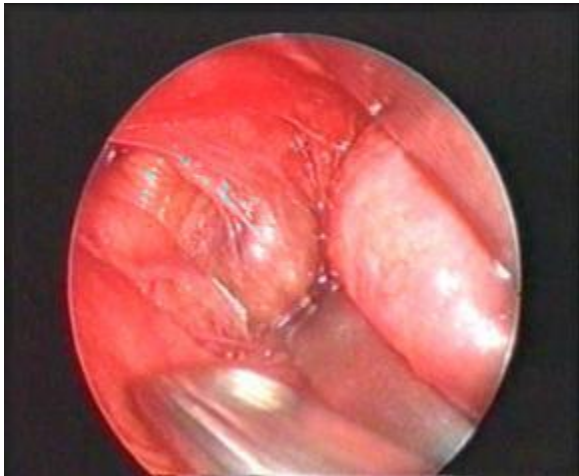


**Design, Development and Deployment of cost-effective Surgical
Telepresence Suite: Case Study from a tertiary care academic
institute of North India**

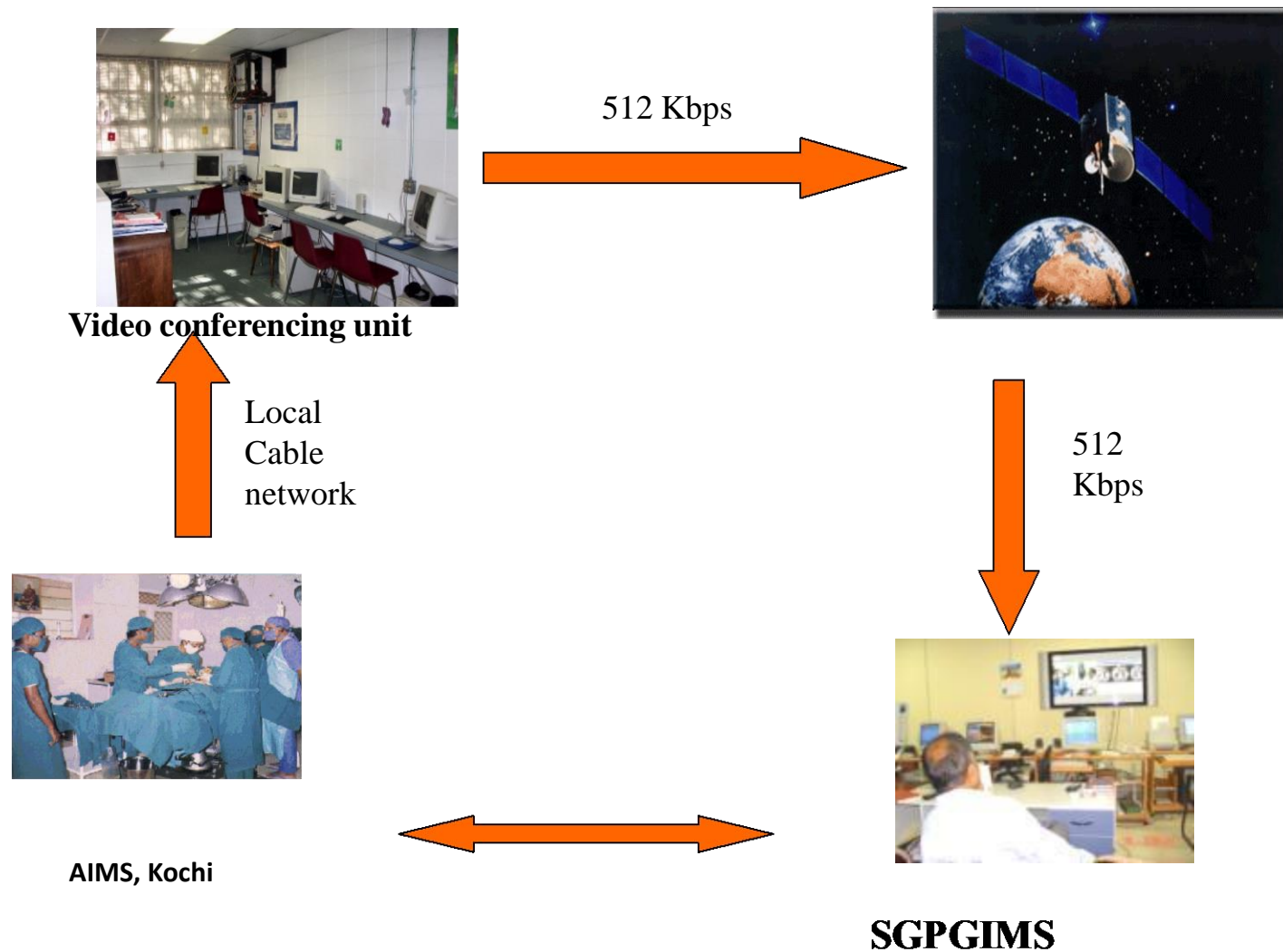
Prof. S. K. Mishra

Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS),
Head, Dept. of Endocrine Surgery & Faculty I/C,
SGPGI Telemedicine Programme
Lucknow, India

