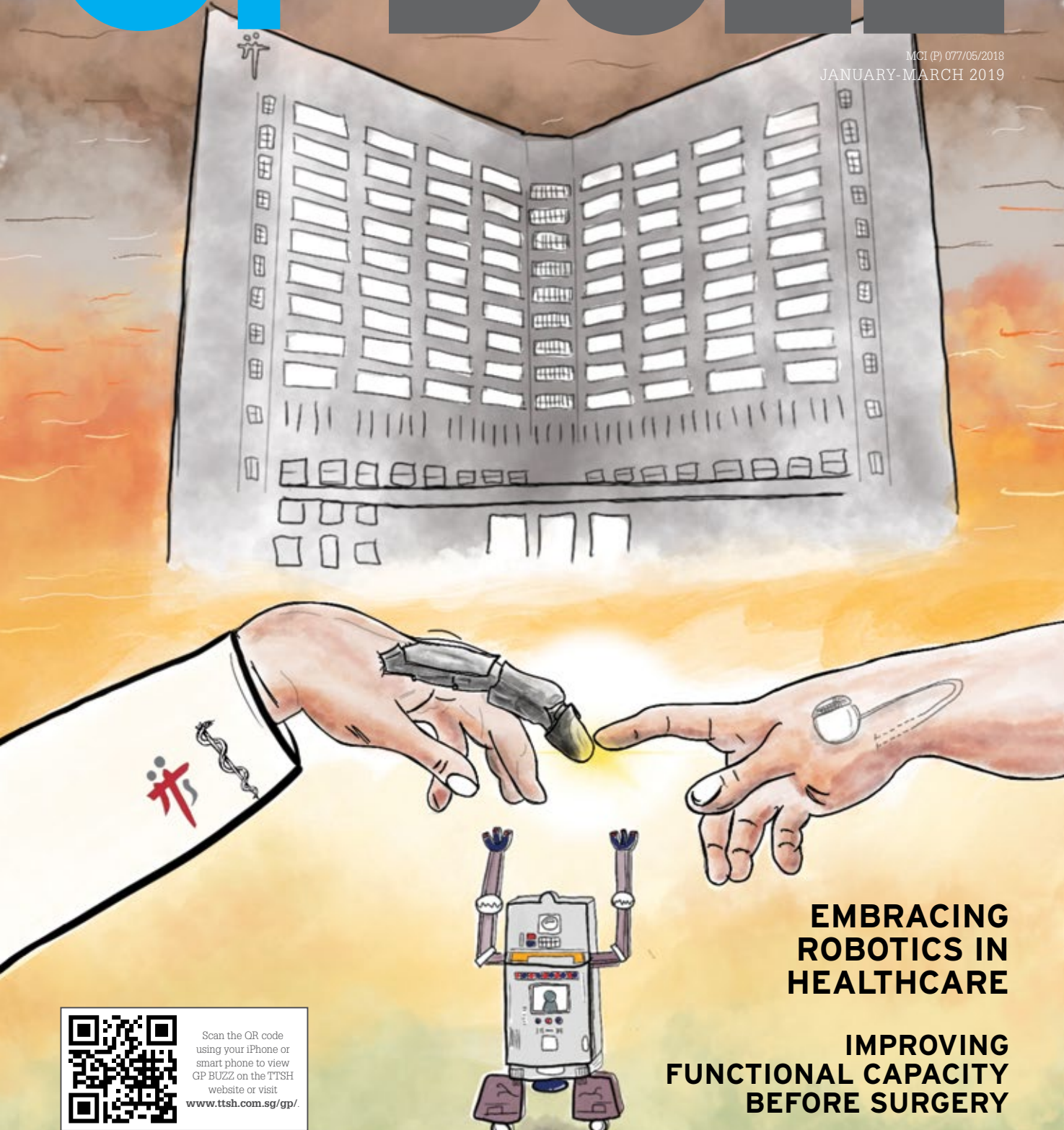


GP BUZZ

MCI (P) 077/05/2018

JANUARY-MARCH 2019



**EMBRACING
ROBOTICS IN
HEALTHCARE**

**IMPROVING
FUNCTIONAL CAPACITY
BEFORE SURGERY**



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JANUARY - MARCH 2019

Cover Illustration: TTSH's executive Tan How Sun's rendition of *The Making of Adam* shows a patient's hand enabled by a nerve simulator, reaching out to a healer with an artificial appendage. Supporting this tenuous relationship between the human condition and high science is the faithful domesticated robot. Dawn is awakened, and the future is bright. Rise of the Machines? You decide.

About the Cover Page:

TO BE MORE HUMAN: HARNESSING ROBOTICS FOR HEALING

By **Associate Professor Thomas Lew**,
 Chairman, Medical Board, Tan Tock Seng Hospital

In the 1999 film *Bicentennial Man*, the late Robin Williams plays a robot named Andrew. Andrew is employed to care for a family household. Eventually, Andrew discovers itself capable of human-like qualities of sentience. For instance, the capacity to feel, perceive or experience subjectively. Along with sensorial function, Andrew also develops a sensitivity to his environment – or as some would put it, consciousness. Eventually, the futuristic script-play that spans 200 years (hence *Bicentennial*), sees Andrew permitted to assume the human range of experiences such as emotions, love, disappointment, bodily functions, and even death. Pointedly, the script details how Andrew's right to be human is determined by the edict of a 'World Congress'.

