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ANNUAL MEETING

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Robotic Tele-surgery: The Next Frontier in Surgery

Chao He, PhD

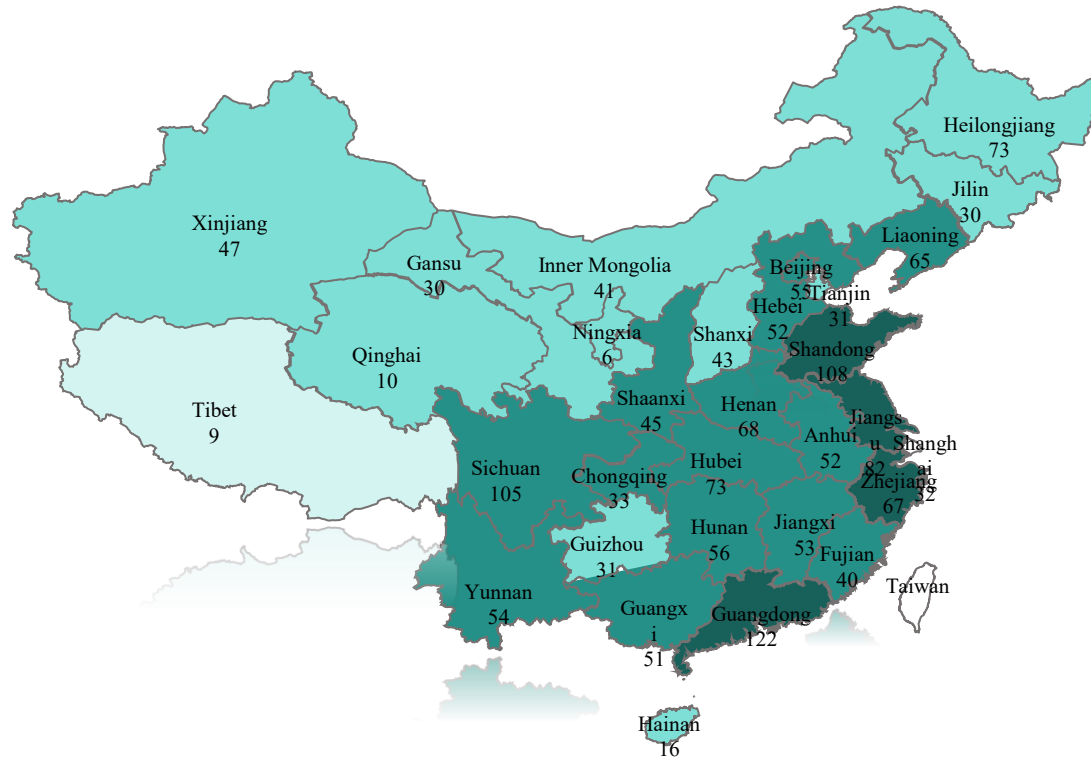
Founder, CEO, Shanghai MicroPort MedBot (Group) Co., Ltd.

Director, Shanghai Mini-invasive Surgical Robots Research Center



Value of Tele-Surgery

Great differences in medical levels in different regions



Number of Class IIIA hospitals in China

- Difficulties in accessing medical care
- Heavy burden for surgeons
- High medical expenses



Tele-Surgery is the key technology for addressing the unequal distribution of medical resources.

