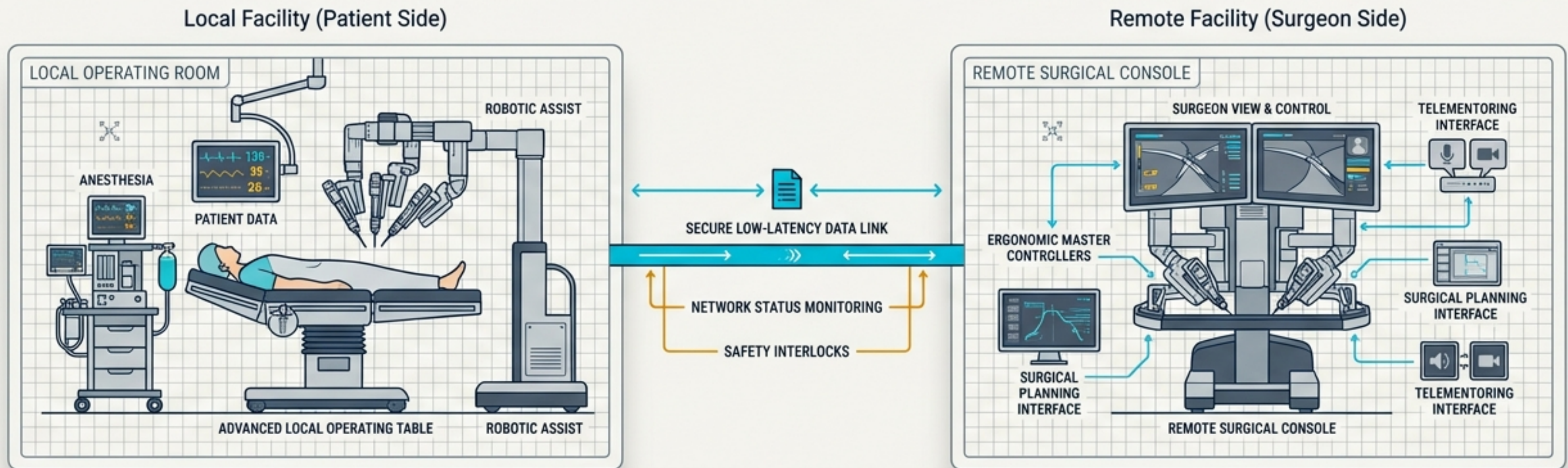


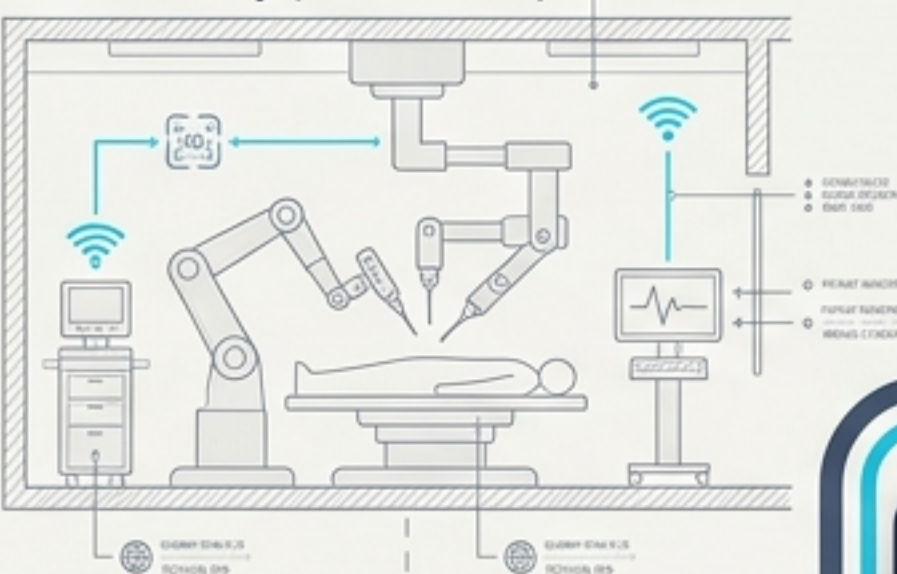
The Telesurgery Implementation Blueprint

A Strategic and Operational Framework for Remote Surgery and Telementoring



Based on the Japan Surgical Society
Clinical Practice Guidelines (2nd Edition)

Local Facility (Patient Side)