The film received mixed reviews, unsurprisingly. Late film critic Roger Ebert awarded *Bicentennial Man* with only two out of four stars, and commented that "*Robin Williams spends the first half of the film encased in a metallic robot suit, and when he emerges, the script turns robotic instead. What a let-down.*" Ebert's pointed criticism hilariously belays the reality and potential disappointments which we experience with modern-day robots and artificial intelligence. With such experiences, it is important that human operators do not forego the humanistic benefits of subtlety, empathy and wisdom, while seeking to alleviate burdens presented by modern living and human-care. Indeed, just as the ancient Greek Philosopher Aristotle gave credence to the modalities of Ethos, Pathos, and Logos in persuasion, to be truly human would mean for one to possess all three dimensions of moral judgment, empathy and logic.

Today, understanding our patient as a person in the practice of medicine increasingly trumps the delivery of hard sciences. What is needed in the exploit of exponential technologies and their convergence, is the ability to merge science with a strong appreciation of a patient's personal wants and needs. When we acknowledge the needs of modern humans in a fast-paced, bewilderingly-technological society, balance becomes a key objective. We look for balance as we enable patients towards better health, because personhood confers autonomy, and autonomy requires intrinsic motivation to successfully overcome modern disease states. While robotic surgical tools can *cure* with a deft haptic stroke, what the human condition needs is *healing* – an extended laying of hands.

The current application of robotics in healthcare applies to the full spectrum of the healing endeavours, ranging from convoluted neural networks in diagnosis enhancements, navigation of Bayesian treatment algorithms, mundane deployment of industrial robots, and of course, modern-day *Bicentennial Man* applications of direct patient care – encompassing mobility exoskeletons, health-trackers, machine companions, life-coaches, and prompters of care. Will we be able to transcend the sentience gap between man and machine, as we move towards robotic augmentation of the healing profession? **GPBUZZ**

TAN TOCK SENG HOSPITAL COMMUNITY RIGHT SITING PROGRAMME (TTSH CRISP)

**NEW DISCHARGE AND SHARED CARE CONDITIONS FROM:
ENDOCRINOLOGY, NEUROLOGY,
RESPIRATORY MEDICINE
AND RHEUMATOLOGY**

Adjunct Associate Professor David Foo

Clinical Programme Director - CRiSP
Head and Senior Consultant
Department of Cardiology
Tan Tock Seng Hospital



Dear Partners and Friends,

Once again, we are happy to introduce new additions to CRiSP's Discharge and Shared Care conditions, supporting the Nation's vision of "One Singaporean, One Family Doctor".

Discharge

In October 2018, we have commenced the right-siting of four new discharge conditions to our GP partners. The Endocrinology department has been discharging patients with Hyperlipidemia, Hypertension and Graves' Disease. Also, the Neurology department will be discharging patients with Stable Headache.

Shared Care

Shared Care focuses on the co-management of moderately stable patients between specialists and primary care physicians. GPs will participate in clinical communication with TTSH specialists through correspondence memos and case discussions. Apart from discharges, the department of Respiratory Medicine has started Shared Care of moderately stable patients with Asthma and Chronic Obstructive Pulmonary Disease (COPD). Rheumatology department's Shared Care programme has also included a new addition, Psoriatic Arthritis, a chronic condition covered under Psoriasis in the Chronic Disease Management Programme (CDMP).

To support right-siting of these conditions, TTSH Pharmacy and NHG Diagnostics will continue to provide drug support and laboratory tests at patient's subsidised rates to our GP partners. Eligible patients with Hyperlipidemia, Hypertension, Asthma, COPD or Psoriatic Arthritis will be able to tap on their Community Health Assistance Scheme (CHAS), Pioneer Generation (PG) and Medisave subsidies under CDMP when they seek treatment at our GP partner clinics.

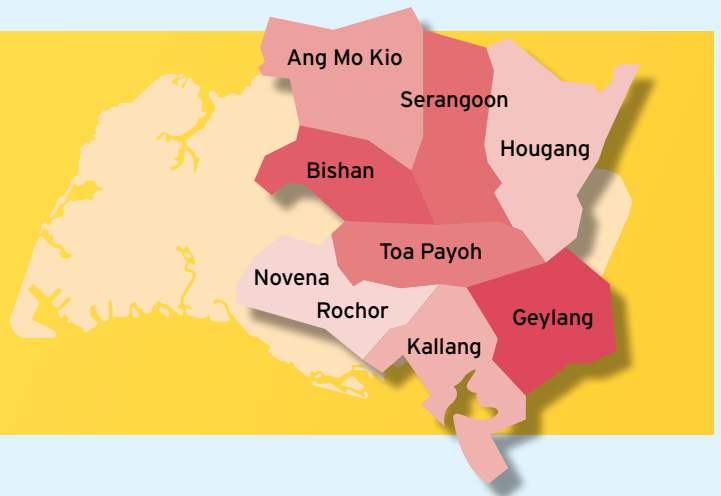
We are heartened by your continual support to care for the health of our population and look forward to building closer partnerships with you. [GPBUZZ](#)



Be part of the Community Right-Siting Programme (CRiSP)!

CRiSP is a partnership between GPs and TTSH, where stable patients at Specialist Outpatient Clinics with selected chronic conditions are appropriately reviewed and co-managed with GP partners.

If you are a GP practising in the central region of Singapore and are keen to find out more about CRiSP, email us at gp@ttsh.com.sg.



CME (JANUARY – MARCH 2019)

TITLE	CME POINTS	DATE	TIME	VENUE	REGISTRATION DETAILS
GP CME Masterclass – Stroke Rehabilitation: What is Good to Know for General Practice	2 CME Points	12 January 2019	1.00pm to 4.00pm	Tan Tock Seng Hospital, Annex 2 Level 1, Room: L1-W-T001 (V2016)	Email: RehabEvents@ttsh.com.sg

OCCUPATIONAL HEALTH SERVICES OFFERED BY TTSH



By **Dr Lee Lay Tin**,
Head of Department, Occupational Health Services
Tan Tock Seng Hospital

Tan Tock Seng Hospital's Occupational Health Department was established in 2009 to strengthen occupational health services for the hospital's employees, and the department has since expanded its services to include industry partners.

