



# REAL-WORLD ADOPTION, BARRIERS, ARTIFICIAL INTELLIGENCE INTEGRATION, AND FUTURE READINESS OF ROBOTIC-ASSISTED SURGERY (RAS) IN CHINA



AUTHORS: CHIA YONG ZHEN BALDWIN (BSc), LILY LIANG (BSc)

## 1. RESEARCH BACKGROUND & RAS INFORMATION

### A. INTRODUCTION

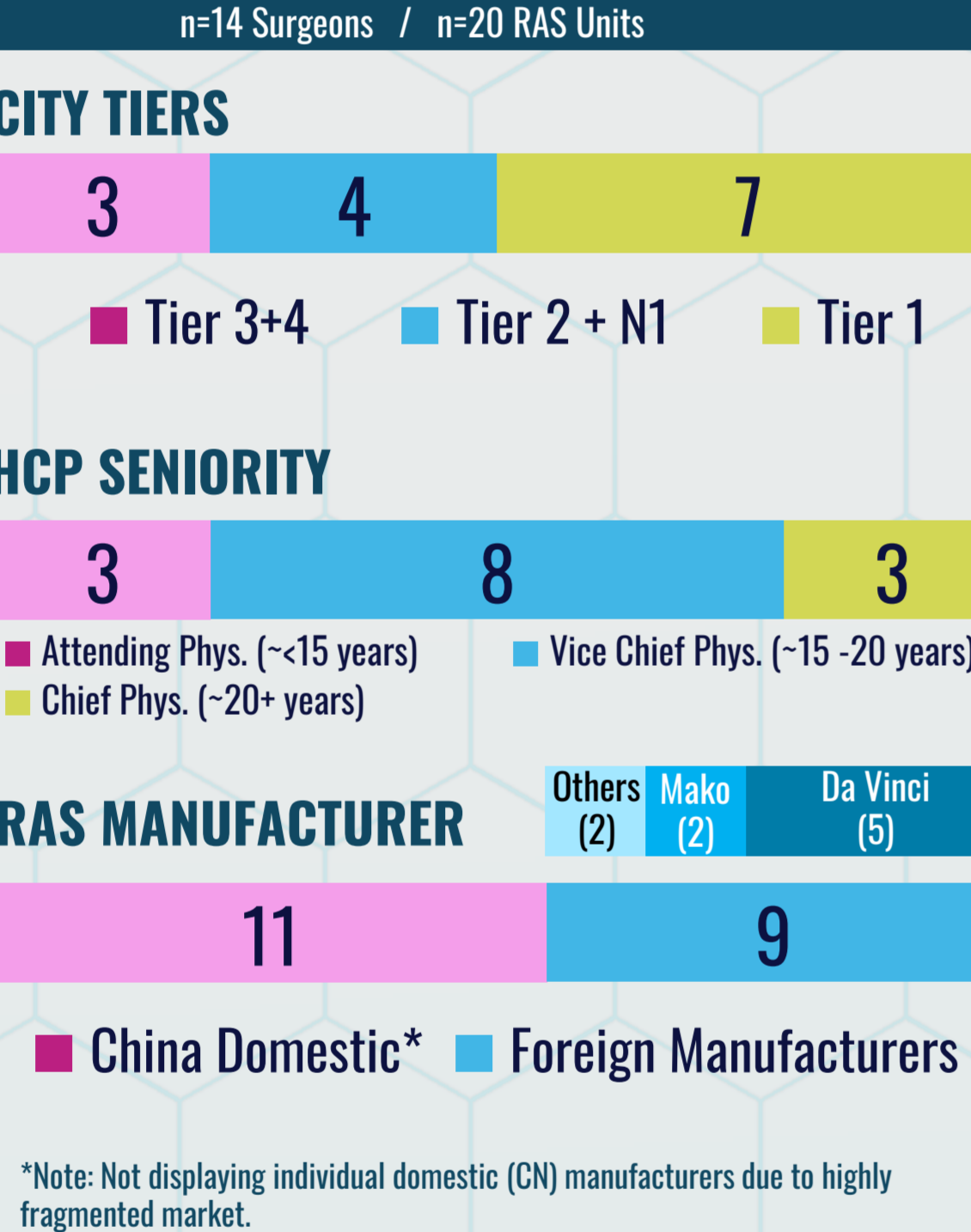
Robotic-assisted surgery (RAS) in China has entered a new phase of adoption. Chinese national policy has created room for expansion, including planned growth in laparoscopic surgical systems under the 14th Five-Year large medical equipment framework, while domestic and imported platforms are increasingly competing across soft-tissue, orthopaedic, spine, and navigation-based procedures. This study examines current and future RAS as well as the adoption of smart technologies / AI in China.