Phase 1: Technological Feasibility

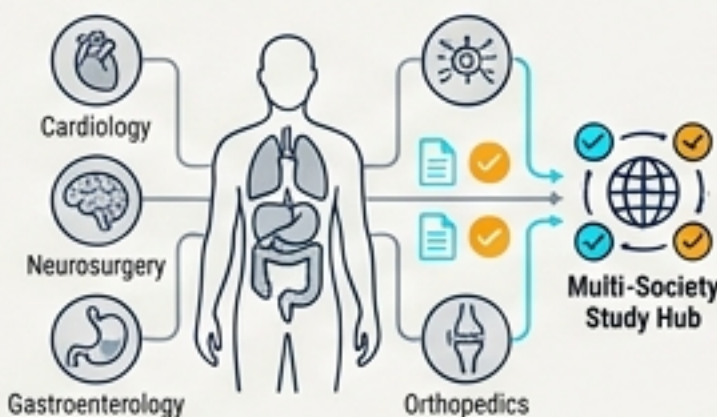
Validating robotic systems, 5G networks, and data processing.



● System Validation: In Progress

Phase 2: Clinical Trials

Multi-society demonstration studies across varied surgical fields.



● Demonstration Studies: Active

Phase 3: The 2nd Edition Mandate (Current)

Transitioning from passive guidelines to **practical, real-world implementation** covering surgeon qualifications, network performance, cybersecurity, and legal frameworks.



● Status: ACTIVE IMPLEMENTATION

Core Mission:

To support the safe, ethical, and responsible global dissemination of telesurgery by **translating technical and legal principles into actionable institutional protocols.**

Remote Facility (Surgeon Side)



Local Facility (Patient Side)

Remote Facility (Surgeon Side)

	Telementoring	Telesurgical Support	Full Telesurgery
		RISK	RISK
Operating Authority	Local surgeon (100%)	Local + Remote collaborative switching	Remote surgeon (100%)
Online Practice Category	D-to-D	D-to-P with D	D-to-P
Primary Liability	Local Surgeon	Local Surgeon	Remote Surgeon
Emergency Response Capability	Local Surgeon	Local Surgeon	Non-surgeon local staff
Legal Feasibility (Japan)	Approved	Approved with strict protocols	Currently prohibited

Source: Japanese Surgical Society Guidelines, 2024. Status: Evolving.



The Local Environment

Where the patient is located and physical interventions occur. Primary locus of legal liability.

The Secure Link:

Synchronized audio, visual, vital sign data, and real-time robotic command telemetry.

The Remote Environment

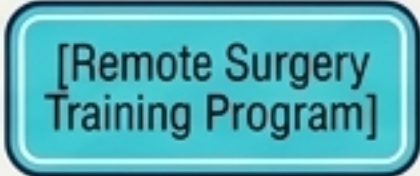
Where the supervising physician provides technical support, guidance, or partial robotic operation.

Local Facility (Patient Side)

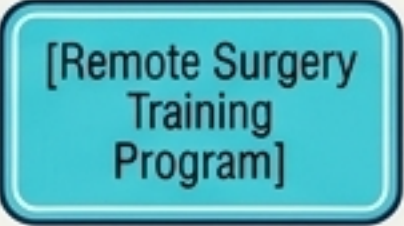
Dual-Site Team Roster: Personnel and Certifications

Remote Facility (Surgeon Side)

Local Facility Personnel

 Local Surgeon (Primary)	 [Robot System Operator Cert]  [Society Board Cert]  [Remote Surgery Training Program] Must have prior experience with the planned procedure or direct proctor instruction.
 Surgical Assistants & Nurses	 [Manufacturer Training]  [Remote Surgery Training Program]
 Clinical Engineer	 [Robot Maintenance Cert] Must be physically present for troubleshooting.

Remote Facility Personnel

 Remote Surgeon / Mentor	 [Instructor/Proctor Cert matching specific robot]  [Remote Surgery Training Program]
 Clinical Engineer	 [Robot Maintenance Cert]

Institutional Prerequisites & System Harmonization

Safety & Governance



Mandatory Medical Safety Management and Information Security systems (compliant with MHLW guidelines).

Prerequisite: Institutional approval as a **"Highly Difficult New Medical Technology"**.

Infrastructure & Medical Info Dept



Dedicated communication lines for surgical robots PLUS a separate, independent line for continuous Web-Conferencing (audio/video/vitals monitoring).

Medical Information Departments must actively manage these lines.

Fallback Capacity (Local Only)



The local facility must possess the equipment and staff necessary to immediately complete the robotic procedure via open procedure via open abdominal/thoracic or endoscopic surgery if telesurgery fails.