Trained professionally in Occupational Medicine, our doctors are familiar with workplace safety and health requirements for various industries. Part of this experience also comes from having held varied occupational health appointments in the private and public sectors, such as with the Ministries of Manpower and Health. [GPBUZZ](#)

Our services include:

- Evaluation for fitness to work
- Statutory medical examinations
- Workplace health and safety education
- Evaluation and follow-up of work-related medical conditions
- Investigation and assessment of occupational diseases and work-related incidents
- Assessment for facilitating returning to work for employees with medical problems
- Surveillance programme and post-exposure management e.g. to infectious diseases and hazardous chemicals



If you have any questions on our occupational health services, please email yourhealth@ttsh.com.sg or contact us at 6357 1596 / 1594 / 3177.

COMMUNITY

World Hospice & Palliative Care Day 2018: Celebration of Life

On 3 November 2018, the Tan Tock Seng Hospital (TTSH) Palliative Care team, in collaboration with ACE Seniors, organised "*Celebration of Life!*". The event was a community outreach effort, held in conjunction with the World Hospice and Palliative Care Day 2018. Held at the National Museum of Singapore, the event featured a series of talks and engagement activities that explored topics revolving around what it means to live life to the fullest, right till the end.

The talks at the event explored issues close to the heart, like the role of Advance Care Planning (ACP), Lasting Power of Attorney (LPA), Palliative Care, and sharing on life lessons that healthcare professionals have learnt from their patients.

Other myths surrounding palliative care were also debunked by the Singapore Hospice Council, through educational posters. Participants were also introduced to alternative methods of expressing their emotions through Art Therapy. In addition, a book containing inspiring patients' stories and experiences of Art Therapy in Palliative Care in TTSH was launched – "*From Our Heart: Healing Art Programme in TTSH Palliative Care*".

Donors contributing \$50 and above to the TTSH Community Fund are eligible to receive a copy of "*From Our Heart: Healing Art Programme in TTSH Palliative Care*", which features inspiring stories of TTSH Palliative Patients. [GPBUZZ](#)



⚡ Crowd participating in booth activities on palliative care at the Event Foyer of the National Museum of Singapore



Scan the QR code to make a donation now!

ACTIVATING SENIORS AS CHAMPIONS OF PARA-CLINICAL CARE

The Singapore Patient Conference (SPC) held on 19 October 2018 saw an attendance of over 1,500 participants. In its sixth year, SPC continues to provide a powerful learning platform for inspiring stories to be shared by patients, caregivers and volunteers. The seven weeks leading up to SPC also witnessed a variety of community outreach events and fringe activities organised within the neighbourhoods.

The conference was themed – “Active Ageing for Life!” where the key issues focused on the topic of building a caring and inclusive society for seniors. The premise of this idea is to build a respectful society that embraces seniors as an integral part of our cohesive community. By including seniors, such community initiative seeks to empower them with knowledge, skills and confidence to care for one another.

Also at the event, the 4th Singapore Patient Action Awards (SPAA) honoured 15 out of 75 nominated groups and individuals, for their selfless dedication and commitment towards caring for patients in Singapore. Find out more via Tan Tock Seng Hospital’s Youtube Channel (<https://youtu.be/ewkz-mFx-mo>).

The key highlight of SPC was the launch of the Temasek Foundation Cares – CHAMPS (Centre for Health Activation Mobilises Para-Clinical Seniors) programmes by Temasek Foundation Cares and Centre for Health Activation. The launch was graced by Mr Chan Heng Kee, Permanent Secretary, Ministry of Health.

These pilot programmes engage and train seniors aged 50 years and above, to support hospital staff. The intended result of these efforts is to enhance care for frail seniors during their outpatient visits, hospitalisation and recovery at Tan Tock Seng Hospital over a two-year period. [GFBUZZ](#)



^ A tribute to all nominees of Singapore Patient Action Awards 2018



^ With our hands on our hearts, pledging to serve our community



Write to us at CHA@ttsh.com.sg to join CHAMPS!

Scan this QR code to find out more about CHAMPS and to read stories about its senior volunteers.



ROBOT-ASSISTED SURGERIES

IN TAN TOCK SENG HOSPITAL



By **Adjunct Assistant Professor Png Keng Siang**
Senior Consultant and Director of Robotic Surgery, Department of Urology
Past Chair, Robotics Review Committee, Tan Tock Seng Hospital



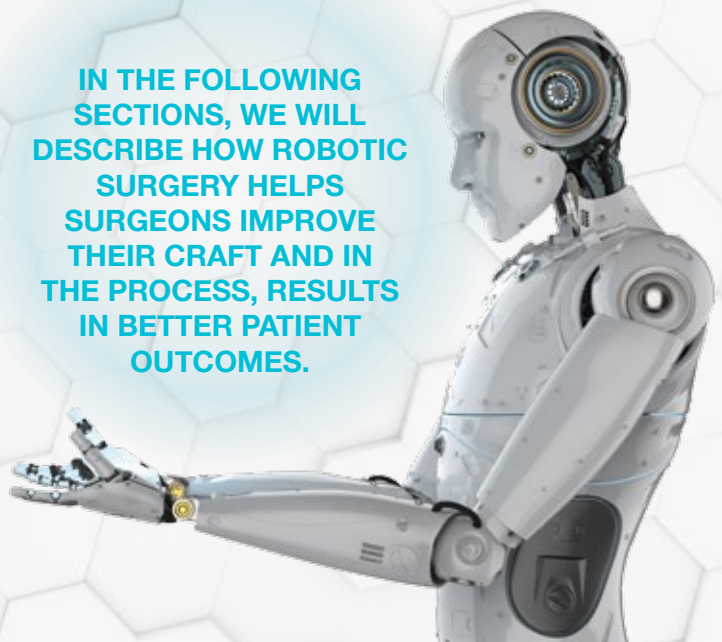
Scan this QR code to read the article online.