### B. METHODOLOGY

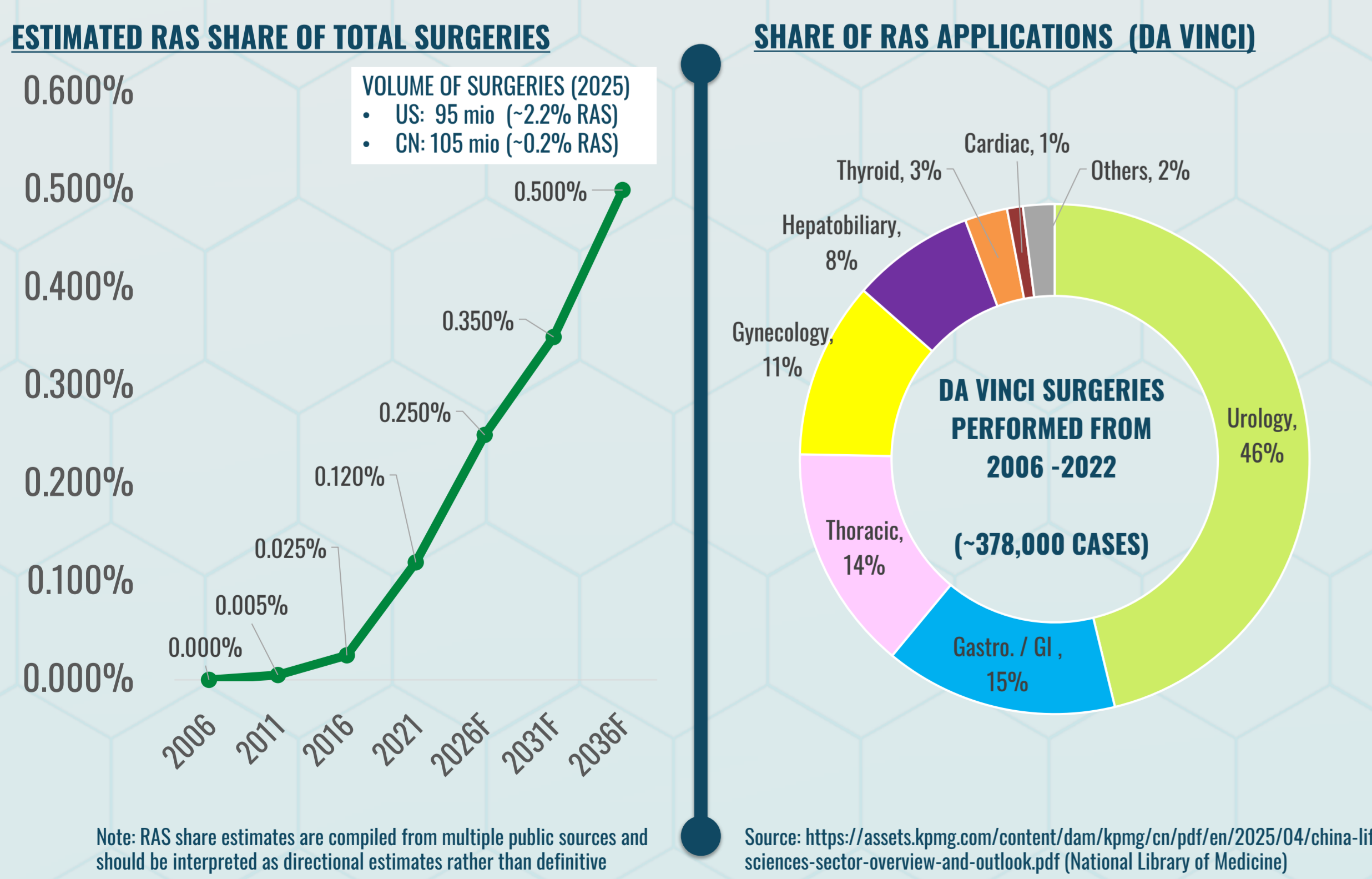
This study was conducted **qualitatively** across **n=14** surgeons, with criteria including:

- At least 1-2 Robot Assisted Surgeries (RAS) per month
- Mix of surgeons from Tier 1 – Tier 4 cities in China
- Mix of soft and hard tissue RAS surgeons
- Mix of applications including general surgery/ GI, thoracic, spine, gynaecology, urology and orthopaedics + joint replacement

