Medical Simulation: Another Scientific Revolution

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http://www.peostri.army.mil/CTO

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Security and OPSEC Review Completed: No Issues.
“If I have seen further it is only by standing on the shoulders of giants.”
– Isaac Newton

Galileo, 1632
Dynamics

Kepler, 1630
Planetary Motion

Newton, 1687
Newtonian Mechanics
Kuhn’s Scientific Revolution

- Revolutionary Science
- Normal Science (Evolutionary)
- Pre-Paradigm
- Paradigms Created
- New Paradigms Created

Weaknesses Revealed
Scientific Revolution

Newton’s fixed space  Einstein’s flexible space-time
Scientific Smackdown

Copernicus

Ptolemy

Einstein

Newton

Do Many in Sim

See One, Do One, Teach One
Evolutionary Change
Evolutionary Change
Revolutionary Change
Revolutionary Change
Enlisted MOS

Infantry Branch
11B Infantryman
11C Indirect Fire Infantryman
11X Infantryman (ambitious; turn into 11Z,11C, or 11M)
11Z Infantry Senior Sergeant
11H Infantry Anti-Armor Specialist
11M Mechanized Infantryman

Field Artillery Branch
13H Cannon Crewmember
13C TAC Fire Operations Specialist
13D Field Artillery Tactical Data Systems Specialist
13E Cannon Fire Direction Specialist
13F Fire Support Specialist
13M Multiple Launch Rocket System Crewmember
13P MLRS/LANCE Operations Fire Direction Specialist
13Q Field Artillery Firefinder Radar Operator
13S Field Artillery Surveyor
13W Field Artillery Meteorological Crewmember
13X Field Artillery Enlistment Option
13Z Field Artillery Senior Sergeant

Air Defense Artillery Branch
14I Patriot Fire Control Enhanced Operator/Maintainer
14J Early Warning System Operator
14M Man Portable Air Defense System Crewmember
14R Bradley Linbacker Crewmember
14S Avenger Crewmember
14T PATRIOT Launching Station Enlisted Operator/Maintainer
14Z Command/Control Systems Technician

Aviation Branch
15B Aircraft Powerplant Repairer
15D Aircraft Powertrain Repairer
15F Aircraft Wire Systems Inspector
15G Aircraft Structural Repairer
15I Aircraft Prescription/Prescription Distribution
15J OH-58D Aircraft Powerplant/Avionics Systems Repairer
15K Aircraft Components Repair Supervisor
15M UH-1 Helicopter Repairer
15N Avionics Mechanic
15P Aviation Operations Specialist
15Q Air Traffic Control Operator
15R AH-64 Attack Helicopter Repairer
15S OH-58D Helicopter Repairer
15T UH-60 Helicopter Repairer
15U Medium Helicopter Repairer
15V Observation/ Scout/ Helicopter Repairer
15X AH-64 Armament/Electrical Systems Repairer
15Y AH-64D Armament/ Electrical Systems Repairer
15Z Aircraft Maintenance Senior Sergeant

Special Forces Branch
18B Special Forces Weapons Sergeant
18C Special Forces Engineer Sergeant
18D Special Forces Medical Sergeant
18E Special Forces Communications Sergeant
18F Special Forces Assistant Operations & Intelligence Sergeant

CMF 63 - Mechanical Maintenance
44B Metal Worker
44E Machinist
45B Small Arms/Artillery Repairer
45G Fire Control Repairer
45K Armament Repairer
52C Utilities Equipment Repairer
52D Power Generation Equipment Repairer
62B Construction Equipment Repairer
63A MA Abrams Tank Turret Mechanic/MA Abrams Tank Mechanic
63D Artillery Mechanic
63F Fuel and Electrical Repairer/Track Vehicle Mechanic
63Q Quartermaster and Chemical Equipment Repairer
63M M2 Bradley Fighting Vehicle System Mechanic/ Bradley Fighting Vehicle Systems Turret Mechanic
63X Track Vehicle Repairer
63W All Wheel Vehicle Mechanic
65Z Mechanical Maintenance Supervisor

Medical Department Branches
68A Medical Equipment Repairer
68D Operating Room Specialist
68L Dental Specialist
68M Patient Administration Specialist
68N Hospital Equipment Specialist
68P Downloadable Equipment Specialist
68Q Pharmaceutical Specialist
68R Veterinary Food Inspection Specialist
68S Preventive Medicine Specialist
68T Animal Care Specialist
68U Respiratory Specialist
68V Health Care Specialist (aka Combat Medic)
68W Health Care Specialist (aka Combat Medic)
68X Mental Health Specialist
68Y Chief Medical NCO

Chemical Branch
74D Chemical Operations Specialist
76G Chemical Operations Specialist
78G Chemical Operations Specialist

Ordnance Branch
89A Ammunition Specialist
89D Explosive Ordnance Disposal Specialist

Quartermaster Corps Branch
92A Automated Logistical Specialist
92F Petroleum Supply Specialist
92G Food Service Specialist
92L Petroleum Laboratory Specialist
92M Mortuary Affairs Specialist
92P Parachute Rigger
92S Shower/Laundry and Clothing Repair Specialist
92W Water Treatment Specialist

Public Affairs Branch
79S Career Counselor
79T Recruiting and Retention NCO
79Z Retention and Transition Noncommissioned Officer

Transportation Branch
88H Cargo Specialist
88K Watercraft Operator
88L Watercraft Engineer
88M Aircraft Transport Operator
88N Traffic Management Coordinator
88P Railway Equipment Repairer
88Q Railway Section Repairer
88U Railway Operations Crewmember
88Z Transportation Senior Sergeant