The da Vinci Surgical System has been revolutionising minimally invasive surgery since 2000. Manufactured by Intuitive Surgical, a company based in Sunnyvale, California, the da Vinci robot facilitates complex minimally invasive surgery through a master-slave robotic system, with the patient-side robot being controlled by a master surgeon seated at a console. The Endowrist robotic instruments mimic the natural range of motion of the human hand. In addition, with motion scaling, tremor reduction and a 3-dimensional (3D) camera system, the da Vinci robotic system enables surgeons to perform complex surgery using a minimally invasive approach by overcoming limitations of traditional laparoscopic instruments.

As of 2017, there were over 4,000 units of da Vinci systems installed in hospitals worldwide. Of these systems, there were 2,770 in the United States, 719 in Europe, 561 in Asia, and 221 in the rest of the world. Over 300,000 da Vinci procedures are conducted annually. Tan Tock Seng Hospital (TTSH) launched its own robotic surgery program in 2010 using its first da Vinci “S” system. Since then, TTSH has seen a steady increase in the number of da Vinci procedures performed. From a volume of 40 cases in the first year, we now perform an average of three to four da Vinci procedures per week, and our annual volume is between 230 to 250 cases. In 2017, TTSH upgraded its da Vinci system to the most advanced model, the da Vinci “Xi”, to replace the end-of-life da Vinci “S” system. The bulk of da Vinci procedures are performed by the department of Urology. The other disciplines which offer da Vinci robotic procedures include thoracic surgery, colorectal surgery and otorhinolaryngology surgery. In this issue, we hope to introduce the role of robotic surgery within these disciplines.

More recently, in 2018, TTSH has embarked on another journey in robot-assisted surgery. The **Mako Robotic-Arm Assisted Joint Replacement System** was launched with excellent outcomes. The Mako system allows surgeons to create a personalised 3D surgical model of a patient’s joint which is used to pre-plan and assist the joint replacement surgery. The Mako system was adapted in the USA, UK, Australia and now the technology has also been adopted here in Singapore. Makoplasty (otherwise known as robot-assisted procedures) is currently capable of performing partial knee replacements, total hip replacements, and more recently in 2017, total knee replacements. [GPBUZZ](#)

IN THE FOLLOWING SECTIONS, WE WILL DESCRIBE HOW ROBOTIC SURGERY HELPS SURGEONS IMPROVE THEIR CRAFT AND IN THE PROCESS, RESULTS IN BETTER PATIENT OUTCOMES.



1. A ROBOT TO SAVE YOUR 'BEHIND'



By **Dr Fong Sau Shung**,
Senior Consultant and Head, Colorectal Service,
Department of General Surgery, Tan Tock Seng Hospital



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Imagine using a pair of 30cm chopsticks to manipulate sub-centimeter objects within a space confined to the diameter of a tin can. Now picture only being able to view the manoeuvre from a camera mounted at the tip of another 30cm stick, held within the same space by the shaking hand of a colleague. What I have described is precisely how challenging the removal of rectal cancers in narrow pelvises can be. Except in this case, any error could result in injured blood vessels, nerves important to bladder and sexual function, and other mistakes can result in serious long-term consequences, such as cancer recurrence.

Conventional laparoscopy results in reduced length of hospital stay, quicker return to work, limits the impact of specific complications and has improved cosmesis. These benefits are similar when a robot is used. Based on the only large randomised controlled trial which compared the two approaches, the primary end point of conversion rate to open for the robot is halved, but this was statistically insignificant. Depending on who you ask, the paper's findings are either significantly flawed, or it justifies eliminating all robotic rectal cancer surgery from routine practice.

Robotic Surgery for Rectal Cancer

Why pay for and use the robot? Open surgery for rectal cancer remains the gold standard. It turns out that operating in small narrow spaces



Robotic Surgery



Laparoscopic Surgery



with conventional laparoscopic instruments 30cm away is not such a simple procedure. It is better to have a big incision, especially in challenging cases. If you have a difficult cancer in a difficult pelvis, your surgeon can either perform it with open surgery accepting a large incision, have a go with conventional laparoscopy with all the compromises that come with it, or try robotics. If you see a competent robotic surgeon at work, you might be surprised at what the robot can do.

In Tan Tock Seng Hospital, rationalising the use and selection of using the robot for the most difficult

of cases, we have managed to offer more sphincter saving procedures and performed multi-organ resections in the pelvis. This is all done in a minimally invasive manner while virtually eliminating all risk of conversion to open and at the same time improving on our already competent oncological results. **GPBUZZ**

THE ROBOT IS PRICIER, BUT NOT UNNECESSARY. THE FUTURE OF SURGERY IS IN ROBOTICS AND APPROPRIATE USE OF THESE INSTRUMENTS EXPANDS OPTIONS AND IMPROVE OUTCOMES.

