Robotic & Telesurgery Research

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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)

![Graph showing latency tolerance over surgical procedure time]

- 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

Pierce the object at the indicated location and pull the needle through. Start from the yellow side of the target.

Skill Trans
Telesurgery: Automatic Surgery
Simulation: Military-use Validation

Robotic Surgery Skills Retention
# Fundamentals of Robotic Surgery

## What
- Outcomes & Metrics
- 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, Academia
- Industry with Academia Medical Input
- ACS
- SAGES, Participating Societies
- FLS
- SAGES/ACS
- ABS
- Certifier
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.