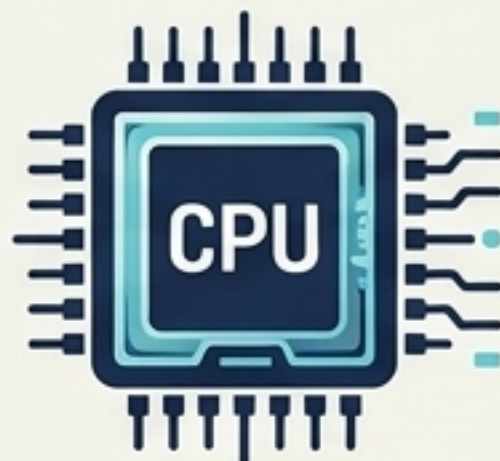
Local Facility (Patient Side)

Technical Thresholds: Latency & Hardware Specifications

Remote Facility (Surgeon Side)



Monitor Delay



Compression Delay



Network Delay

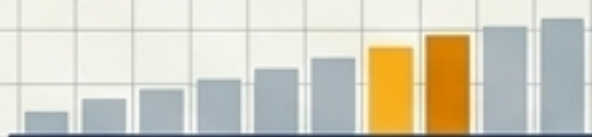


Perceived Latency

Telementoring Threshold



< 450 milliseconds



Telesurgical Support Threshold



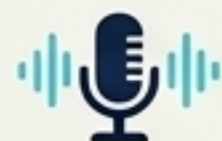
<=100 milliseconds



Hardware Specifications



- **Video:** Full HD (1920x1080) minimum, ≥ 60 fps.

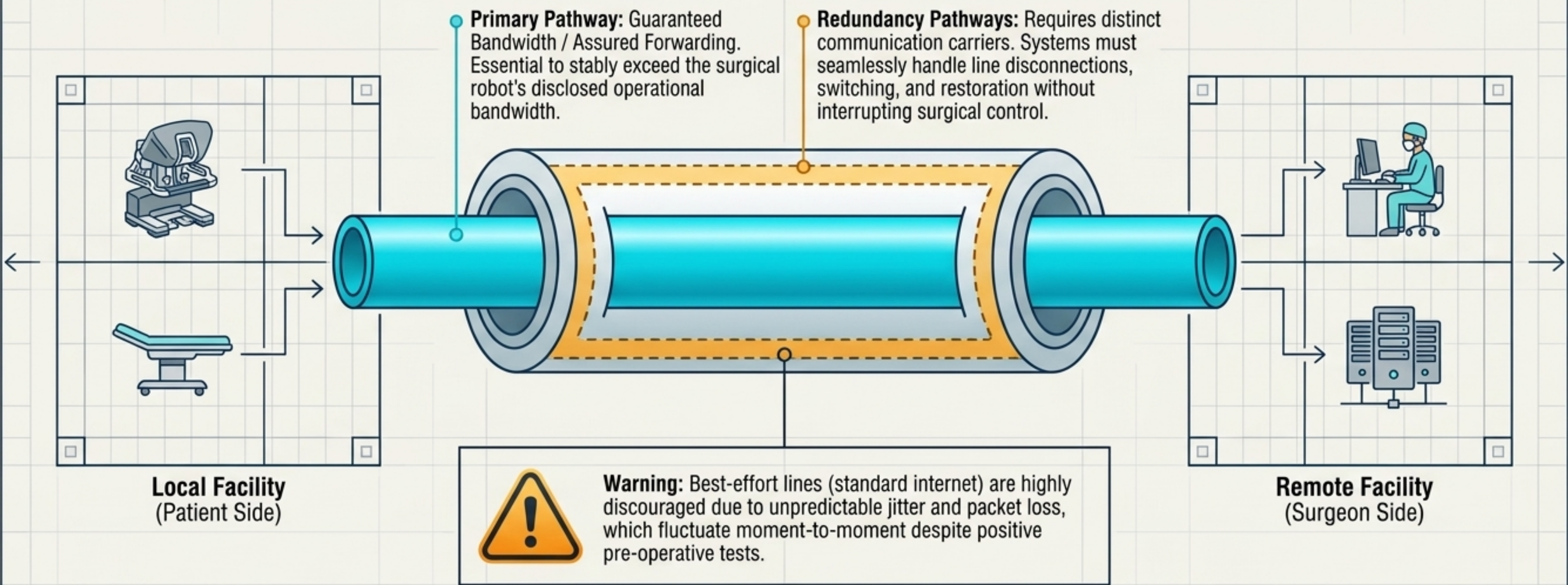


- **Audio:** 44.1 kHz (CD quality), full duplex, echo cancellation.