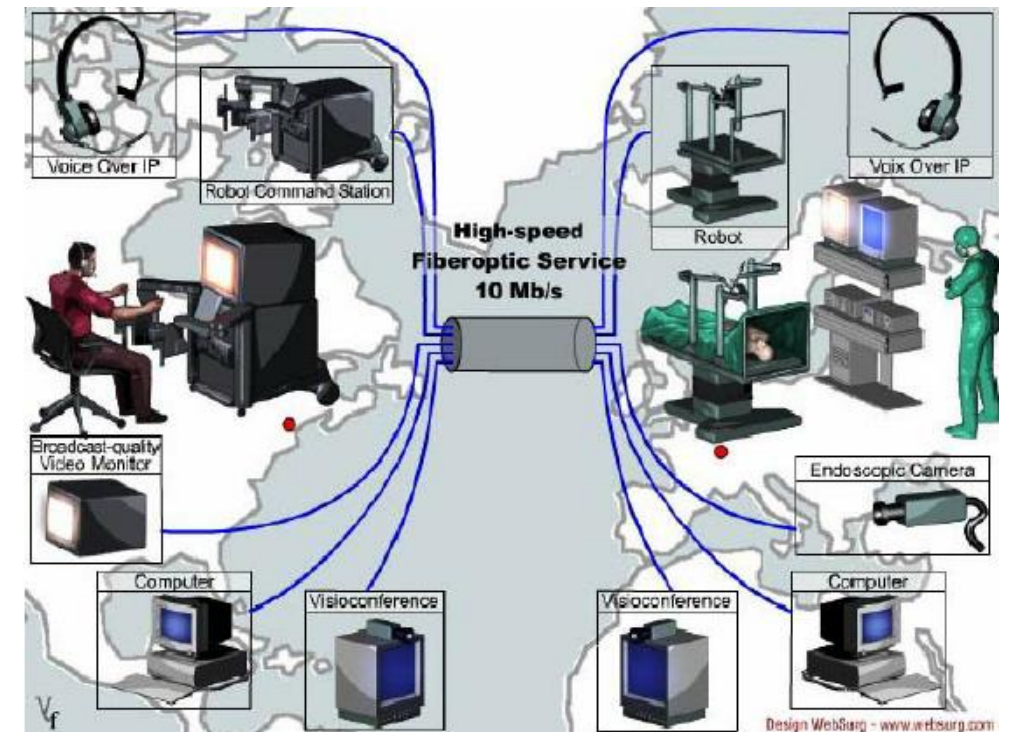


Pioneering Exploration of Tele-surgery

24years ago, 2001, **Lindbergh Operation**, the world's earliest tele surgery was performed by **Prof. Jacques MARESCAUX**

Opened the new era of Tele-surgery

Location: **France-US**
Communication: **Undersea Optic Fiber**
Robotic system: **ZEUS**
Distance: **7000km+**
Latency: **≥310ms**





Build the theory of “2nd generation Tele-surgery”

Establish connectivity for tele-surgery

1st Generation tele-surgery



- Dedicated lines, optical fibers
- Point to Point connection
- Rely on specific suppliers for quality
- Long deployment cycles and high costs

Technical
advancement



Accelerate the development and maturation of tele-surgery

2nd Generation tele-surgery



OR & Console



OR & Console



- Compatible for multiple networks
- Establish a surgical network
- Explore the possibility of greater distances
- Facilitate large-scale application

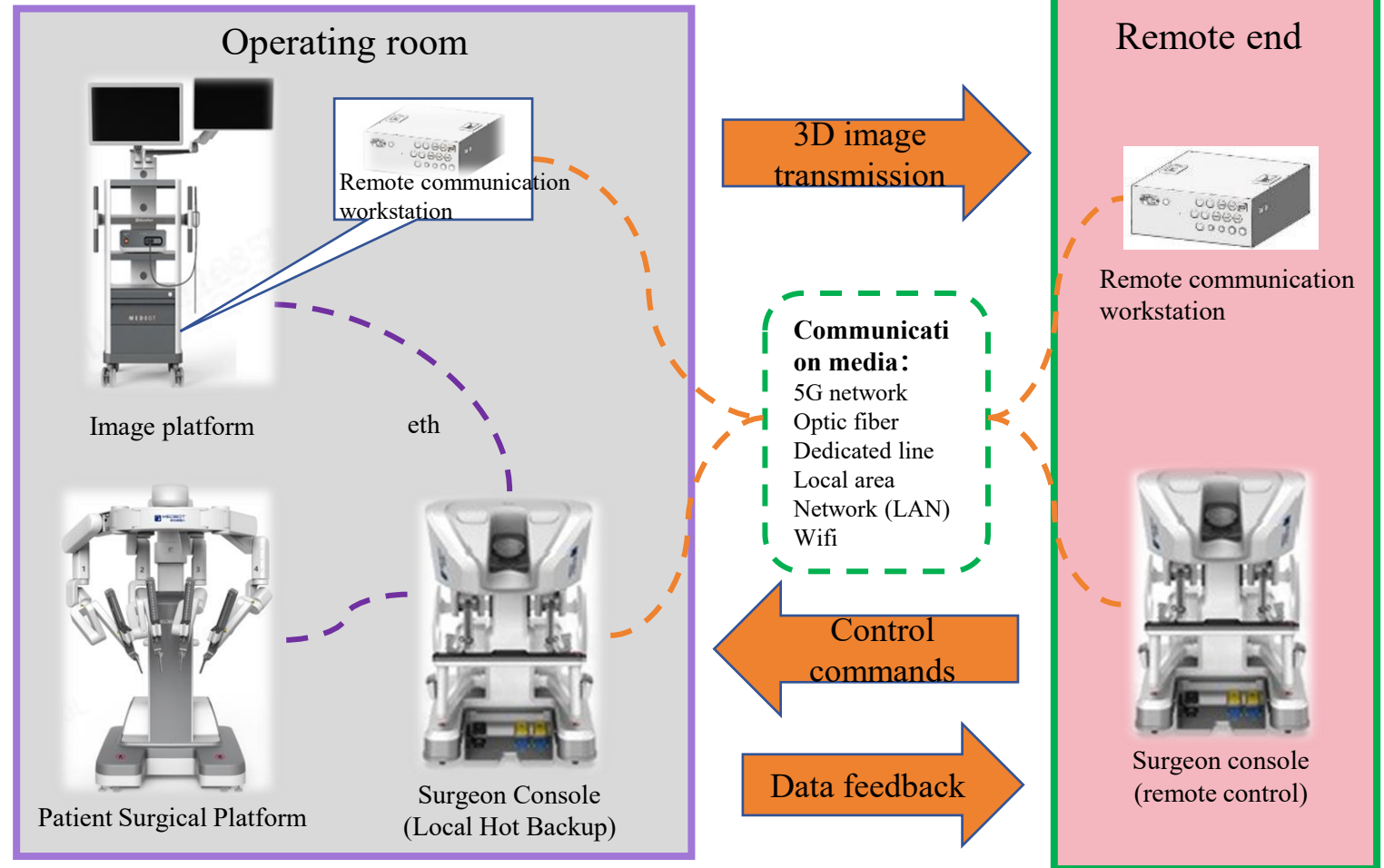
Establish the technical foundation for large-scale clinical applications