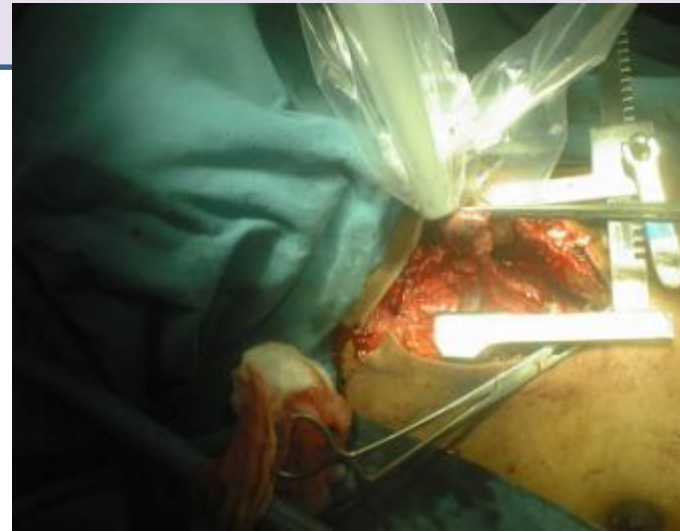
Endocrine Tele-Surgery Workshop (1999)



Tele-mentoring Trial With AIMS, Kochi (March 2004)