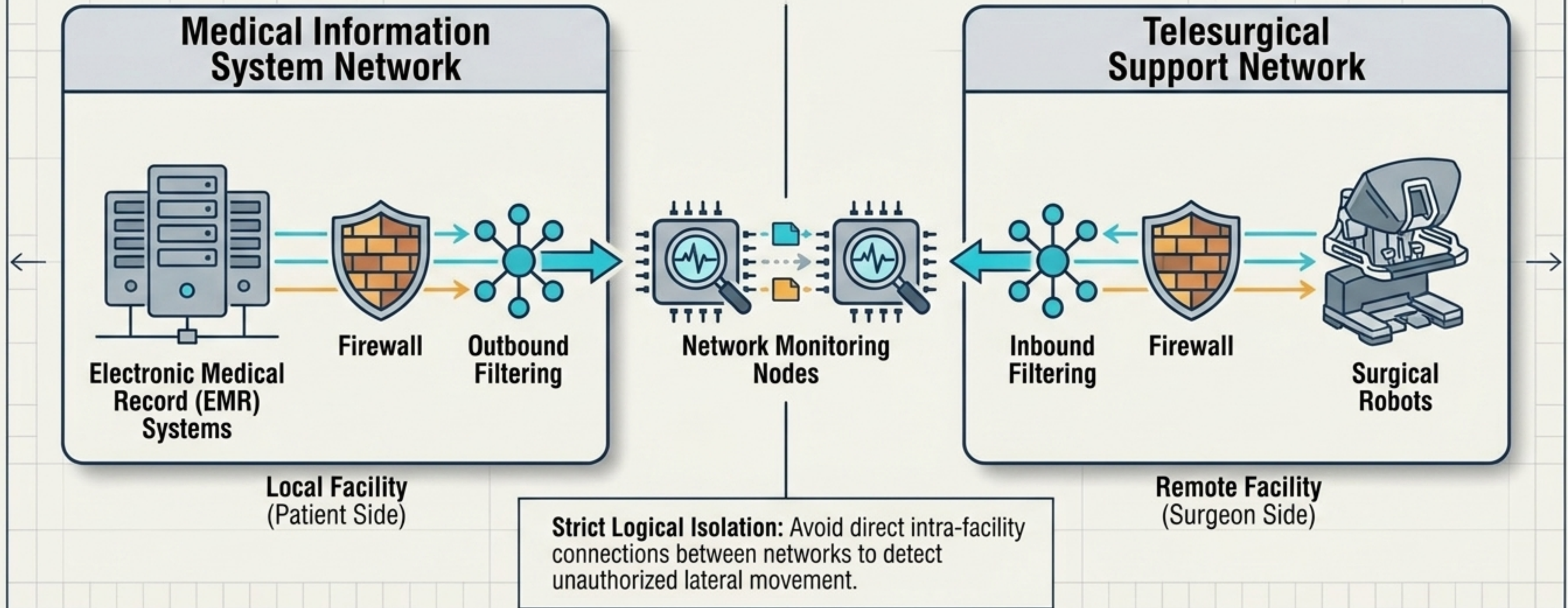


- **Robot:** Class III device, equipped with internal logic to mitigate control device stoppages during packet loss or reordering.

