Robotic & Telesurgery Research

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Approved for Public Release.
Robotic and Telesurgery Research Summary

Telesurgery

**Comms Latency:**
- Modify surgical procedures
- Safe Telesurgery at 500ms
- Match to City-Pairs

**Automatic Surgery:**
- Record Surgery in Simulator
- Execute with Unmanned Robot
- Identify Control Variables

Simulation

**Surgical Rehearsal:**
- Dynamic Organ Model in Sim
- Patient-specific Rehearsal
- Improve Surgeon Performance

**Military-use Validation:**
- Simulator of Robotic Surgery
- Retain Skills in Theater
- Define Deployable Package

Robotic Curriculum

**Consensus Conferences:**
- Define Certification Criteria
- Develop Curriculum
- Develop Training Tasks

**Curriculum Validation:**
- Validate the Program
- Identify Testing Measures
- Set Passing Criteria
Telesurgery: Communication Latency

Comm Latency = 1 + 2

1. Robot Commands
   - Surgeon Audio

2. Stereo HD Video
   - Team Audio
Telesurgery: Simulated Latency

da Vinci Skills Simulator

Mimic dV-Trainer
Telesurgery: Latency Tolerance (Concept)

Surgical Procedure Time

Milliseconds

Latency Tolerance

City Pair Mean Latency

sd1-pos

sd1-neg
Potential City Pairs:
Orlando, FL
Bethesda, MD
Seattle, WA
Boston, MA
New York, NY
Atlanta, GA
Dallas, TX
Denver, CO
San Fran, CA

Strasbourg, FR
Sao Paulo, BZ
Tel Aviv, IS
Telesurgery Modifications

• Control pace of movement
• Subdivide current atomic movements
• Change direction of movements
• Introduce new instruments
• Stabilize tissue
• ....
Simulation: Surgical Rehearsal
Telesurgery: Automatic Surgery

Data Trans
Simulation: Military-use Validation

Robotic Surgery Skills Retention
Fundamentals of Robotic Surgery

WHAT
- Outcomes & Metrics
  - Course Development
- Simulator Development
- Validation Studies
- Implement: Survey Training Certification
- Issue Certification

HOW
- Consensus Conference
- Standard Curriculum Template
- Engineering Physical Simulator
- Standard Validation Template
- Current Procedures
- Issue Mandates And Certificates

WHO
- ABS
- SAGES
- ACS
- Specialty Societies
- SAGES Societies Academia
- Industry with Academia Medical Input
- ACS Participating Societies
- FLS SAGES/ACS
- ABS
- certifier

Created by Dr. Rick Satava
Future Directions

• Robotics
  – Machine assistance for all surgical procedures. “Robot” will take multiple forms to fit the needs of the procedure.
  – Redesigning the operating room to accommodate people, machines, and information.

• Simulation
  – Lap and Robotics use equipment to intermediate between the surgeon and the patient. Creates a natural environment for training simulators
  – VR/Games/Browser in providing in-hospital maintenance training. Currently done largely with in-service seminars.

• Education
  – Curriculum that integrates lecture, live, and simulation. Nursing has taken the lead in this, surgery catching up.