« Robotic assistance versus conventional laparoscopic instruments - for fine movements more than 30cm from the point of manipulation through a narrow inlet, there is no competition

2. DA VINCI SURGICAL SYSTEM FOR UROLOGY



By **Adjunct Assistant Professor Png Keng Siang**
Senior Consultant and Director of Robotic Surgery, Department of Urology
Past Chair, Robotics Review Committee, Tan Tock Seng Hospital

Radical Prostatectomy for Prostate Cancer

Robot-assisted Radical Prostatectomy (RARP) is the most common robotic procedure performed in Singapore, and worldwide. Tan Tock Seng Hospital's (TTSH) department of Urology performs 70 to 80 cases of RARP annually, which is on the rise due to the increased incidence of prostate cancer along with the heightened use of Prostate Specific Antigen (PSA) testing. The da Vinci system, with its 10 times magnification and 3-dimensional (3D) camera system, is perfectly suited for deep pelvic surgery such as radical prostatectomy. For instance, anastomosis of the bladder to urethra requires intracorporeal suturing, which is extremely challenging with conventional laparoscopy. In contrast, the da Vinci Endowrist instrumentation allows the surgeon to perform the urethrovesical anastomosis effortlessly. RARP is now offered as a standard treatment option for patients considering surgery for localised prostate cancer. It is a proven surgical approach which provides patients the benefits of minimally invasive surgery, low blood loss, short hospital stay and superior oncological and functional outcomes. On average, patients are discharged after two days with a Foley catheter, which is removed after two weeks. In TTSH, all patients who require radical prostatectomy for prostate cancer undergo the robotic approach. Even patients with locally advanced prostate cancer may be considered for RARP as part of a multi-modality treatment approach, together with adjuvant radiotherapy and hormonal therapy.

After surgery, patients are advised to seek help from their GPs or return to TTSH if they notice that their catheters are blocked with no urine output, or if they develop abdominal distension. If they develop haematuria in the urine bag, it is best to urgently refer them back to their urologist.

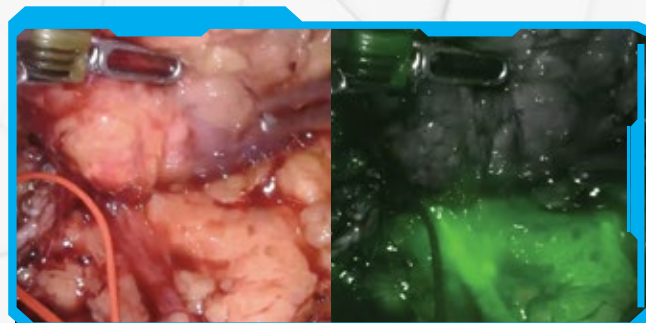
Partial Nephrectomy for Kidney Cancer

In the last decade, urologists are moving towards nephron-sparing approaches for kidney cancers. This is especially true in selected patients with chronic kidney disease or those with a single kidney. Partial nephrectomy in complex tumours is challenging with conventional laparoscopic approaches. Urologists have to balance the oncological efficacy while reducing the warm ischaemia

time associated with renal hilum clamping during tumour excision and kidney repair. In such cases, the da Vinci system allows for precise kidney tumour removal, rapid intracorporeal kidney suturing and reconstruction, thereby reducing warm ischaemia time. TTSH published the largest meta-analysis of about 4,900 patients by Leow and Png et al¹, which showed that *Robot-assisted Partial Nephrectomy (RAPN) had shorter warm ischaemia time, reduced complications and had less conversion to open or radical nephrectomy when compared to the laparoscopic approach*. With the use of near-infrared fluorescence imaging available on the da Vinci Xi, we can now offer selective arterial clamping, thereby avoiding global ischemia to the entire kidney during tumour excision and renorrhaphy. The da Vinci Xi also makes it easier to employ either the transperitoneal or the retroperitoneal approach during RAPN, depending on whether we are dealing with an anteriorly or posteriorly located tumour.

Patients are typically discharged two days after RAPN. During their first week after discharge, patients are advised to look out for gross haematuria which can be a sign of early rebleeding from the tumour bed. Bleeding may also result in abdominal distension and flank pain. This happens in 1% of patients and they should be referred back to the Emergency Department urgently.

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✦ RAPN without (left) and with (right) near-infrared fluorescence imaging ("Firefly" technology)

Footnote:

1. Leow, Jeffrey & H. Heah, Nathaniel & L. Chang, Steven & Chong, Yew-Lam & Png, Keng-Siang. (2016). Outcomes After Robotic Versus Laparoscopic Partial Nephrectomy: An Updated Meta-Analysis of 4919 Patients. *The Journal of Urology*. 196. 10.1016/j.juro.2016.06.011.



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SURGICAL TRENDS IN TAN TOCK SENG HOSPITAL: ROBOTIC THORACIC SURGERY



By **Dr Aneez D.B. Ahmed**,
Chief & Senior Consultant, Thoracic Surgery & Thoracic Oncology,
Department of General Surgery, Tan Tock Seng Hospital



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read the article online.

Robotic thoracic surgery has been in operation in Tan Tock Seng Hospital (TTSH) since 2012. We have since performed over 400 cases of lung resections and mediastinal resections.

The procedures are performed using Intuitive Surgical's da Vinci robotic surgical systems. TTSH has since acquired the da Vinci Xi system, with a multi-portal capacity that greatly enhances dexterity with complex procedures.

Typically for lung resections, four working ports are used (each 8mm in size). For thymic resections, three similar working ports are used instead. The average length of stay is three days for lung resections, and patients usually go home the next day after thymic resections. The advent of robotic thoracic surgery places great emphasis on teamwork. Our anaesthetic team takes excellent care with using paravertebral analgesia, and this greatly reduces the use of postoperative narcotics.

As with all minimally invasive procedures, there are higher chances of successful resections with earlier stages of cancer. The assistance of robotic capability safely improves chances of advanced lung cancer resections.



Indications for Robotic Thoracic Surgery

The current indications in our hospital for surgery include lung resections for lung cancer. These cases mostly involve primary lung cancer and a few secondary lung cancers that require resections. Mediastinal resections are usually done for thymomas and thymectomies for myasthenia gravis. We also advocate robotic resections for posterior mediastinal tumours, including oesophageal work.

The treatment for lung cancer is rapidly changing with the advent of immunotherapy and targeted cell therapy. This places platforms like robotic surgery in the forefront as more patients will come into the surgical domain.