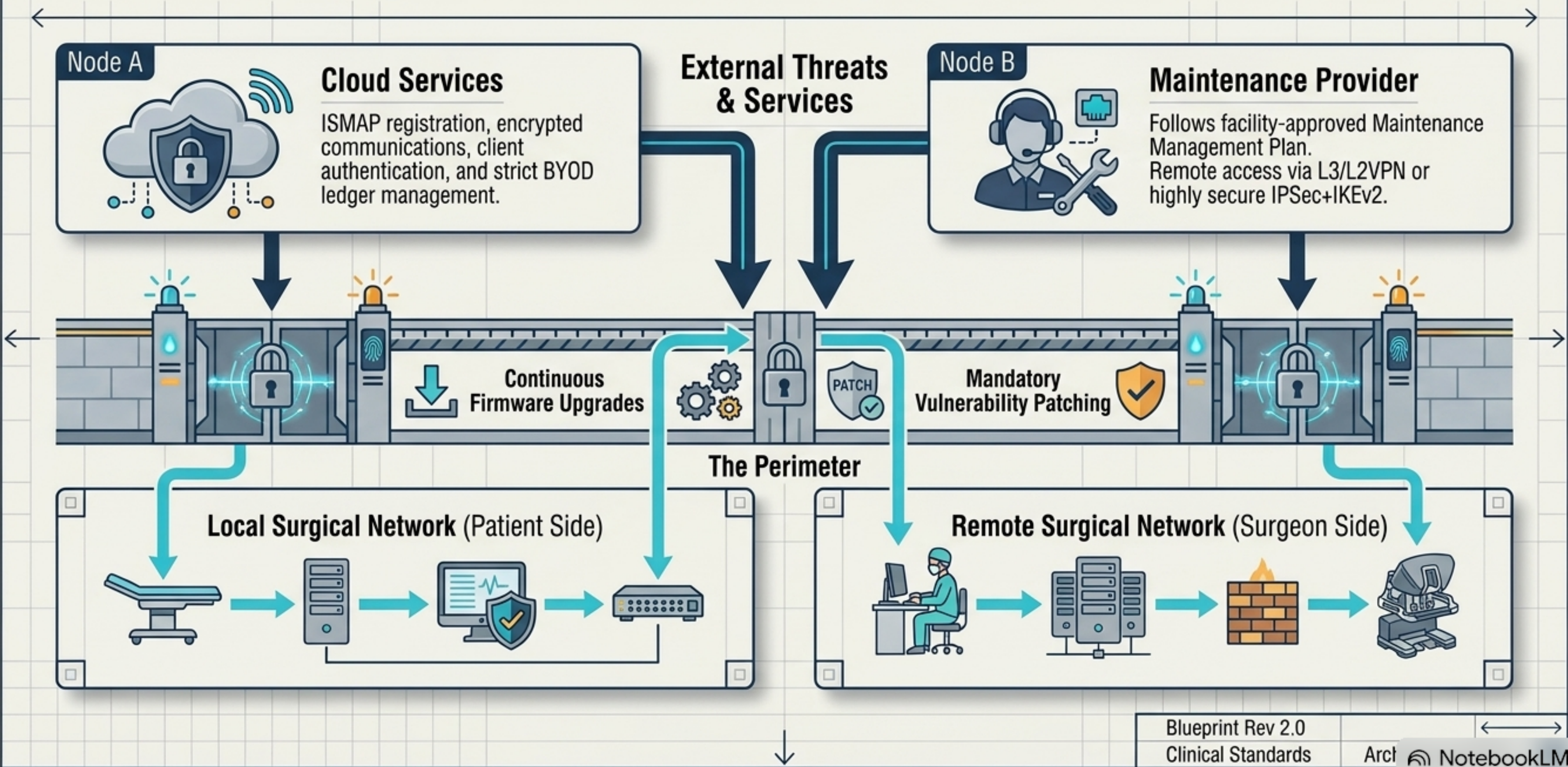
Network Redundancy & Connectivity: Pipeline Architecture



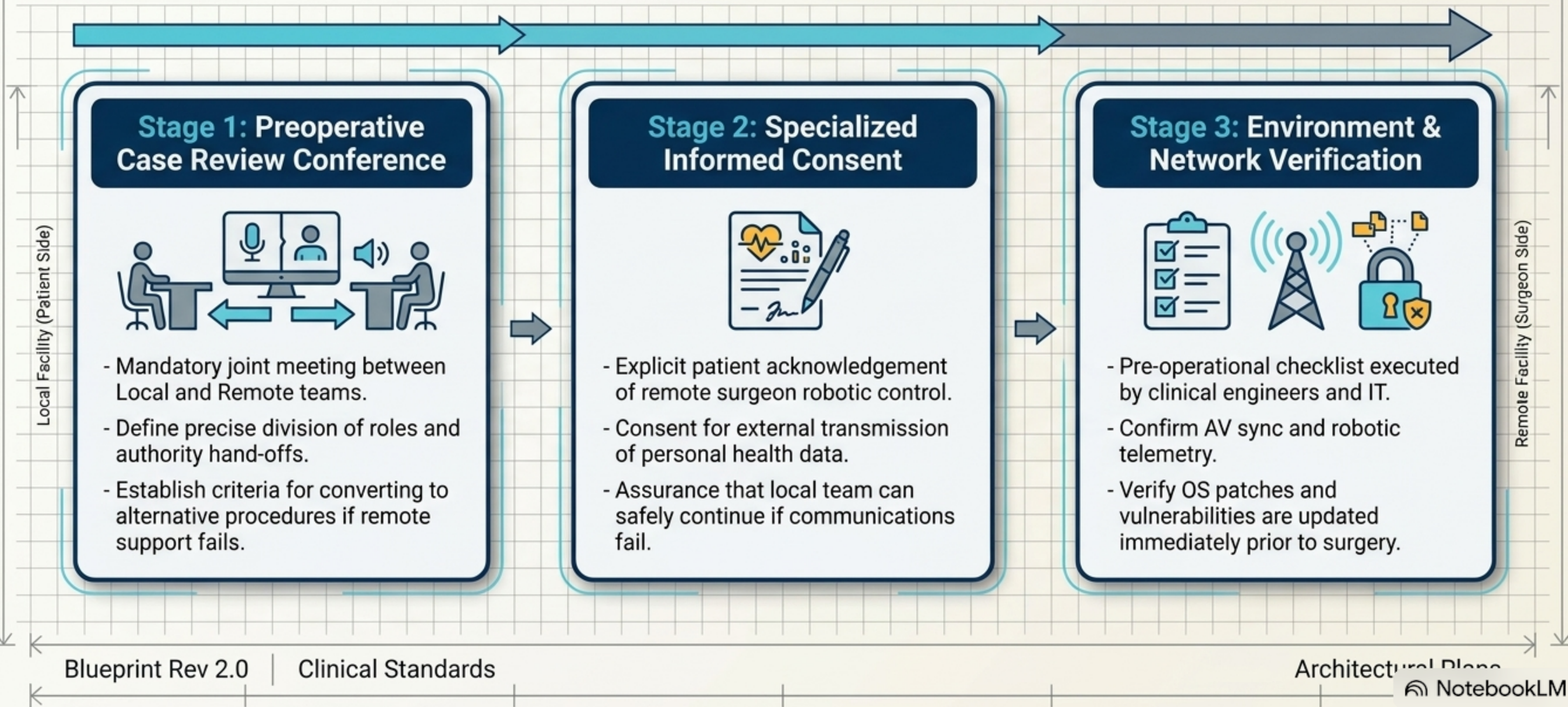
Network Isolation & Logical Separation: Preventing Lateral Movement