Satcom based Tele-mentoring Trial A case of failed Parathyroid Surgery

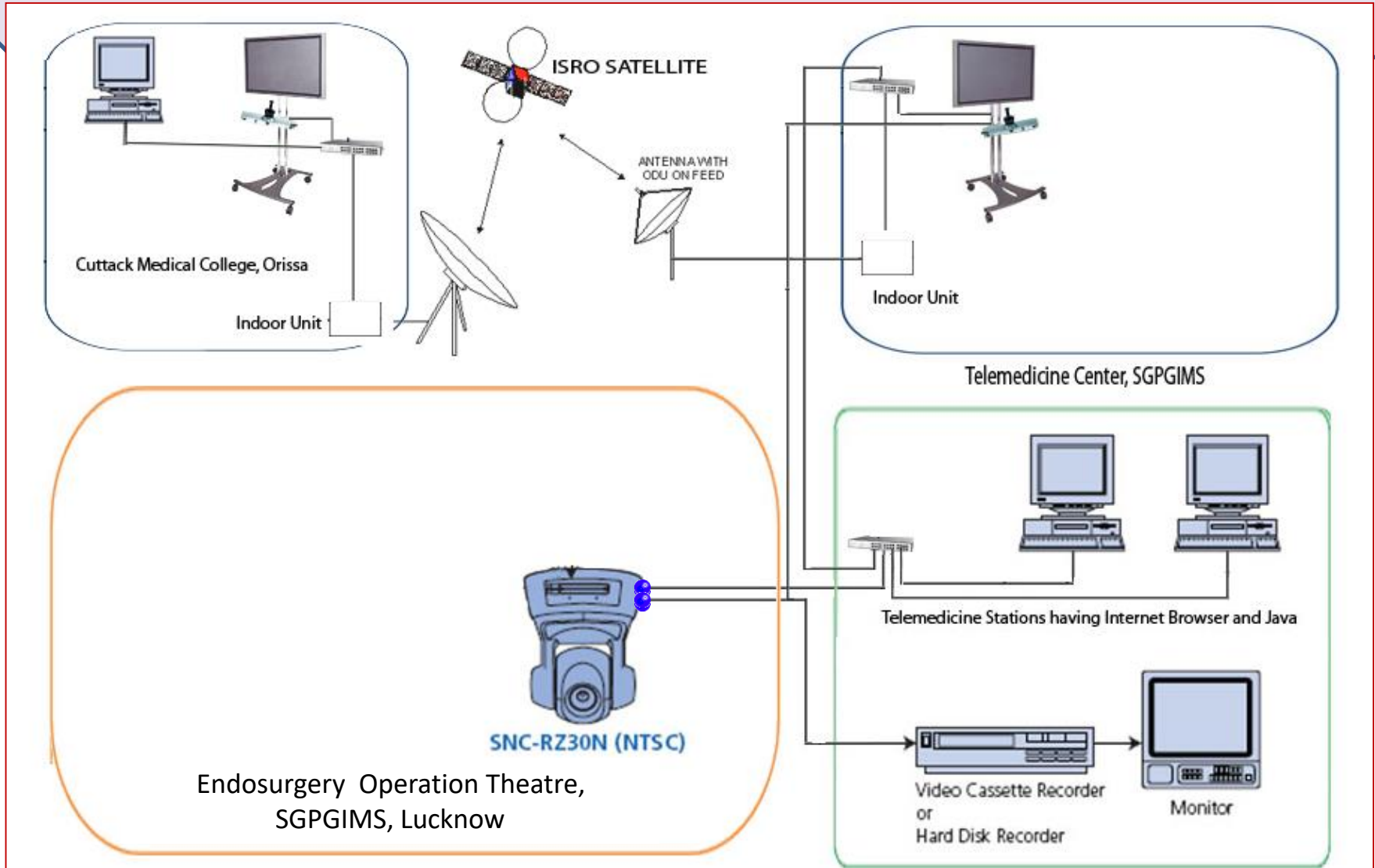


Telementoring in Endocrine Surgery, Mishra SK, Mishra A, Pradeep PV; Chapter 11, Telesurgery Book, Edited by Kumar S/ Marescaux J Springer-Verlag GmbH, Heidelberg/Germany. ISBN no. 978-3-540-72998-3, 2007

Intra-operative Tele-consultation Network Proof of Concept - 2005

- IP based Video conferencing system
- Java Enabled IP Camera
- Computer system for camera navigation
- 17" CRT Monitor / Large display screen.
- IP Telemedicine Network

Network Design



Implementation

- A network Sony camera was mounted over a stand in the Endocrine Surgery operation theatre which was connected over the Ethernet (CAT-5) cable to the network switch connected to video-conferencing and IT platform located at Telemedicine Center.
- Web interface allowed control of the camera angle and zoom at the local and remote telemedicine nodes.

Navigation Platform



Screen Shot from Desktop Computer





Technical Trials

- Initial technical trials were carried out between January – March, 2005
- Few surgical sessions were transmitted to Telemedicine node located at S.C.B. Medical College, Cuttack located 150 kms away
- Live Surgery and audio two way transmission between SGPGI and venue of an international telemedicine conference held at Bangalore, March 2005.