Configuration of MedBot Tele-surgery system

Technical principles

- Original master-slave control method remain unchanged
- Operations performed are transmitted over the network
- Compatible for hospital existing networks
- Dural surgeon consoles, Local hot backup
- Local console share the highest control right





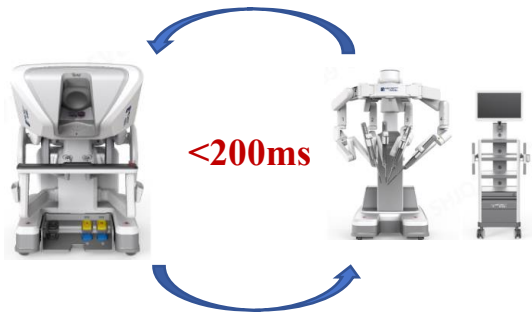
Features of Medbot Tele-surgery system

Ultra-low latency

End-to-end latency

<200ms

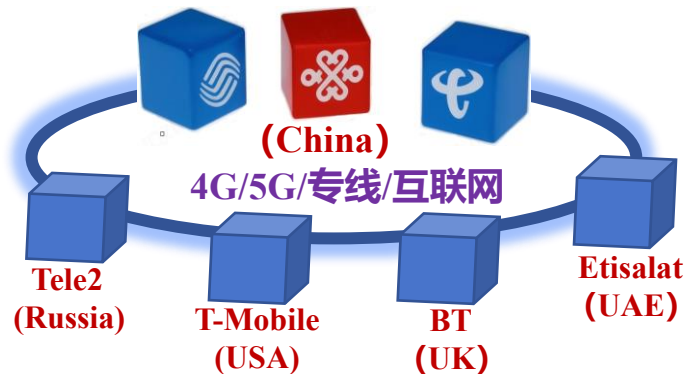
- ❑ Ultra-low latency image encoding and decoding
- ❑ Lowest master-slave control latency



Multi-network fusion

Compatibility with current infrastructure of hospitals

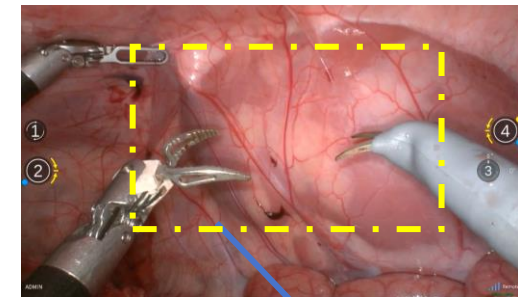
- ❑ 4G/5G/Dedicated Line/Internet
- ❑ China Mobile /China Unicom/ China Telecom



Low network requirements

Bandwidth requirement **as low as 1.25Mbps**

- ❑ Dynamic adaptive algorithm
- ❑ Lossless high compression ratio image encoding and decoding algorithm



Quality assurance of hotspots.



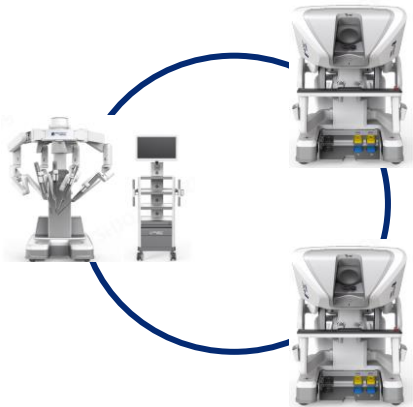
Systematic safety assurance strategy

Dual-end hot standby

Pioneering in the industry

Zero-second switching

- ❑ Zero-second dynamic uninterrupted switching

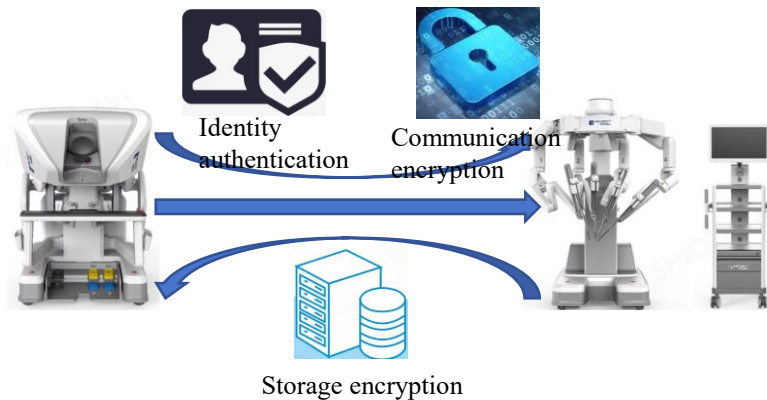


Data encryption

Full data high-intensity **encryption**

Fearless of network security risks

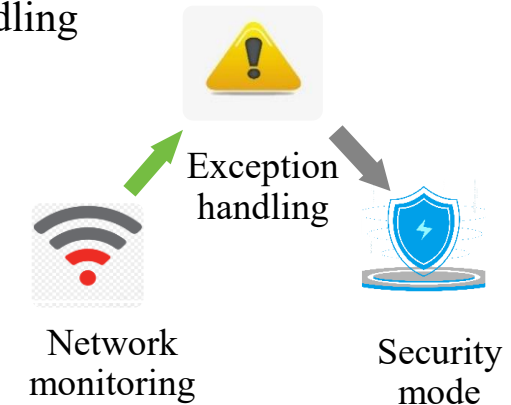
- ❑ Real-time encryption of communication data
- ❑ Local data encryption backup