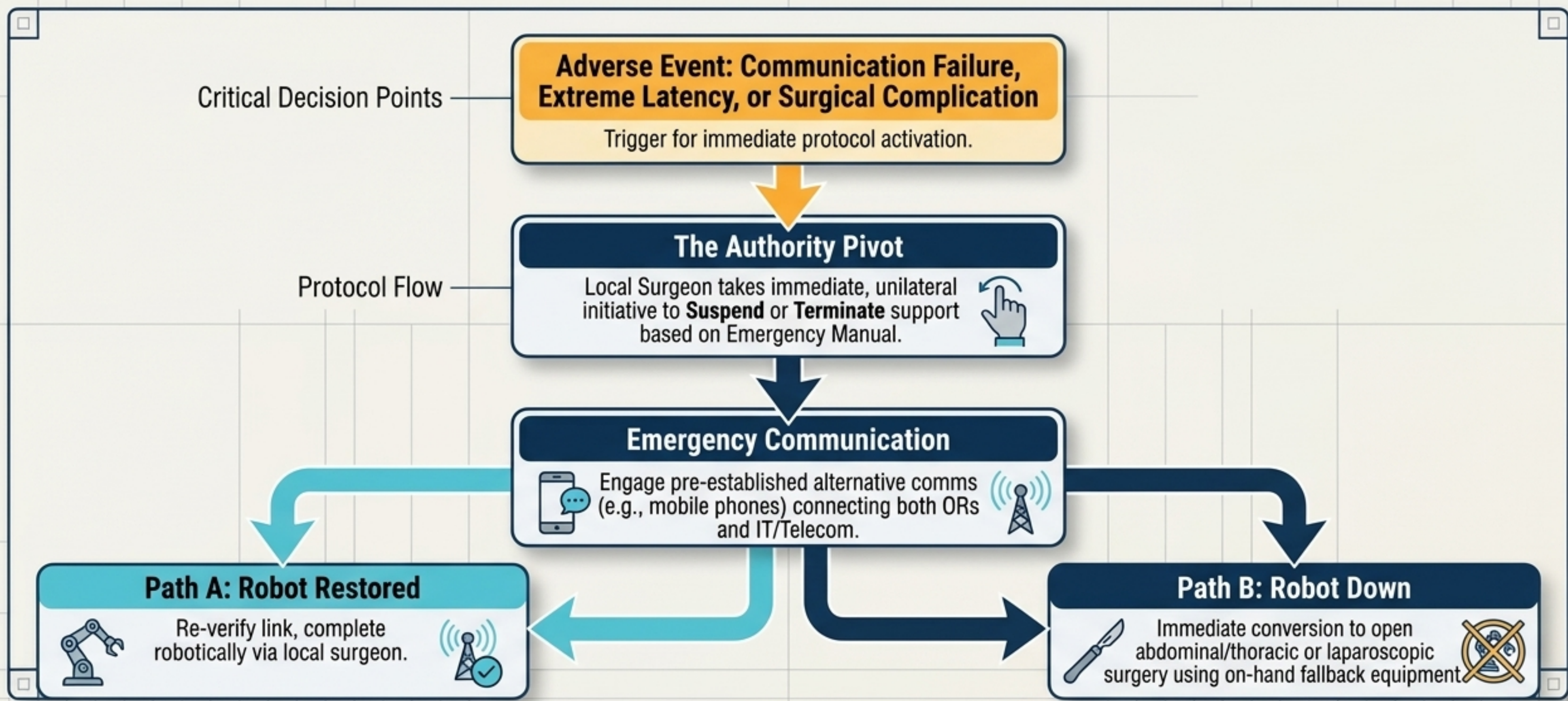
External Security Countermeasures: Top-Down Structured Defense Grid