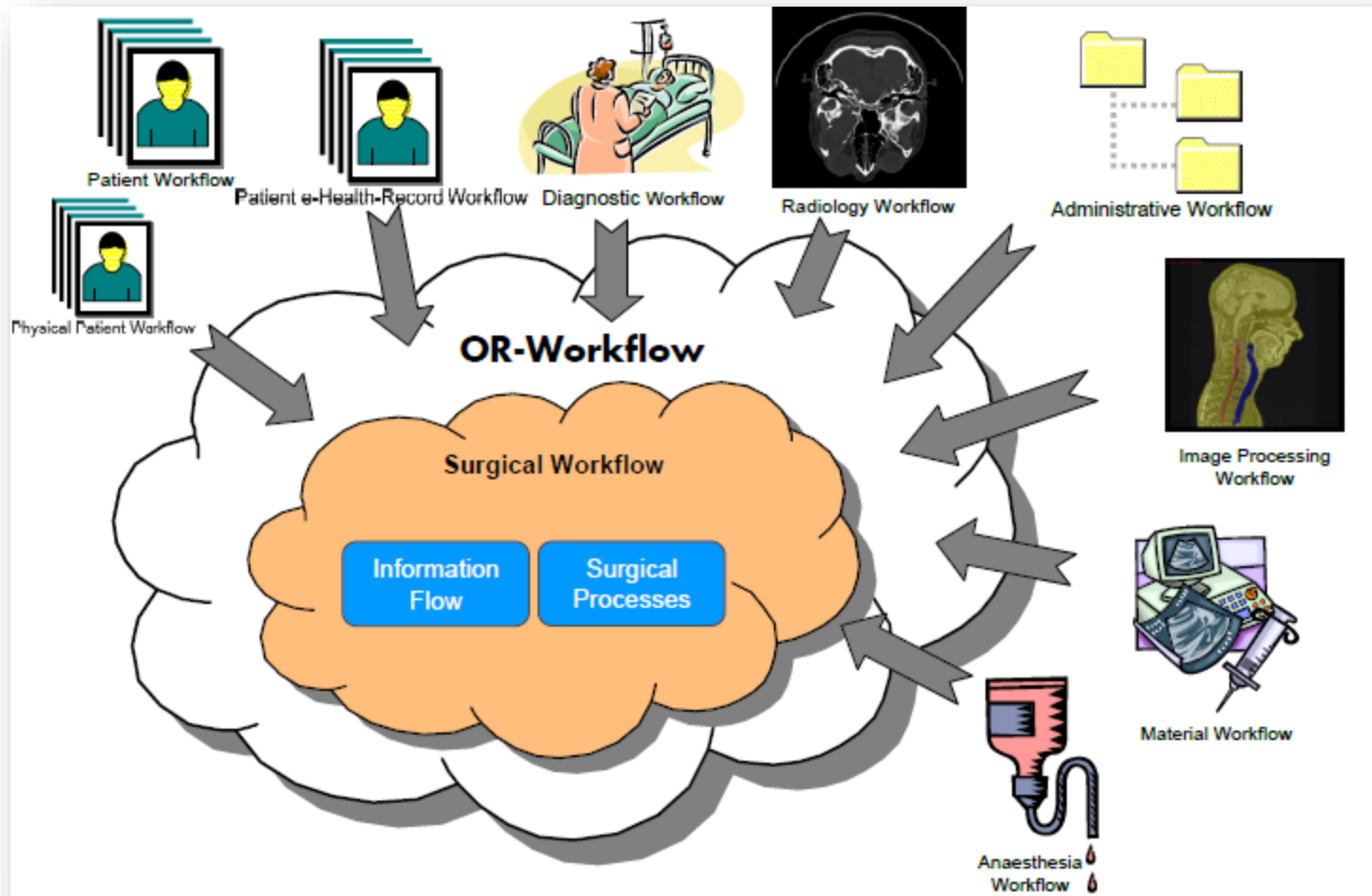
Project: Integrated Digital OT: 2005

Background

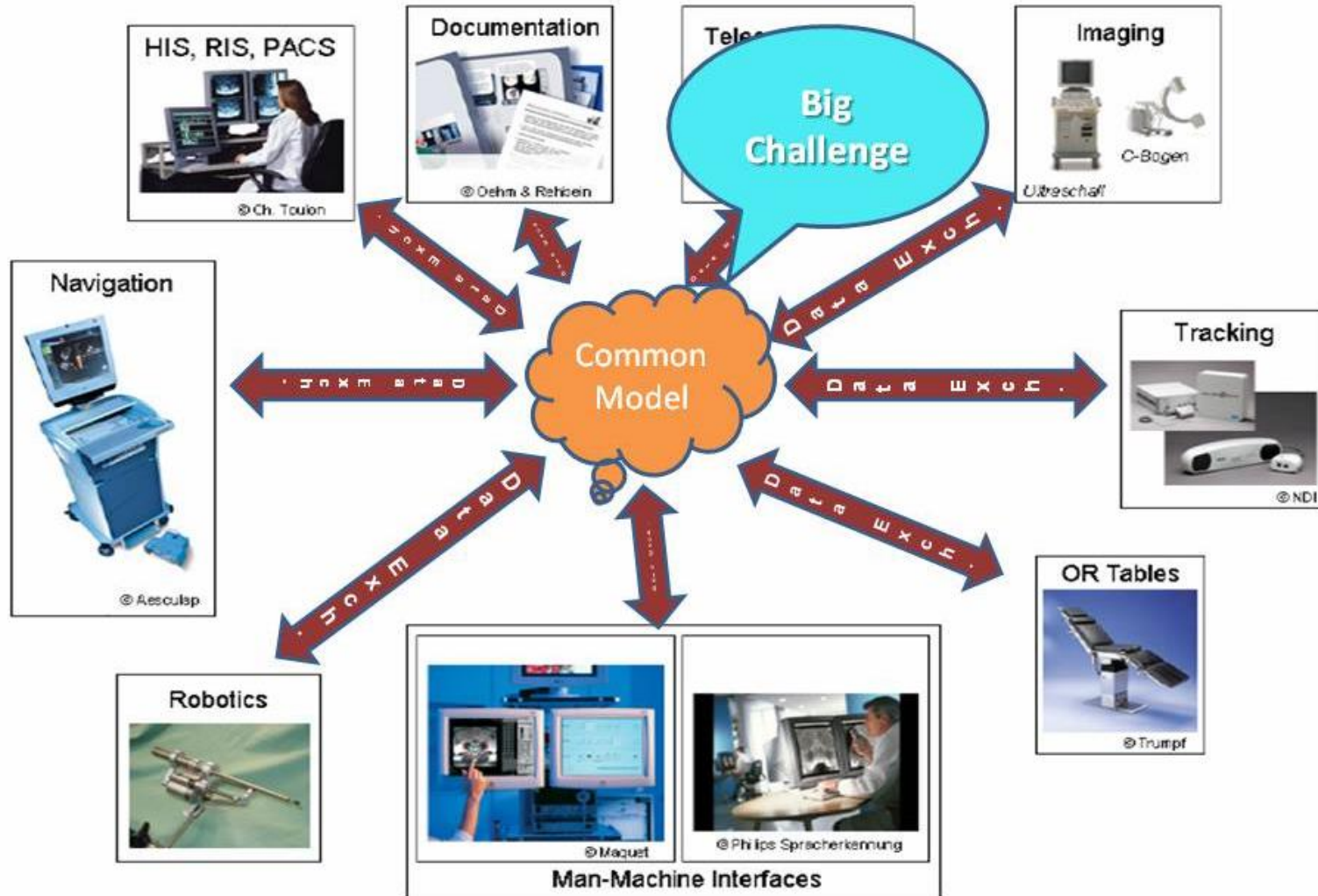
- Demonstration of Live surgical procedures from a gallery attached to the operation theatre
- Current system of education: Glass partition between OT and gallery. No interaction.
- Surgical Workshop using interactive local audio-video network, Tele-medical videoconference and edited video
- Web based system: Live web casting, VoD
- Advancement in interventional procedures and complex technology aided surgical intervention demands skill education.