Real-time monitoring

Real-time **monitoring and handling** of network status

- ❑ High-frequency monitoring with a cycle as low as **2ms**
- ❑ The most secure network anomaly handling





1st Tele-surgery of Toumai

World's 1st ultra-long-distance 5G Tele-surgery

1st tele-surgical case: performing an ultra-long-distance surgery over 5000km

Location:	Shanghai-xinjiang
Communication:	5G
Robotic system:	Toumai
Distance:	5000+km
Latency:	≥220ms
Procedures:	Decapitating renal cyst





1st 100+ tele-surgery cases study

- Long distance : spanning over 5000 kilometers
- Wide range of procedures : 70+ 3nd and 4th level surgeries
- Broad range of indications
- Multiple consecutive surgeries: 20+ times

Numerous global first in complex tele-surgeries:

Radical gastrectomy for gastric cancer

Liver resection

Radical prostatectomy for prostate cancer

Hysterectomy

Pancreatectomy

Radical nephrectomy for renal tumor

Bariatric/metabolic surgery for weight loss

Pediatric remote surgery

High-altitude remote surgery

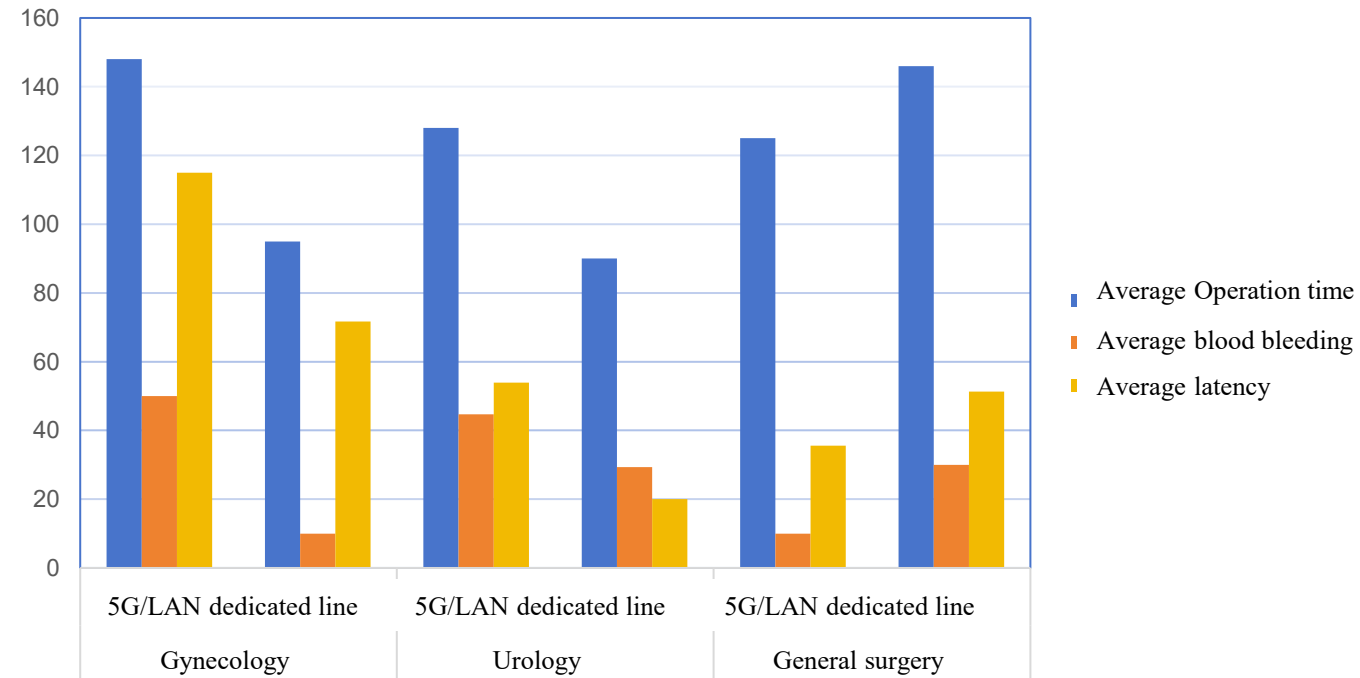
Study Design	Prospective / Simple Arm / Multicenter
Sample Size	100+
Indications	Urology 32 General surgery 61% Gynecology 7%
Networking mode	5G network Cable Dedicated Line Internet



Tele-surgery clinical study data analysis

Distance	Network	Average delay (ms)	Maximum delay (ms)
~5000km	5G/LAN	159.88	488.37
~5000km	Dedicated line	73.38	1041.81
1000-2000km	5G/LAN	52.99	247.85
<200km	5G/LAN	41.97	591
<200km	Dedicated line	24.16	151.24

Technical results



Clinical results



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5 Years journey of

- **“Arduous and in depth” Technological development**
- **“Exciting but cautious” Clinical exploration**

Tele-surgery has reached the critical point of breakthrough!



