Subject: The Changing Role of Military Medicine

Place: Municipal Auditorium, San Antonio, Texas

Time: Monday, 6 April, 1000-1045

Audience: Society of Air Force Surgeons (plus invitees from Wilford Hall & Brooks AH)

Precis: American military dominance has had the effect of decreasing risk of large scale, conventional conflict with attendant battle trauma, and of increasing likelihood of military interventions in destabilized societies for political and humanitarian purposes. The ramifications for the medical services of the several military departments are greater emphasis upon preventive medicine and readiness for biological warfare to support our own armed forces, coupled with preparedness to succor large groups of foreign civilians in need of medical aid to meet environmental, physiological, and psychological challenges. In most instances, these missions will entail projection of medical facilities, personnel, and skills into culturally austere regions of the world. Future information systems will constitute a highly significant asset for military medicine.

I Introduction: minimum presence/maximum impact
II The Politico-military Context
   Threat Assessments
   National Security Policy
   Medical Implications
      Evacuation Policy
      Projection of medical capabilities
III Medical Readiness: Skill Projection
   Preventive medicine
   Biological warfare
   Civic Action
IV Logistics
   Water and food
   Medical Facilities
   Maintenance of medical equipment
   Shelter, clothing, blankets
V Technology Trends
   Sealift
   Airlift
   Containerization
   Information systems
      Computing
      Communications
      Human interfaces
Sensors
Training

VI Impediments
Military Medicine

A Changing Role

has been...will be

P.F. Gorman, San Antonio, Mar 1998
A War the U.S. Avoided  
Central America 1983-1998  
The Role of Military Medicine

- Presence 
- Public Health 
- Tertiary Care and Teaching 
- Field Medical Service Training 
- Air Evacuation 
- Medical Maintenance 
- Veterinary Service

1983: Edge of the Cliff

- **Nicaragua**: Mounting insurgency. Soviet/Cuban buildup. Massing in northwest; cross-border military incursions in both north and south.

- **Honduras**: Preparations for general mobilization.

- **El Salvador**: Guerillas striking in large units. Increasing government losses. Impending defeat and collapse.
  — During ‘82, Salvadoran Army sustained 7% casualties (1300 KIA/DOW of 40k: like the U.S.’ losing 65,000 in 1991). Mortality among WIA 45%.
  — U.S. SOUTHCOM limited by Congress to 55 trainers/advisors. Military Assistance Program severely constrained.
1985: A Future Restored

• During ‘83 and ‘84 US MTT trained 1391 Salvadoran medics, set up a field medical service battalion, and an air-evacuation system (dedicated HU1Hs & C-47s).*

• WIA then reached hospital within 3 hours. Mortality among WIA reduced to 5%. Morale improved.*

• Army leadership revamped. Optempo accelerated. Guerillas forced to adopt small-unit hit-and-run tactics.

• Jose Napoleon Duarte elected President. Economy revived. “You have taught us how to catch fish instead of selling us fish in cans.”


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**TRANSOCEANIC TELEMEDICINE**

Army’s Remote Clinical Communications System 1993

[Diagram showing the connections between INMARSAT, Modem 9.6kbps, Mac 180 PowerBook, Color Monitor, Kodak Digital Camera, Mac Quadra 950, External Drive, Printer, Archives, Data Base Pt Records, Data Base NLM, and the Overseas Hospital and Walter Reed Army Medical Center.]
40mm. Grenade Embedded Left Palm

An Era of Strategic Uncertainty

• **Downsized U.S. military forces possess unprecedented reach and striking power. But have been tasked to exert influence throughout the world, and hence must plan to do more with less. [1/3 presence in theater….]**

• **American industry is creating new capabilities to generate wealth via transmittal of goods and information**
  — Containerization for intermodal transportation
  — 40 knot container ships and airlift of 500 tons of containers per sortie
  — Extensive transcontinental cables and constellations of satellites for communication networks

• **Rogue nations, cultural and religious groups have increasingly turned to terrorism and to weapons of mass destruction to challenge American dominance and to counter American influence: an asymmetric response to U.S. power**
## Computer Technology Evolution

<table>
<thead>
<tr>
<th>Year</th>
<th>Generation</th>
<th>Platform</th>
<th>Interface</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>web computers</td>
<td>PCs, client-server</td>
<td>keyboard</td>
<td>telephone or cable</td>
</tr>
<tr>
<td>2001</td>
<td>speech-controlled</td>
<td>hand-held</td>
<td>audiogenic</td>
<td>wireless</td>
</tr>
<tr>
<td>2010</td>
<td>one info dial tone</td>
<td>video screen</td>
<td>imagery as primary data</td>
<td>hyper-speed</td>
</tr>
<tr>
<td>2020</td>
<td>anticipatory</td>
<td>room monitors</td>
<td>recognition, gesture</td>
<td>networked places</td>
</tr>
<tr>
<td>2025</td>
<td>body net</td>
<td>artificial retina, cochlea, glasses for display, body monitors</td>
<td>implanted or attached sensors &amp; actuators</td>
<td>human body networks on wireless www</td>
</tr>
</tbody>
</table>

Gordon Bell, “Beyond Moore’s Law
IEEE Spectrum, June 1997

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## GLOBAL GRID

**Pervasive High-Capacity Information Conduits**

Asynchronous Transfer Mode [ATM]  
Fiber-optic or virtual cables

- **Time to transmit overseas complete medical records for 1000 patients:**
  - 18 Hours 64 kbps DS-0
  - 1.5 Minutes 45 mbps DS-3