ALTHOUGH WE DO NOT HAVE A NATIONAL CANCER SCREENING PROGRAM YET, SINGAPOREANS IN GENERAL ARE A HIGHLY EDUCATED AND CONSCIOUS LOT. THEY ARE INVOLVED IN THEIR OWN PUBLIC AND PRIVATE COMMUNITY-BASED PROGRAMS THAT AID WITH THE DIAGNOSIS OF EARLY STAGE LUNG CANCER.

As more robotic companies bring their new machines into the fold, the cost of robotic surgery should rapidly decline. With this decline in cost, we can also expect a widening of applications for thoracic surgery.

GPBUZZ

4. DAWN OF THE AGE OF ROBOTS



By **Dr Kelvin Tan**,
 Consultant, Adult Reconstruction Service, Department of Orthopaedic Surgery,
 Tan Tock Seng Hospital
 Special Interest in Robotic Surgery



Scan this QR code to read the article online.

Dear colleagues, it gives me great pleasure to share about the use of Robotic Surgery in Orthopaedics in modern medicine. As an avid proponent of advances in healthcare technology, I am thrilled that the age of Robots has finally dawned upon us.

Robotic orthopaedic surgery began in 1992 but has only been more widely adopted internationally over the recent years. This is largely due to the launch of the Mako robot in the orthopaedic industry.

A pre-operative Computed Tomography (CT) Scan is required to formulate a 3-dimensional (3D) operative plan for individual patient anatomy. After this, the surgery is performed with extreme accuracy. The surgeon controls the robotic arm using real-time haptic feedback. The robotic cutting/burring tool shuts off automatically when it goes off tangent or within the proximity of neurovascular structures. This makes robotic surgeries safer and more precise than conventional surgeries. Dynamic soft tissue feedback is acquired intraoperatively, allowing

change in surgical plan to optimise soft tissue tension and tracking. The robot is not fully autonomous (yet), as no surgeon will fully entrust their patient's life or limb to robots.

Types of Makoplasty Procedures

Tan Tock Seng Hospital (TTSH) offers all 3 Makoplasty (robotic-assisted) procedures – namely, Unicompartamental Knee Arthroplasty (UKA), Total Hip Arthroplasty (THA) and most recently Total Knee Arthroplasty (TKA). Mako UKA is currently the most commonly performed Makoplasty procedure.

Makoplasty Procedures



⚡ Mako UKA

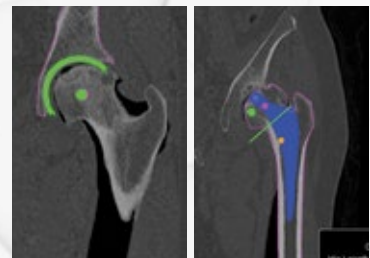
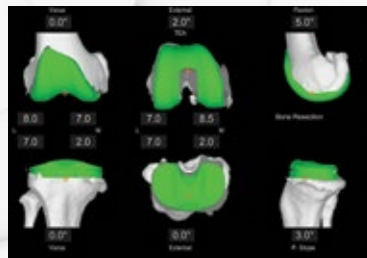
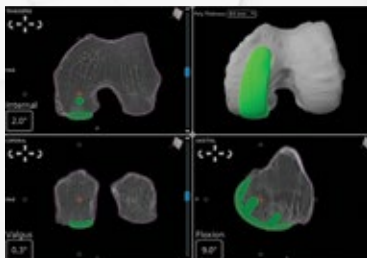


⚡ Mako TKA



⚡ Mako THA

Makoplasty 3D Planning



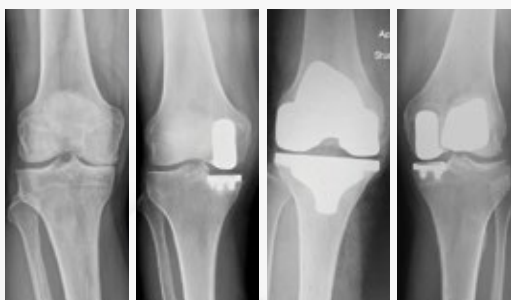
About 20% of Osteoarthritis (OA) knees are confined to a single compartment (usually medial). A medial UKA could have been performed for this group of patients instead of TKA. The advantages of performing a UKA over a TKA includes a smaller incision, lesser pain, blood loss and bone resection, faster return to work and more normal knee kinematic (due to preservation of all the cruciate ligaments).

Benefits of Makoplasty

Using conventional instruments to perform UKA is susceptible to considerable alignment, rotational, sizing errors as well as complications such as peri-prosthetic fractures. This is likely the cause of suboptimal survivorship compared to TKA data and therefore lack of confidence in surgeons to perform conventional UKA for patients with isolated unicompartmental disease despite the obvious superior benefits for UKA over TKA. Makoplasty UKA has proven to deliver consistently accurate alignment, reproducible results, optimal implant sizing, tracking, soft tissue balancing and better forgotten joint scores (a score that measures patients' awareness of their joint after a joint replacement).

For THA, Makoplasty has consistently allowed for accurate acetabular cup placement compared to conventional 'eyeball methods'. This leads to lower postoperative complication rates such as dislocation and limb length discrepancy. Personally, I find Makoplasty especially useful in patients with dysplastic acetabulum as the robot can help make a typically difficult operation much easier.

Makoplasty TKA was launched worldwide in 2017 with the aim to restore normal knee kinematics by customising the bone cuts to best fit the implants to individual patient's anatomy and taking into account



Left to right: X-rays of medial unicompartmental OA, medial UKA, TKA, bicompartmental knee replacement



Left to right: UKA wound, TKA wound

dynamic intraoperative soft tissue balancing feedback. Results of this latest state-of-the-art technology are currently limited but certainly optimistic.