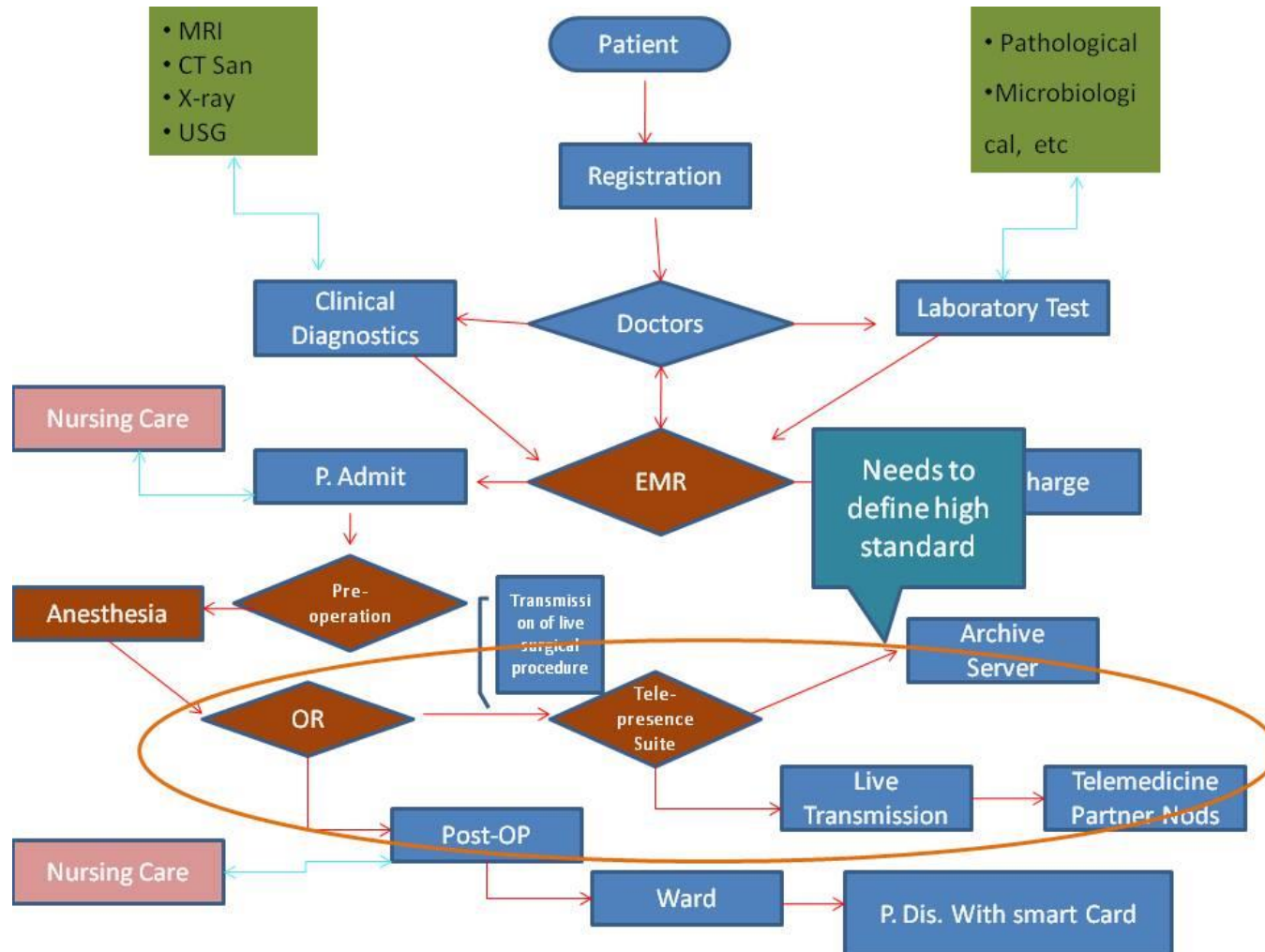
Work Flow in the hospital



Clinical Data Exchange



Work Flow in the hospital



Computer Assisted Digital Exchange

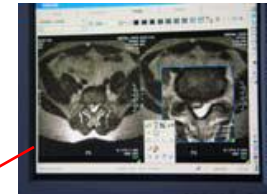
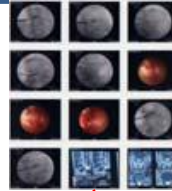
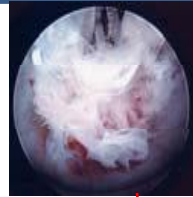
Video Endoscopy Monitor

Image Manager
- Report

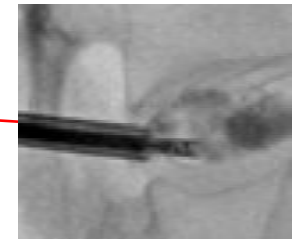
C-Arms Images



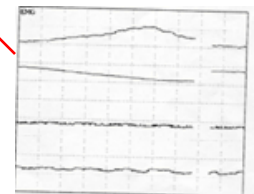
ECG Monitoring



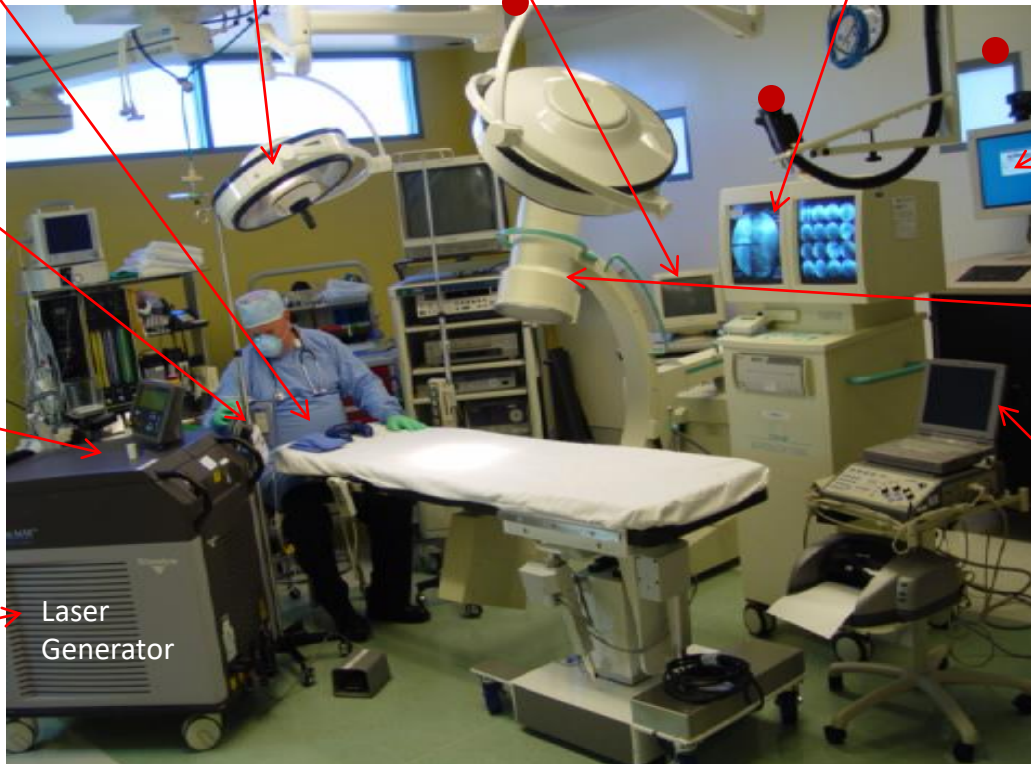
MRI Images- PACS



C-Arm Fluoroscopy



IMG Monitoring



Left Side OR



Image view Boxes

Laser
Generator

Teleconferencing - telesurgery

Design, Development and Operation

- Integrated Operation Theatre
- Surgical Skill Transfer & Management System
- Preparation of web based video content which can be accessed by outside world through interactive videoconferencing/ real time streaming/Video on Demand (VOD) was the main objective of this project.
- Integration of image inputs
 - In light camera
 - Laparoscopic camera
 - Operative microscope
 - Room camera mounted in the ceiling
 - Audio / Videoconference system
 - Intra-operative Ultrasound, Fluoroscopy
 - Vital Sign monitor record
 - Any other equipment used during surgery