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400+ Cases

World's **1st** on
human

100%
Surgical Success
Rate

25+
World Records

50+
Cities

80+
Hospitals

1000,000+ km
Communication
Distance*

1st LATAM case



1st Europe case



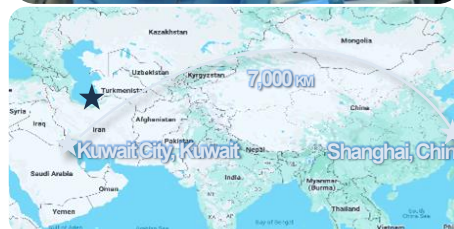
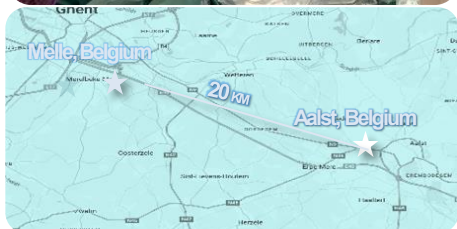
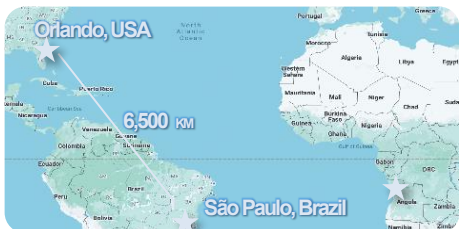
1st MidEast case



1st Africa case



World's Longest



Africa's First Telesurgery

- Main Surgeon: Dr. Marcio Moschovas
- Date: Sep 03, 2024

Europe's First Telesurgery

- Main Surgeon: Dr. Alex Motttrie, Dr. Geert De Naeyer
- Date: May 26, 2025

World's Highest-volume Telesurgery 8 cases

- Main Surgeon: Dr Saad Aldousari
- Date: May 20, 2025

Africa's First Clinical Telesurgery

- Main Surgeon: Dr. Vipul Patel
- Date: Oct 23, 2024

World's Longest Clinical Telesurgery

- Main Surgeon: Dr. Youness Ahallal
- Date: Nov 16, 2024



1st Tele-Surgery in Angola

6 Robotic-Assisted Laparoscopic Radical Prostatectomy, 2 of the cases were performed remotely using Toumai™'s telesurgery capability



Remote Control
(Training) Room



Operating Room

One-way latency

7ms

hospital's internal telecom network



“My team came here to Angola to help the country for a great humanitarian purpose. **The potential of robotics, telesurgery and education is the future of healthcare equity for countries such as Angola.**”

“By being able to operate remotely we have demonstrated for the first time in Africa the potential route for future humanitarian success. Today was proof of concept with our entire team here, we must proceed with caution and safety in the future.”

Dr. Vipul Patel President of Society of Robotic Surgery, completed 19,000 robotic surgeries.



Historical 1st FDA-approved IDE tele-surgery clinical trial

From Orlando, USA to Luanda, Angola

- To enable world-class surgeons to perform complex procedures remotely in underserved regions like Africa
- The **17,000km* tele-surgery (85min, Prostatectomy)** sets a new real-world benchmark
- Beyond single operations, **tele-training empowered** African surgeons to master robotic surgery, creating lasting local healthcare capacity





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The Longest Tele-surgery record of the world



Casablanca
Morocco

Two-way communication distance :
More than **30,000 Km**
Straight-line distance **12,000 Km**

Shanghai
China

On-human Telesurgery Procedure: Robotic-Assisted Laparoscopic
Radical Prostatectomy

Time: 2024. 11.16

Main Surgeon: Dr. Youness Ahallal



Dr. Youness stressed:

“Although it was the first time to conduct a telesurgery using the Toumai robot and the distance was so far, I **could still clearly sense the flexibility, precision, and stability of the Toumai robot.**”



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Promote the development of standards and regulatory systems

2024.12

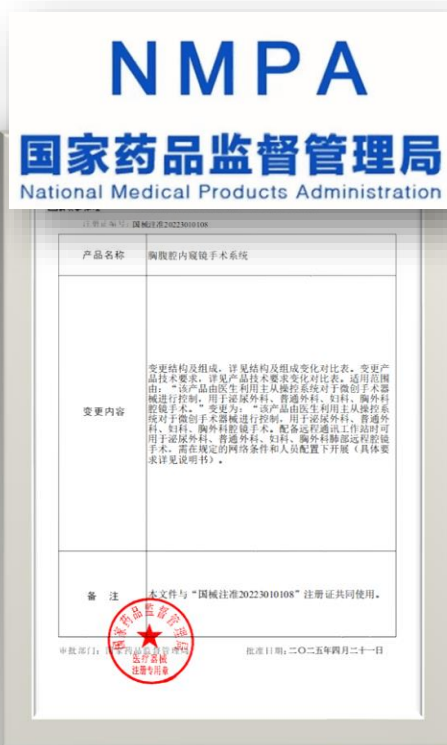
National Standard &
Guidelines



人工智能医疗器械创新合作平台
ARTIFICIAL INTELLIGENT MEDICAL DEVICE INNOVATION AND COOPERATION PLATFORM

2025.04

Regulatory Approved
by NMPA



2025.06

FDA IDE-approved
human trial



World's 1st Regulatory approved tele-surgery system!