Field Artillery Branch
13A Field Artillery
13J Field Artillery Targeting Technician
13K Air Defense Artillery Branch
14D Air Defense Artillery Officer
14G Command and Control Systems Technician
14I Air and Missile Defense (AMD) Officer
14U Aircraft/Army Aviation Branch

Tactical/Technical (Patriot Systems Technician)
14X Air Defense Artillery (ADA) Immortal
Military Intelligence Branch
31D Military Intelligence Officer
350 All Source Intelligence Technician
350G Imagery Intelligence Technician
350Z Attaché Technician
350K (150U) Tactical Unmanned Aerial Vehicle Operations (transferring to Aviation Branch in Summer 07)
351 Counterintelligence Technician
351M Human Intelligence Collection Technician
351V Area Intelligence Technician
352N Traffic Analysis Technician
352Q Morale Intercept Technician
352R Emanations Analysis Technician
352S Non Morse Intercept Technician
357T Intelligence and Electronic Warfare Technician

Psychological Operations Corps Branch
37A Psychological Operations Officer
37X Psychological Operations Officer, Designated

Civil Affairs Branch
38A Civil Affairs Officer
38X Civil Affairs Officer, Designated

Adjutant General Branch
42B Personnel Systems Management Officer
42C Band Officer
420A Military Personnel Technician
420C Bandmaster

Finance Branch
44A Finance Officer

Chaplain Branch
56A Command and Unit Chaplain

Medical Department Branches
60A OPERATIONAL MEDICINE
60B NUCLEAR MEDICINE OFFICER
60C PREVENTIVE MEDICINE OFFICER
60D OCCUPATIONAL MEDICINE OFFICER
60E PULMONARY DISEASE/CRITICAL CARE OFFICER
60G GASTROENTEROLOGIST
60H CARDIOLOGIST
60J OBSTETRICIAN AND GYNECOLOGIST
60K UROLOGIST
60L DERMATOLOGIST
60M ALLERGIST, CLINICAL IMMUNOLOGIST
60N ANESTHESIOLOGIST
60P PEDIASTRIC SUB-SPECIALIST
60R CHILD NEUROLOGIST
60S OPHTHALMOLOGIST
60T OTOLARYNGOLOGIST
60U CHILD PSYCHIATRIST
60V MEDICAL CORPS OFFICER

61A NEPHROLOGIST
61B MEDICAL ONCOLOGIST/HEMATOLOGIST
61C HEMATOLOGIST
61D RHEUMATOLOGIST
61E CLINICAL PHARMACOLOGIST
61F INTERNIST
61G INFECTIOUS DISEASE OFFICER
61H FAMILY MEDICINE
61J GENERAL SURGEON
61K THORACIC SURGEON
61L PLASTIC SURGEON
61M ORTHOPEDIC SURGEON
61N FLIGHT SURGEON
61P PHYSIATRIST
61Q RADIATION ONCOLOGIST
61R DIAGNOSTIC RADIOLOGIST
61U PATHOLOGIST
61V PERIPHERAL VASCULAR SURGEON
61Z NEUROSURGEON

62A FIGHTER PILOT
62B Field Surgeon
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<thead>
<tr>
<th>Abdominal surgery</th>
<th>Fistulotomy</th>
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<td>Abdominoplasty</td>
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<td>Acromioplasty</td>
<td>Frontalis lift</td>
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<td>Adenoidectomy</td>
<td>Fundectomy</td>
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<td>Amputation</td>
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<td>Angioplasty</td>
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<td>Appendicectomy</td>
<td>Heart transplantation</td>
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<td>Arthrodesis</td>
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<td>Arthroplasty</td>
<td>Hemilaminectomy</td>
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<td>Arthroscopy</td>
<td>Hemorrhoidectomy</td>
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<td>Bilateral cingulotomy</td>
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<td>Biopsy</td>
<td>Hernia repair</td>
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<td>Brain surgery (Neurosurgery)</td>
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<td>Breast biopsy</td>
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<td>Brostrom procedure</td>
<td>Kidney transplantation</td>
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<td>Cesarean section</td>
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<td>Cholecystectomy</td>
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<td>Circumcision</td>
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<td>Clitoridectomy</td>
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<td>Colon resection</td>
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<td>Colostomy</td>
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<td>Colorrhaphy</td>
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<td>Commissurotomy</td>
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<td>Endoscopic thoracic sympathectomy</td>
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<td>Penectomy (also known as peotomy)</td>
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<td>Pleurodesis</td>
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<td>Sphincterotomy</td>
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<td>Tracheotomy</td>
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<td>Tubal ligation</td>
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<td>Tubal reversal (Tubal Anastomosis)</td>
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<td>Ulnar Collateral Ligament Reconstruction</td>
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<td>Ureterosigmoidostomy</td>
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<td>Vivisection</td>
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<td>Vulvectomy</td>
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Total Integration of Surgical Care

Remote Surgery

Minimally Invasive & Open Surgery

Pre-operative planning
Surgical Rehearsal

Intra-operative navigation

Simulation & Training
Pre-operative Warmup

Courtesy of Joel Jensen, SRI International, Menlo Park, CA
The New Paradigm Struggle

Rick Satava: What is the REVOLUTION in surgical education?
What Really Matters

- Lower Cost
- Better Access to Symptoms/Cases
- Reduced Time to Competence
- Reduced Errors

If simulation can deliver one or more of these, then it may be valuable enough to trigger a scientific smackdown.
Scientific Smackdown

See One, Do One, Teach One

Do Many in Sim