Integrated Operation Theatre



Inside OT (Video)



Surgical Telepresence



Tele-presence Video

Telepresence Suite & Surgical Video Hub

Tele-Collaboration @ Integrated Medical Lecture Theatre



3D Surgery



Doctors viewing live 3D Surgery inside the lecture theatre





2nd International Arctic Telemedicine Conference; 24-25 Nov 2016

Mobile Telemedicine Kiosk

(Operation using Hospital LAN)



Mobile kiosk @ Patient's bedside



Doctor's Duty Room



Department's Seminar Room

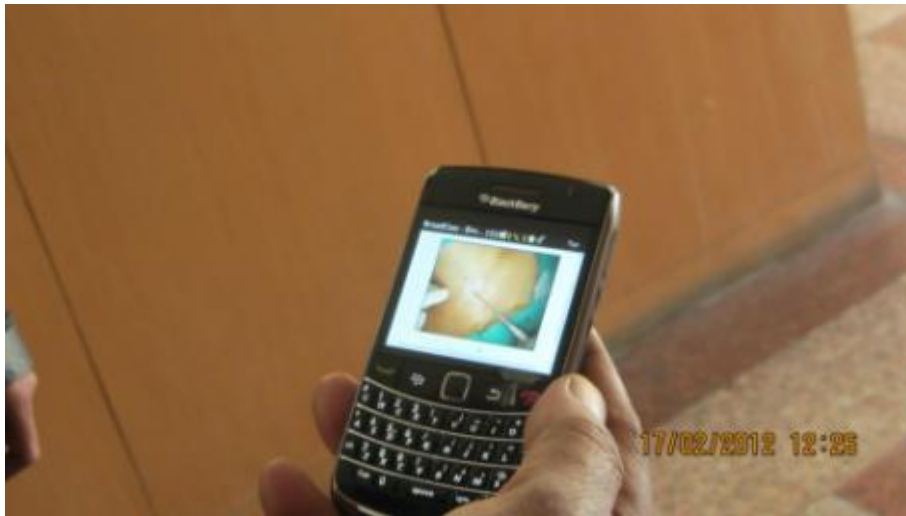


Tele-Clinic in Out Patient Department

Live Streaming of Surgical Video



Mobile Learning Platforms



SGPGI Knowledge Engineering Architecture



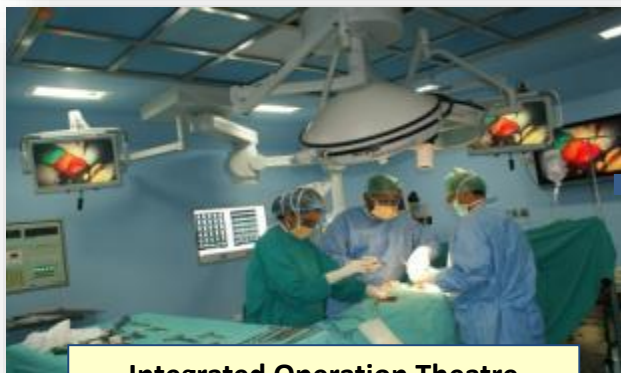
Hi-Tech Lecture Theatre



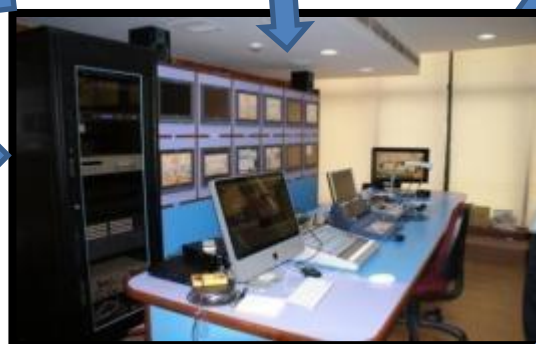
Broadcast Quality Studio Camera



Network Monitoring Hub



Integrated Operation Theatre



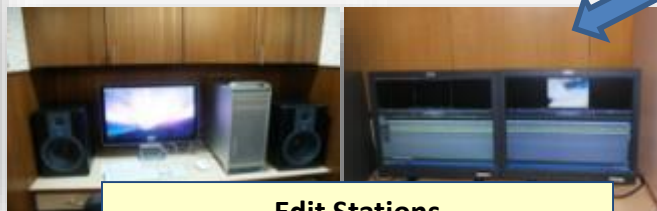
Production Control Unit (PCR)