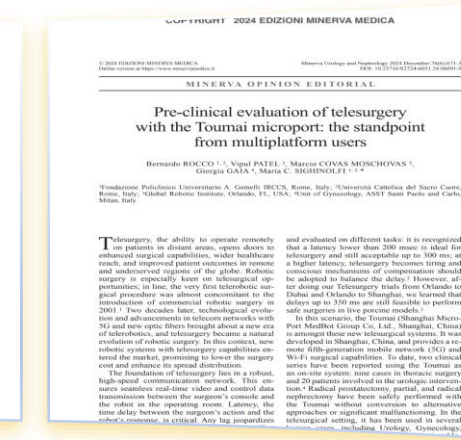
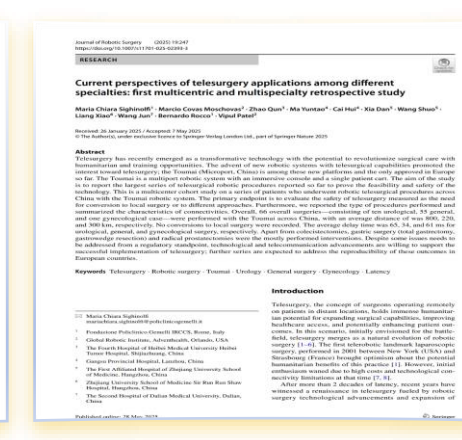
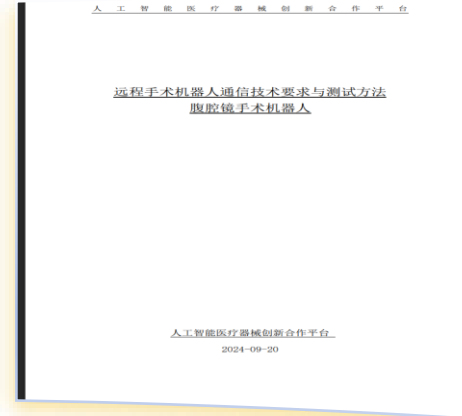
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Advancing Academic Research to Promote Tele-surgery Development

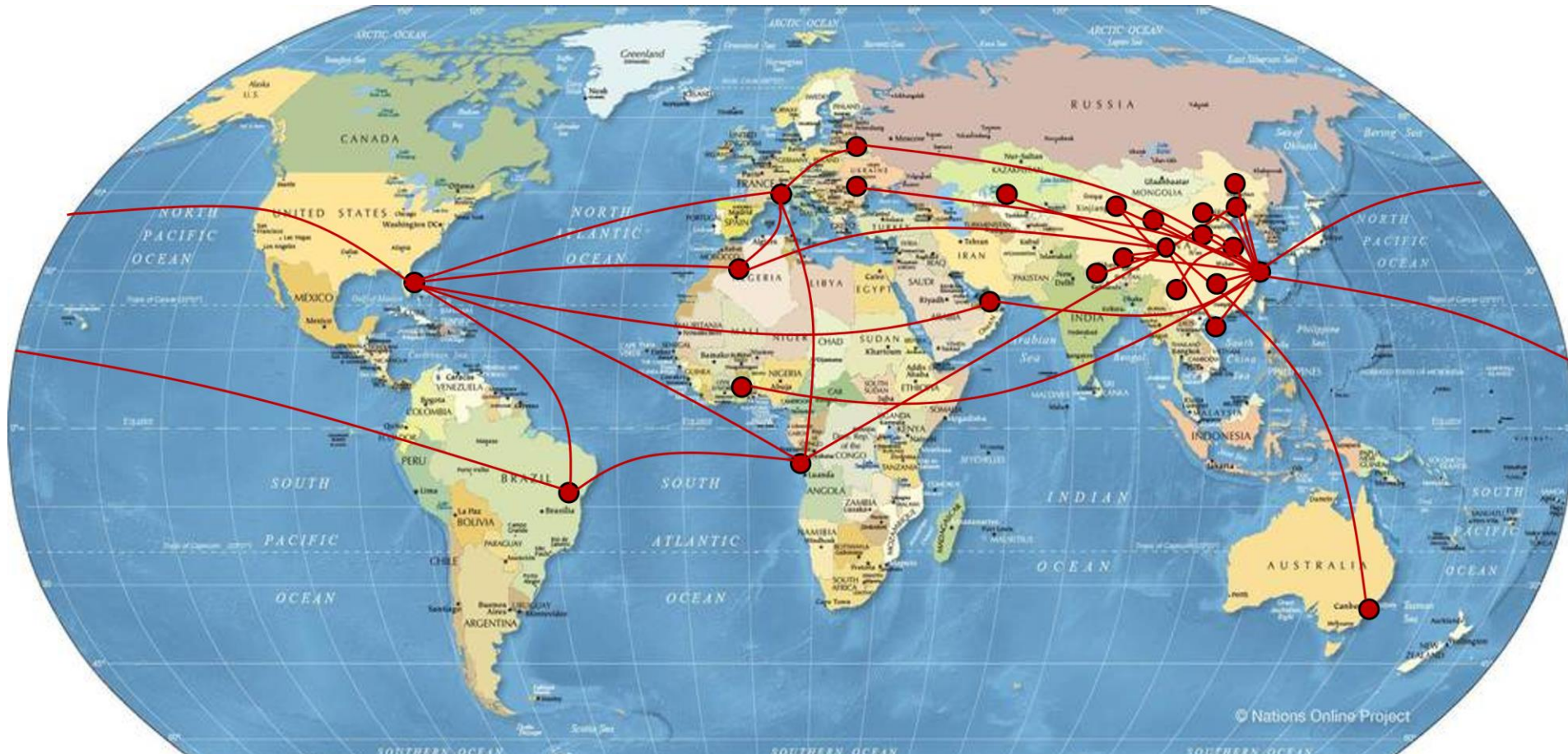
National Telesurgery Standard&Guidelines Drafted by MedBot