Rigorous Preoperative Workflow: Three-Stage Clinical & Technical Validation



Emergency Response: High-Contrast Decision Tree for Critical Failures



Executive Considerations: Responsibility & Economics

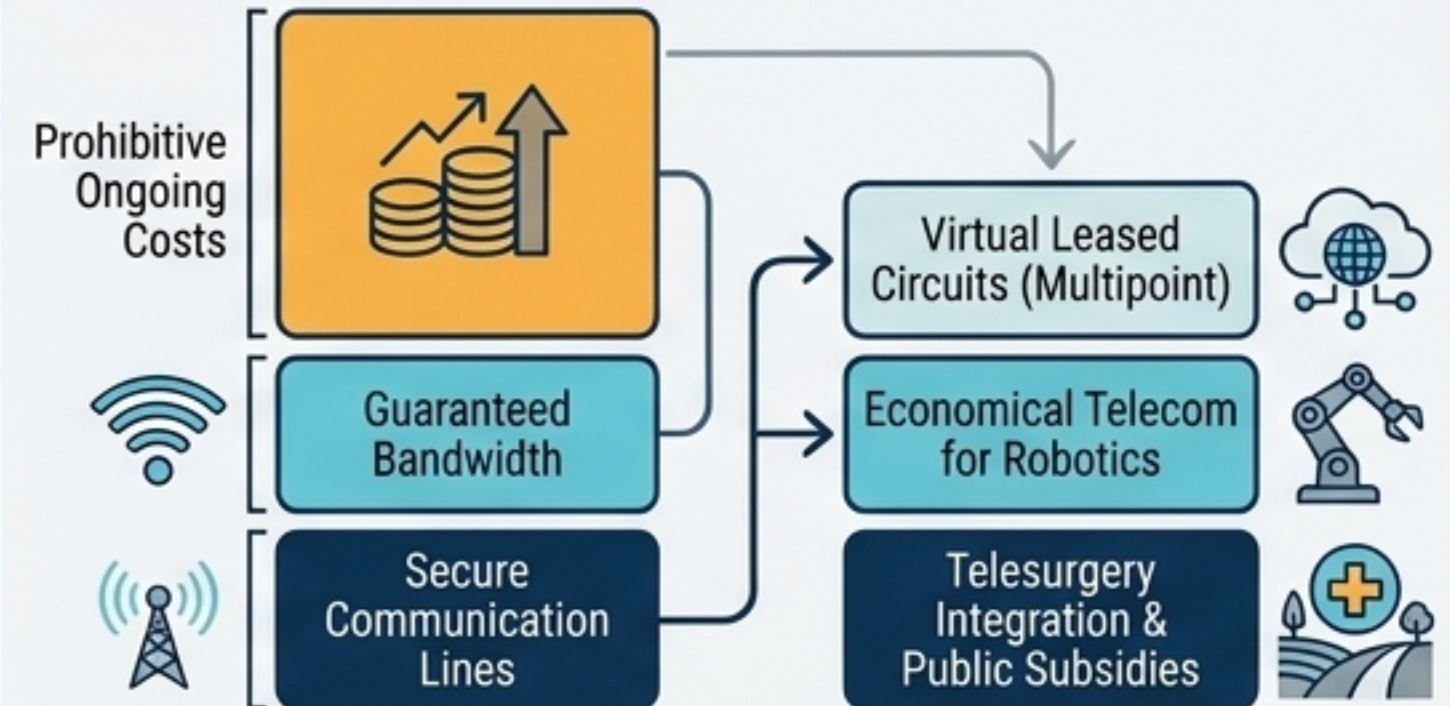
Apportionment of Responsibility



The Primary Anchor: The Local Surgeon and Local Facility Administrator bear primary responsibility for medical procedures and postoperative outcomes.