### C. SAMPLE STRUCTURE



### D. RAS ADOPTION TREND IN CHINA



## 2. FINDINGS & CONCLUSION

### A. RAS ADOPTION IN CHINA

- Clinical benefits of RAS are clear – RAS adoption is strongest when the procedure has a clear technical pain point – narrow pelvic space, fine suturing, deep or hard-to-access lesions, precise screw/implant placement, high demand for functional preservation, etc.)
- Imported systems are still trusted for maturity and complex cases
- Domestic systems are seen as scale enablers – systems can be at least 2-5x cheaper
- Tier 1 cities like Beijing & Shanghai are the earliest adopters, with Tertiary and Teaching hospitals leading adoption. Training usually starts from developed cities with lower tier cities following after
- Currently still seen as “selective” premium care in China – not regarded as routine / standard surgery.

### B. CURRENT RAS USAGE DRIVERS AND BARRIERS

- USAGE DRIVERS**
- Procedural precision for anatomically difficult or narrow surgical spaces
  - Potentially better outcomes due to better suturing & minimal damage to surrounding tissue
  - Minimally invasive while maximising view angles
  - Reduction in surgeon fatigue (sitting vs. standing), especially important for volume surgeries
- USAGE BARRIERS**
- Somewhat nascent / Low awareness among patients / No standard national reimbursement / Lack of clear pricing
  - Surgeon training / High equipment cost & maintenance / OT space constraints
  - DRG (Diagnosis Related Group) / Hospitals may hesitate due to exceeding cost threshold
- Due to the above, RAS may only make sense in larger, tertiary hospitals in China – primarily in bigger more developed cities.

### C. HIGH VALUE RAS FUNCTIONS / DESIRED FUNCTIONS

- CURRENT HIGH VALUE FUNCTIONS**
- 3D / Ultra-HD Visualization / Image Enhancements
  - Tremor elimination / Motion Stability / Force Feedback & Tension Sensors
  - Surgical Navigation & Real Time Positioning
  - Customizable, Flexible Multi-degree Robotic Arms
- DESIRED FUNCTIONS & NEEDS**
- Smaller / More Compact System (Current systems may be limited by OT layouts / space)
  - Better Tactile Force Feedback
  - Multi-Specialty Robots – For centres that cannot afford multiple robots
  - Standardization of Implants / Consumables to drive uptake and reduce cost

**CONCLUSION**

Surgeons in China prefer RAS for non-straightforward, precision-heavy cases, but use is limited by hospital tier, patient costs (national reimbursement), and machine availability. AI is seen as a **helpful guide, not a replacement**, and domestic robots are catching up on cost and accessibility, while imported systems still lead for complex surgeries in the short term. Future growth depends on better training, smarter workflows, and wider but cautious AI integration.



## 3. FUTURE OF AI IN CHINA + DISCUSSION POINTS

### CURRENT AI & INTEGRATION

- Current AI use is mostly around planning, navigation, imaging/data support, and hospital workflow.
- Surgeons often used “AI” broadly. Some counted 3D reconstruction, preoperative planning, navigation, tissue/anatomy recognition, warning systems, hospital AI consultation, and big-data decision support as AI.
- Current AI use in RAS is uneven and depends on specialty. For example, surgeons felt that AI has more value in areas such as Orthopaedics – calculating bone resection, predicting implants, planning pin entry points and cutting planes, etc.
- For areas such as urology, surgeons cannot yet recall potential applications

### EXPECTED FUTURE AI USAGE & READINESS

- Surgeons want AI, but mostly as decision support & “safety layer”, not autonomous surgery. The highest mentions are of the following:
- AI-assisted Preoperative Planning (linked with HIS and patient history)
  - Intraoperative Image Recognition and Anatomy Identification
  - “Danger Zone” Alerts (Major Vessels, High Risk Organs, etc.)
  - AI-assisted Angle Optimization
  - Workflow Optimization & Intelligence (Including prediction models e.g. tumour locations)

The perceived value of the future of AI is in **standardizing precision** before the surgeon cuts. AI readiness is much higher in top, tertiary centers.

### DISCUSSION POINTS & THOUGHT STARTERS

- Is AI for RAS a good or bad thing? “Co-pilot” or “Autopilot” Why?
- What additional safeguards, be it regulatory or functionality, can be implemented to mitigate risks? What about overreliance?
- What level of AI support would surgeons trust during robotic surgery?
- Besides cost, regulations and system functionality, which (controllable) factors can be addressed to drive RAS uptake in China? How can AI drive uptake? What evidence?