Selection of Patients for Makoplasty

The indications for Makoplasty are the same as our current joint replacement patients, who are predominantly patients with symptomatic osteoarthritis of the hip or knee that have failed conservative management. Selection of patients for Makoplasty UKA is more stringent but their symptoms and radiographic disease should only be isolated to the affected compartment. Robotic bicompartmental knee arthroplasty is an available option, should there be disease in two compartments (typically medial and patella-femoral compartments).

There is no difference in the post-operative care of robot-assisted joint replacement patients from our existing practice, apart from the addition of pin site wounds required to place tracking arrays that communicate with the robot. In fact, because robotic surgery employs minimally invasive incision (particularly so for UKA), faster recovery and therefore same day or next day discharge for this group of patients is achievable.

It took the Australian Orthopaedic Association National Joint Replacement Registry 10 years before

computer navigated TKAs showed better survivorship than conventional TKA, especially among younger patients. Just as with other areas of medicine, only time will tell if robotic technology is superior to current methods of orthopaedic surgery. [GPBUZZ](#)

ROBOTIC TECHNOLOGY MAY BE THE ANSWER FOR SOME OF THE 'UNHAPPY' HIP AND KNEE REPLACEMENT PATIENTS. IT MAY ALSO FORM THE CORNERSTONE OF SURGICAL TRAINING FOR BUDDING ORTHOPAEDIC SURGEONS, AS REPRODUCIBLE AND CONSISTENT RESULTS ARE ACHIEVABLE WITH LOWER SURGICAL VOLUME.

Mako™
Robotic-Arm
Assisted
Surgery





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5. EMBRACING THE NEW FRONTIER - TRANSORAL ROBOTIC SURGERY IN OTORHINOLARYNGOLOGY



By **Adjunct Assistant Professor Chong Khai Beng**,
Consultant, Department of Otorhinolaryngology (ENT),
Tan Tock Seng Hospital



By **Adjunct Assistant Professor Chong Yaw Khian**,
Senior Consultant, Department of Otorhinolaryngology (ENT),
Chief of Sleep Disorder Service, Tan Tock Seng Hospital

Robot-assisted Surgery in Otorhinolaryngology (Ear, Nose and Throat (ENT))

Robot-assisted surgery has proven beneficial and effective in the realms of transoral surgery in ENT. To put it simply, the da Vinci Xi surgical robotic system allows us to perform minimally invasive surgery in deep areas within the upper aerodigestive tract that were previously inaccessible.

The system does this by having slim robotic arms that are remotely controlled. Surgery is performed using a master/slave system. The robotic surgeon (master) directly controls the endoscopic camera and robotic surgical instruments (slave) from a console located away from the surgical site. By inserting a 3-dimensional (3D) endoscopic camera system and two computer-guided surgical instruments through the oral cavity, surgery can be done without any external incision.

Before the advent of robotic systems, such surgery can only be done after extensive surgical resection and retraction to create access. Robot-assisted surgery via the oral cavity is also called TransOral Robotic Surgery (TORS).

Other Benefits of Robot-assisted Surgery besides being Minimally Invasive

Firstly, robot-assisted surgery improves visualisation by using a 3D endoscopic camera system that gives superior magnification within the deep recesses of the oral cavity. Secondly, with slim robotic arms controlled by the surgeon, it provides surgical access to previously inaccessible areas. Thirdly, the robotic arms allow for high degrees of manoeuvrability with surgical instruments (an even higher degree of freedom provided as compared to the human hand). Finally, it improves surgical precision with motion scaling and tremor reduction technology.

ENT Conditions that Benefit from Robot-assisted Surgery

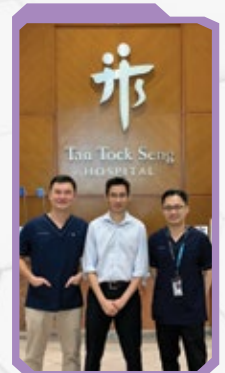
Despite the usefulness of robot-assisted surgery, only certain types of ENT surgery can benefit from its use. The main use of the da Vinci Xi in ENT is for patients with

Obstructive Sleep Apnea (OSA). There is a sub-select group of OSA patients who has significant base of tongue and/or supraglottic obstruction which contribute to OSA. Robotic surgery is ideal for the removal of such obstructions.

Robot-assisted surgery is also useful for removing benign lesions of the oropharynx, hypopharynx and larynx, such as lingual thyroid and parapharyngeal tumours. Small cancers of the oropharynx, hypopharynx and larynx, such as oropharyngeal squamous cell carcinoma can also be removed using TORS.



△ Placement of da Vinci robotics for a transoral resection of excessively enlarged lingual lymphoid tissues that is obstructing the airway during sleep (Severe Obstructive Sleep Apnea)



△ ENT robotic team (from left to right): Dr Chong Yaw Khian, Dr Lim Ming Yann & Dr Chong Khai Beng

Clinical Advisory of Post-operative Care Management in the Community

Robotics surgery has also significantly shortened hospital stay. As compared to the traditional open approach with hospital stay of about one week or more, patients who had TORS of the upper aerodigestive tract usually have an average hospital stay of three to four days.

The main risk of TORS is bleeding and infection, which may not be apparent with routine examinations of the throat. Hence, patients are advised to return to the Emergency Department if they present with any signs of bleeding. [GPBUZZ](#)

ENSURING COST-EFFECTIVE AND EVIDENCED-BASED ROBOTICS SURGERY AT TTSH

By **Adjunct Associate Professor Chong Yew Lam**,
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Co-Chair, Robotics Review Committee, Tan Tock Seng Hospital

Since 2010, Tan Tock Seng Hospital (TTSH) has been providing the option of robot-assisted surgery to our patients whenever it is clinically appropriate and cost-effective. Although it can be more costly than conventional surgery methods, we believe that every application of robotic-assisted surgery deserves to be carefully weighed for its cost-effectiveness and clinical outcomes.