The Joint Agreement: A written agreement mapping exact shared liability must be established case-by-case between Local and Remote facilities before the operation begins.

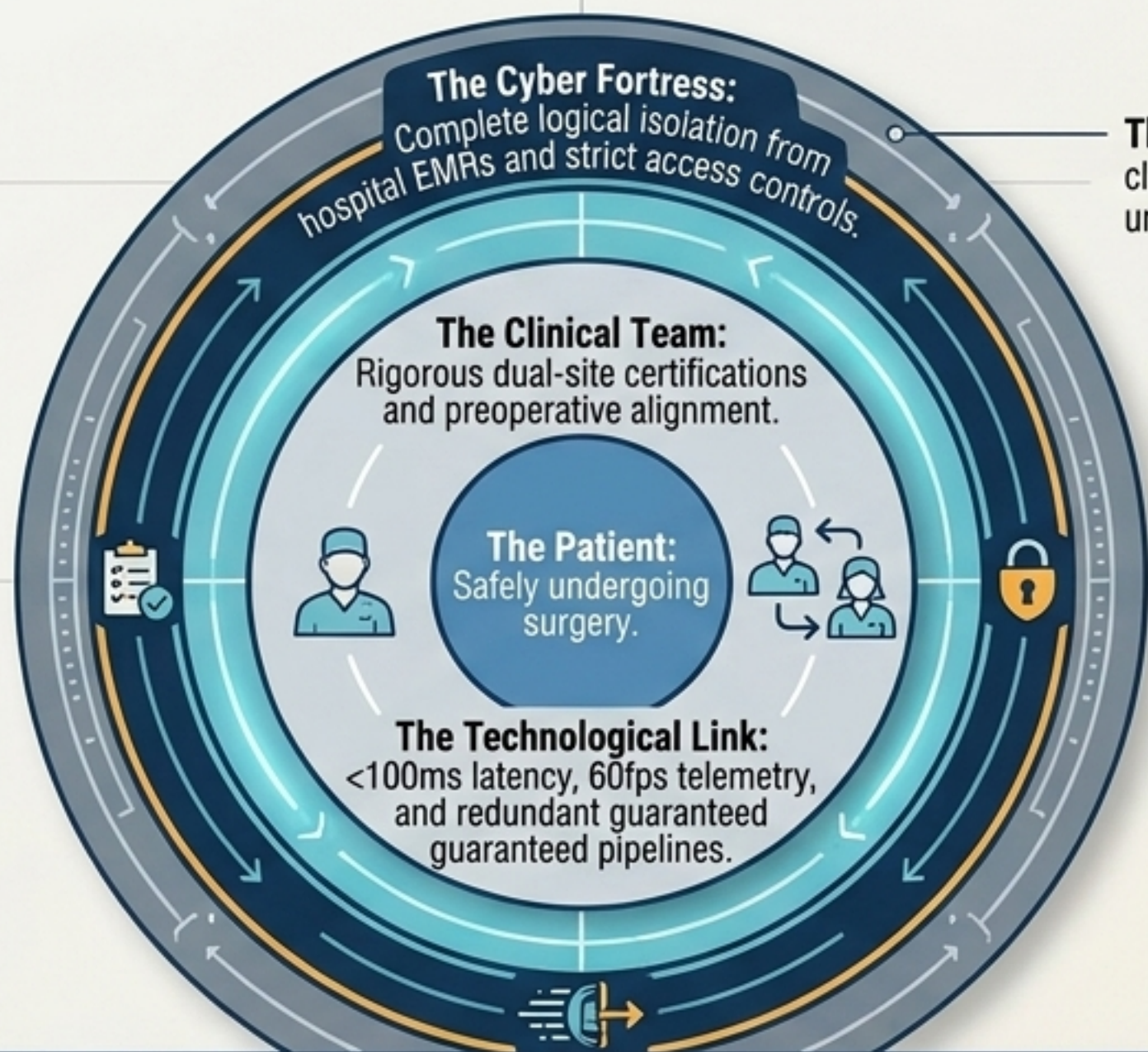
The Economic Architecture



Current Challenge: Guaranteed-bandwidth, highly secure communication lines carry prohibitive, high ongoing costs.

Future Mandates: Requirement for virtual leased circuits (multipoint), economical telecom services tailored for robotics, and the integration of telesurgery into public health subsidies to support elderly/rural populations.

The Telesurgery Trust Architecture: A Concentric Framework for Safe Remote Operations



Telesurgery is not merely a technological achievement; it is an orchestrated alignment of specialized human expertise, resilient infrastructure, and rigorous governance.