Academic Papers Published by Global Medical Experts on Toumai™ Telesurgery



The most ambitious plan: Establish a global three-layers Tele-surgery network



Establish a **cross-continental** telesurgery network, realize Tele-training and guidance, explore the normalization of cross-continental robotic telesurgery, and promote the maturity of telesurgery technology

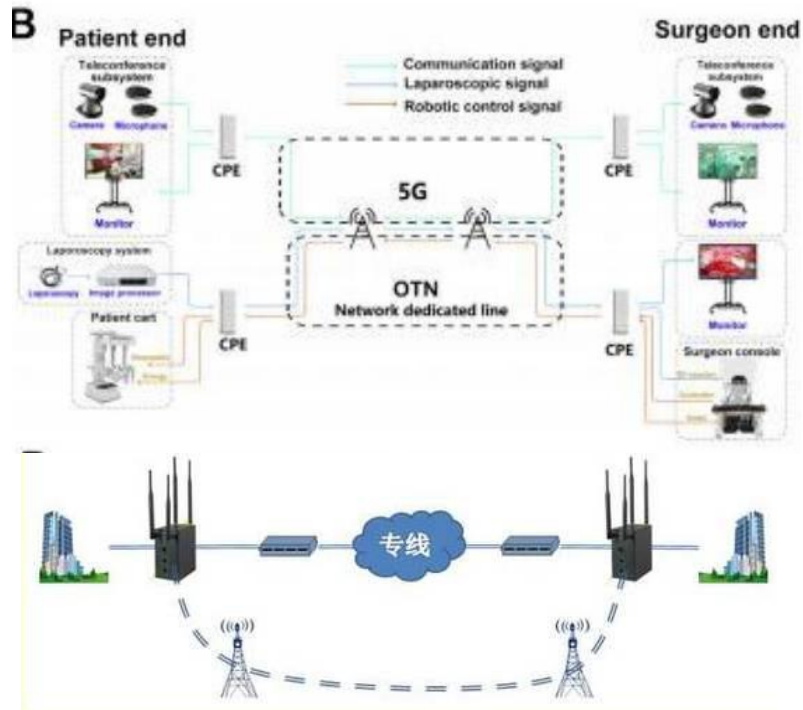


“Ground-Ocean-Space” Integrated Tele-Surgery System

1

Domestic

Laying of dedicated fiber optic lines



2

Cross-continental

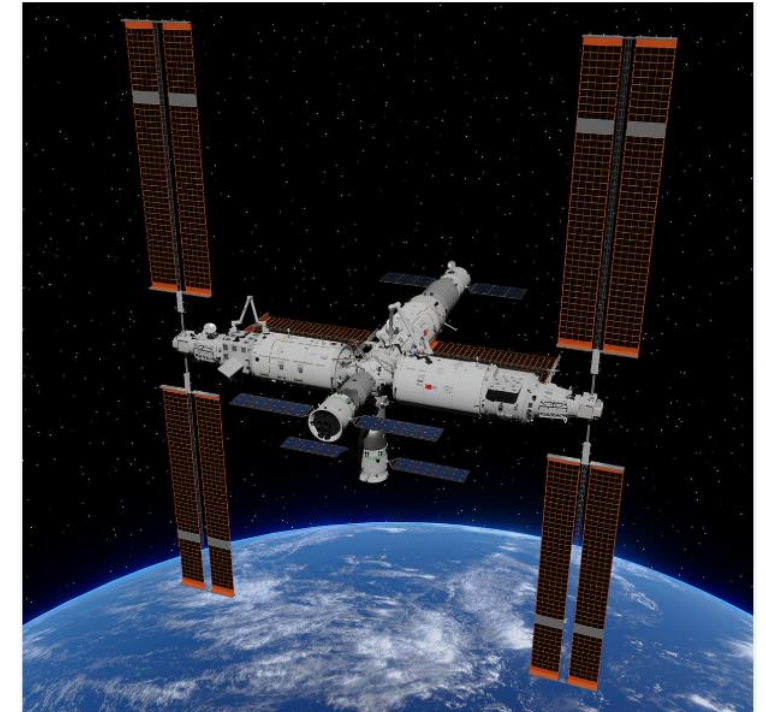
Use of submarine fibre cables and signal base stations