To ensure that all patients are appropriately assessed for suitability of such treatment based on evidence and a peer-reviewed system, TTSH has a hospital level system of review and approvals, guided by Ministry of Health's policy on cost-effective indications for Robotics Surgery, agreed clinical criteria and overseen by the leadership of senior clinician. We are confident that with these clinician-led systems of review in place, no deserving patients will be denied access to the excellent outcomes that advanced surgical technology can provide.

IN FUTURE ISSUES OF GP BUZZ!

ROBOTIC-ASSISTED THERAPY IN REHABILITATION MEDICINE

AI IN DIAGNOSTIC MEDICINE

ROBOTS IN HEALTH LOGISTICS & NURSING



Prehabilitation: Getting Yourself Ready for Surgery



By **Ms Jaclyn Chow**,
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Traditional rehabilitation happens post-surgery, and focuses on facilitating a patient’s return to a pre-operative state. However, patients often feel pain and fatigue post-surgery, which can reduce motivation. In addition, feelings of depression and anxiety can also arise as they await additional treatment. Hence, the pre-operative period is a crucial time for the patient to participate in prehabilitation, as they are likely more motivated towards taking an effort to build up strength to withstand the side effects of surgery. This is especially beneficial for older adults at “high risk”, as they may be frail and have multiple health problems.

WHAT IS PREHABILITATION?

Today, prehabilitation is an emerging process that enhances an individual’s functional capacity prior to surgery. Prehabilitation enables patients to improve their rate of recovery,

post-surgery. Along with Tan Tock Seng Hospital, other major healthcare institutions are including prehabilitation as a standard of care in the enhanced recovery after surgery (ERAS) pathways.

The primary aim of this effort is to achieve lifestyle changes to reduce risks and complications from surgery. In older adults, the secondary aim is to improve a patient’s physical function, to improve their suitability for surgery.

HOW IS PREHABILITATION DONE?

Prehabilitation involves personalised assessments and treatments that include medical optimisation, physical training, nutritional intervention, smoking and alcohol cessation, as well as anxiety coping interventions. However, exercise is a major component in the prehabilitation programme that can commence four to eight weeks before surgery.

EXERCISE TRAINING

Modes of exercise include endurance, strengthening, flexibility, static and

dynamic balance exercises. The core of the prehabilitation exercises involves endurance and muscle strength training.

1) Endurance training

Brisk walking, cycling, stair climbing or swimming are different forms of endurance training. Higher ‘doses’ of exercise adding up to 150 weekly minutes of moderate to vigorous exercise can result in greater improvements.

The Borg Rating of Perceived Exertion (RPE) is a scale used to gauge the intensity of your exercise. The scale starts at 0, where exertion feels like “nothing at all” and ends at 10, feeling “very very hard” exertion. Using this scale (Fig. 3), moderate intensity exercise should begin at RPE level 3 during the first week of exercise, and progress to RPE levels 5-6 by the fourth week. An example of a four-week walking programme using the Borg RPE scale is described below (Fig. 4).



Fig. 3: Modified Borg’s scale

Week	Warm up (minutes/day)	Brisk Walk (minutes/day)	Cool Down (minutes/day)	Number of exercise days	Total exercise time/week (minutes)	Borg RPE Scale
1	5	20	10	3	60	3 (easy)
2	5	20-30	10	3	60-90	4 (moderate)
3	5	30	10	4 - 5	120-150	5 (somewhat hard)
4	5	30	10	5	150	5-6 (somewhat hard to hard)

Fig. 4: Example of a walking programme

2) Muscle strength training

Strengthening exercises can be performed within the home setting. These exercises should be done at least twice a week, alternating with endurance training. They can be done with ankle weights or dumbbells, as muscle strengthening requires overloading the muscles by adding additional 1.5kg - 2.0kg of weights.

The following are examples of strengthening exercises that should be done in three sets of 8 to 10 repetitions each. A rest period of 30 seconds to 1 minute should be taken between each set. [GPBUZZ](#)

Life hack: Bottles filled with water or ziplock bags filled with rice/beans can also be used as alternatives to weights or dumbbells!

Legs - Quadriceps strengthening



- Sit on a chair with back support
- Strap the ankle weight to one leg
- Slowly straighten knee fully
- Hold this position for 3 seconds before lowering it to starting position
- Repeat with the other leg

Legs - Quadriceps strengthening - Sit to stand



- Sit on a chair with back support
- Hold one dumbbell in each hand
- Stand up and straighten elbows to bring the dumbbells downwards to your sides



- If weights are not used, cross arms in front of chest before standing up

Arms - Shoulder press



- Sit on a chair with back support
- Hold one dumbbell in each hand
- Plant feet firmly on the floor, shoulder-width apart
- Bend elbows and raise arms to shoulder height so that the dumbbells are at ear level
- Push the dumbbells up directly overhead
- Ensure that elbows are not fully extended when lifting dumbbells overhead

Arms - Bicep curl



- Standing feet shoulder-width apart
- Keep elbow close to trunk, palm facing outwards
- Bend elbow and lift the dumbbell upwards, ensure that elbow is fully bent
- Lower arm down to the starting position
- Repeat with the other arm

3 Steps for referring patients to TTSH

Here's a comprehensive chart listing the steps to refer **non-subsidised patients and patients under the Community Health Assist Scheme (CHAS)** to Tan Tock Seng Hospital (TTSH).



*To ensure that your patients are seen promptly at TTSH, triaging may be conducted by our staff. You may be required to fax the referral letter and CHAS cover note to TTSH. Our staff will get back to you with an appointment date within 3 to 5 working days.

Please retain a copy of the documents for reference purpose.

We thank you for your kind understanding.