Data Server



Video Conferencing Suite



Edit Stations

Data Center (National Resource Center)



Hospital Backup Servers

Web Servers, Mail Servers

Proxy Servers

Application Servers

Data & Video Storage

Video Bridge RMX 2000

Streaming Server RSS 2000

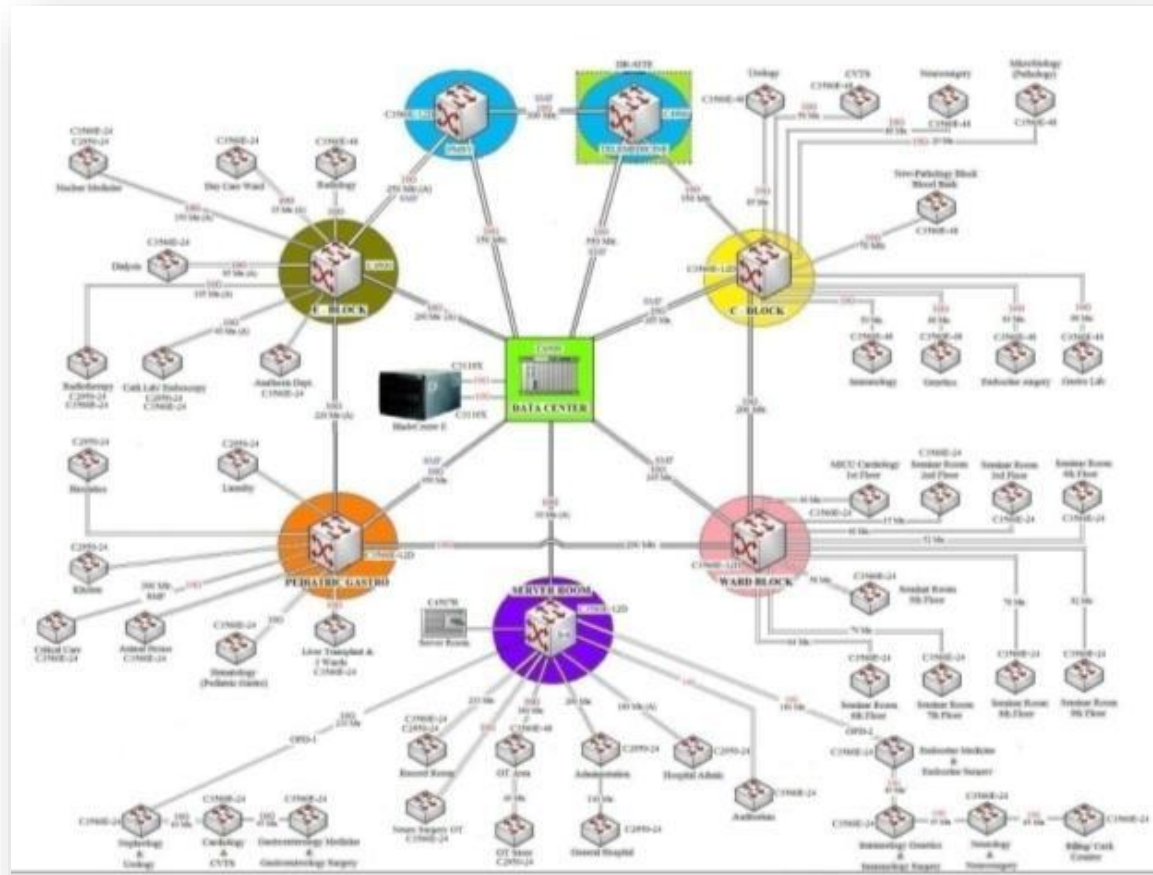
Video Scheduler

Wide Area Application Server (WAAS)

- **UP Medical College Network**
- **National Medical College Network**
- **National Knowledge Network**
- **SAARC Telemedicine & PAN Africa e-Network**
- **SGPGI Knowledge Network**

Intra-Hospital Telemedicine Network

- Riding over Hospital Information System Network



SGPGIMS Knowledge Network Enterprise



Conclusion

- With the maturity of Video over IP technology and lowering cost of high definition video and audio and high resolution visualization enterprise medical image network needs to be designed at least in academic medical institutions.
- SGPGI case study can be studied as a model to work further in this field of medical imaging in particular building infrastructure for skill based training both in house and distance education mode.



Thank you for your attention !