3

Space

Use of satellite links to space stations



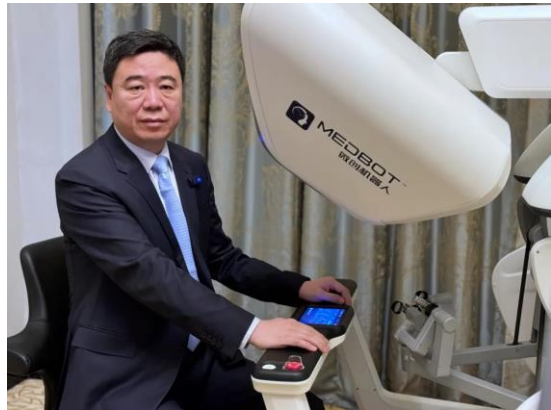


Satellites communication: From high-orbiting to low-orbiting

2025.01: 1st satellite tele-surgery of the world (High orbit)

From Lhasa to Beijing

2 Robotic-Assisted Laparoscopic Hepatectomy

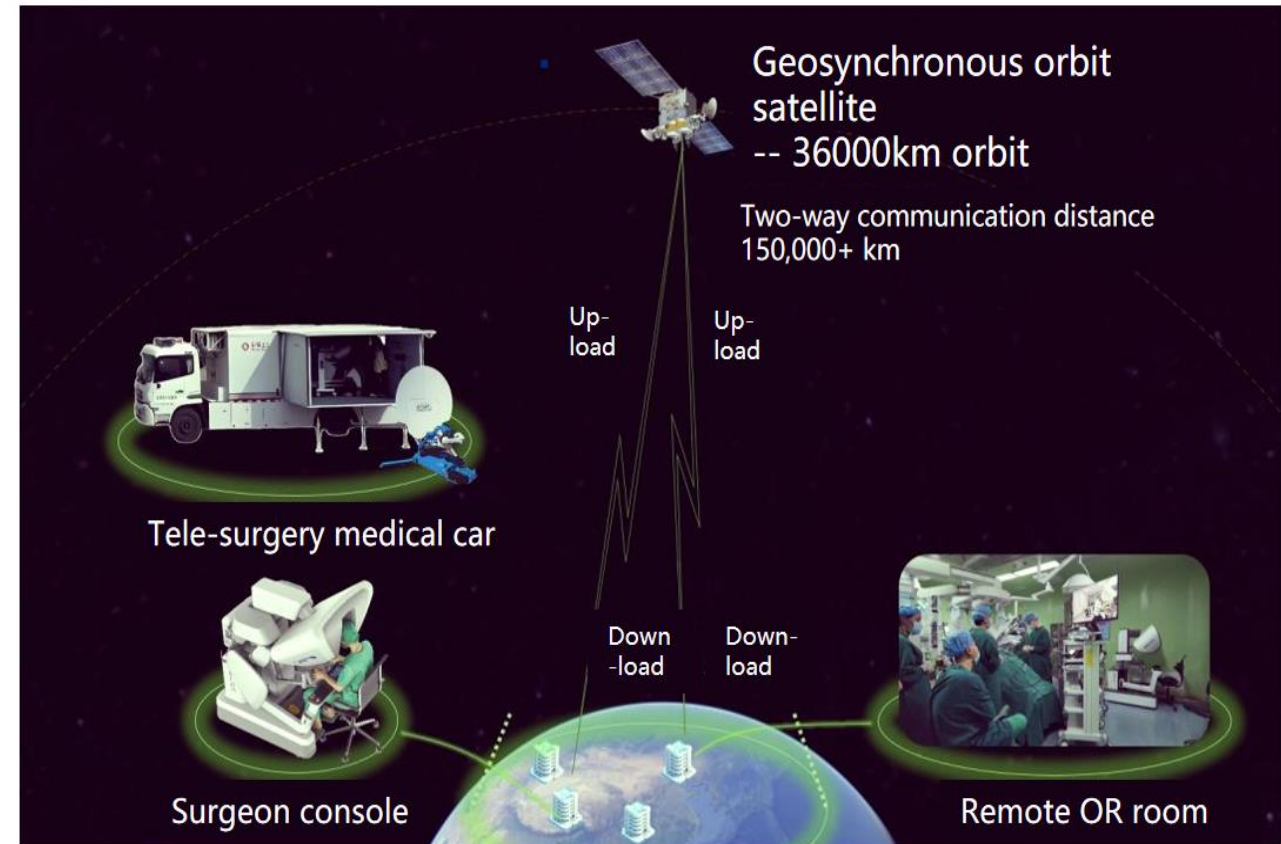


Remote Control
(Training) Room



Operating Room

Earth-orbiting satellites
36,000km near ground level





Satellites communication: From high-orbiting to low-orbiting

2025.07: the 1st Low Orbit satellite tele-surgery of the world

Beijing – Xiongan, 105km

2 Robotic-Assisted Laparoscopic Hepatectomy

Delay: ≤ 100 ms

Operating time: 16 mins & 72 mins



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