ATM switched data-stream
## Pervasive Communications

**Personal Communications Satellite Systems**

<table>
<thead>
<tr>
<th></th>
<th>Voice-Oriented</th>
<th>Data-Oriented</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of Systems</strong></td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td><strong>No. Active Satellites</strong></td>
<td>184</td>
<td>502</td>
<td>686</td>
</tr>
<tr>
<td><strong>Est. Investment</strong></td>
<td>$14.31 Billion</td>
<td>$38.72 Billion</td>
<td>$53.03 Billion</td>
</tr>
</tbody>
</table>

*Scientific American*

*April 1998*

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- **GEO Satellite** @ 10,000s of km
- **LEO Satellite** @ 100s of km
- **HALE (Hi-Alt Long Endurance)** Aircraft @10s of Km
- **Dirigible**
- **Cellular Towers**
- **Fiberoptic Cable**

*Scientific American*

*April 1998*
Pervasive Communications
Personal Communications Satellite Systems

“By 2000 it will be possible to call home from essentially anywhere on the planet using a handheld terminal similar to one of today’s cellular phones. For better or worse, we need never be out of touch, no matter where we are...

“Within a decade it will probably be possible to live in a remote area and yet be connected to the worlds of commerce and entertainment via the Internet and other sources of multimedia at rates high enough to support movies on demand...

Scientific American
April 1998

Biological Warfare: the Threat

• Pathogens known to have been “weaponized”
  — 18 types of bacteria
  — 14 toxins
  — 4 rickettsiae
  — 28 viruses

Airborne particulates are considered the most dangerous form of bio-weapons

• Plus eight forms of plant pathogens, and 16 forms of animal pathogens

• Plus genetically modified micro-organisms or genetic elements that contain nucleic acid sequences or coding associated with pathogenicity, and are derived from organisms on the core list.

An effective attack would probably use an airborne particle 1 to 10 microns in size, dispersed by sprayers, airburst explosives, or passing traffic, to cause widespread inhalation.

- 1 cc of pulmonary anthrax agent contains ~ $10^9$ spores; inhalation of ~$10^3$ spores is fatal in 95% of cases; symptoms in 24-36 hours, but by then toxicity is beyond medical intervention.
- In 1979 an accidental aerosol release of dry anthrax spores from a biological weapon plant in Sverdlovsk, USSR caused 100 deaths.
- In the mid 90’s Aum Shinri Kyo cult was growing bio weapons to spread over Tokyo. 100 kg of anthrax, spread over 500 km$^2$ would have resulted in ~ 3 million deaths.
- Little evidence to date of attempts to bio-engineer pathogens; rather, efforts have been directed at weaponizing anthrax, botulinum toxin, plague, tularemia, and Q fever.

 Defense Against Biological Warfare

- **Vaccines**
- **Therapeutics**
- **Diagnostics**
- **Intelligence**
- **Detectors**
- **Informatics**
- **Neutralization**
- **Non-Medical Countermeasures**
- **Decontamination**

**Time\*\**

- **Invention:** 10 yr
- **Production:** 1 yr
- **Delivery:** 1 mo
- **Personnel Exposure:** 1 hr
- **Onset of Symptoms:** 1 hr
- **Decontamination:** 1 d
- **Personnel:** 1 mo
### R&D: Examples of Pathogenic Detectors

- Shoe-box sized, 20 lb. mass spectrometer
- Hand-held, chip-based device using up-converting phosphors
- Electronic ribosomal identification of micro-organisms
- Combinations to reduce false positives and increase confidence in identification

<table>
<thead>
<tr>
<th>Fiber optic waveguide pathogen detector</th>
<th>Bacillus anthracis Ames 9500x</th>
<th>Mass spectrometer pathogen detector</th>
</tr>
</thead>
</table>

### Defense Against Chem/Bio Attacks

- Prepare small mobile units to manage crisis and consequence
  - Enable proactive collaborative planning and execution
    - Exploit the available bandwidth
    - Just enough patient record
  - Rapid action — pack it in and out quickly

- Enhanced Consequence Management Planning and Support System [ENCOMPASS]
- Chemical Biological Incident Response Force [CBIRF]
ENCOMPASS Components

- Field Incident Survey Tool
- Global Response Incident Planner
- Design Repository
- Electronic Playbooks
- Incident Repository
- Essential Medical Data Set
- Casualty Triage Tag
- Electronic Watchboard

Electronic Watchboard

Provides situational awareness to the on-scene commander. Web-based access provides the ability to communicate events to multiple sites, including Joint Operations Centers and supporting federal and local agencies.
The Casualty and Triage Tag Application (CATT) is used to record essential casualty treatment information.

Computer generates plastic bar-code tag for patient.

Desert Care

1. DNBI records from individual clinics sent [routinely] to SWA Server
2. 24 hour batch of DNBI records sent [via how?] from SWA Server to ACC Server
3. Basis runs on latest 24 hour picture of DNBI events on ACC Server
4. Basis alerts Watch Officer that higher than expected events observed
1. Watch Officer sends Alert Notice to USAMRIID for assistance
2. ACC Server pushes required objects to USAMRIID [pat records, analyses]
2. ACC - USAMRIID collaborate over shared map depicting warning cases and look at selected patient records

• Create Possible BW Event in GENOA Crisis Information Package (CIP) and establishes Collaboration Services between BWD Repository and CIP
• Push data to DSWA for source term analysis
• First draft time-based plume model pushed to ACC Server
• CODA runs casualty projections - expected rate/location of sick soldiers and initial projection of mitigation responses

ACC Server

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ACC Server

ACC Server pushes Smart Message to SWA to add additional business objects for Mitigation Response [new questions, reset triggers, alerts, queue times]

• Push BWD Plan objects [subplans, triggers, estimated resources, business rules, etc] to JTF Planner - ALP