U.S. Army Telemedicine Programs in the Pacific Theater

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Disclaimer: "The views and opinions expressed in this presentation are those of the author and do not reflect official policy or position of the Department of the Army, Department of Defense or the U.S. Government."

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Army Medical Department Investment in Telehealth

- World-wide deployed capability
  - Radiology (>100 DICOM servers in AMEDD, 16 in SW Asia)
  - Pathology (22 systems) linked to the AFIP, including Baghdad
  - Ophthalmology (LRMC, WRAMC, TAMC)
  - Dermatology (tri-service program supporting 31 sites)
- Medical Center (MEDCEN) expertise
  - Landstuhl Regional Medical Center, Landstuhl, Germany
    - Radiology – support to Europe and SW Asia
  - Brooke AMC, San Antonio, TX
    - Dermatology – 400 consults /month
    - Cardiology – 300 Echo's/month
  - Tripler AMC, Honolulu, HI
    - Pediatrics – 50 consults/month
    - eICU consults with Guam Naval/Seoul, Korea
  - Walter Reed AMC, Washington, DC
    - Psychiatry – 2000 consults/month
    - Neurosurgery – 200 consults/month
  - Martin ACH, Fort Benning, GA
    - Mental Health Chapter evaluations – 100 consults/month
  - Madigan AMC, Fort Lewis, WA
    - Pediatric Cardiology – 100 consults/month

U.S. Army Teleconsultation program for OIF/OEF

Background

- Initiated in April 2004
- Email based system with JPEG image attachments – no patient identifying information; no patient privacy violations
- Utilizes theater providers' personal digital camera & routine Internet email access
- U.S. based medical specialists answer tele-consults 24x7
- Response time: ~ 5 hours (average for more than 4300 consults)
- Strong favorable response from deployed providers

Current U.S. Army Tele-Consultation Clinical Specialties in OIF/OEF

Burns-Trauma
Cardiology
Dermatology
Infectious Diseases
Internal Medicine
Nephrology
Neurology
Occupational Medicine
Ophthalmology
Pediatrics
Preventive Medicine
Rheumatology
Toxicology
Urology
Orthopedics
Traumatic Brain Injury (TBI)
Microbiology/Laboratory Medicine
Infection Control

Program Summary

- 18 clinical specialties with contact groups
- 4,306 teleconsultations (Apr 04 to Sep 08 – 55 months)
- 65 known evacuations prevented
- 151 known evacuations facilitated following consultant's recommendation
- 1,217 different referring health care professionals
- 583 teleconsultations on non - US patients
- Average Reply Time 5 hr 9 min

Year	Reply Time
2004	5 hr 9 min
2005	5 hr 16 min
2006	5 hr 12 min
2007	5 hr 17 min
2008	4 hr 59 min
Aug 08	4 hr 14 min
Program	5 hr 9 min

Non-U.S. Patients			
Country	Consults	Country	Consults
Afghanistan Army	20	Iraqi Air Force	1
Afghanistan Detainee	4	Iraqi Army	30
Afghanistan Non-Combatant	120	Iraqi Detainee	55
Australian Army	1	Italian Navy	1
Australian Navy	2	Jordanian Soldier	1
Bangledesh Contractor	1	Jordanian Contractor	1
Bosnian Child	1	Kenya Child	4
Bosnian Officer	1	Korean Army	2
Bosnian Contractor	1	Kyrgyzstan Contractor	1
British Contractor	1	Macedonian Soldier	3
British Soldier	1	Mauritania National	1
British Air Force	3	Napalese Contractor	6
Bulgarian Army	2	New Zealand Contractor	1
Canadian Soldier	1	Pakistan	30
Columbian Army	2	Philippine Contractor	3
Congo Child	1	Poland Army	1
Dijoubti National	3	Romanian Contractor	1
Dutch Army	2	Romanian Soldier	1
Fijian Contractor	3	Russian AFEES Contractor	1
German Child (in Turkey)	1	Saudi Detainee	1
Georgia Contractor	1	Scottish Civilian	1
Ghana Child	2	SE Asian (not specified)	1
Guatamala Child	1	Somalia Child	1
Hungarian Contractor	1	South Africa Contractor	2
Hungarian Army / Police	12	Sri Lanka Contractor	2
India Army / Police	1	Turkey Contractor	2
India Contactor	10	Ugandian Army	18
Iraqi Civilian	212		
Total			583

U.S. Army Tele-Consultation Program Summary for Deployed Forces

April 2004 to 1 September 2008

By Specialty

- 55% Dermatology
- 9% Infectious Diseases
- 5% Ophthalmology

By Location

- 68% Iraq
- 11% Afghanistan
- 4% Kuwait

By Patient Branch

- 54% Army
- 12% Marine Corps
- 9% Air Force
- 10% Non-Combatant

N = 4306 consults

Teleconsultation Measures Of Effectiveness

Relevant to deployed medical support

- Improved access to specialty care (demonstrated in all specialties)
- Avoided or facilitated medical evacuations due to second opinion consult
- Elevation of the quality of care by allowing rapid multi-specialty consultation (e.g. Infectious Disease & Dermatology)
- Improved optimization of medical resources (consult management in theater)

Pacific Island Health Care Project

- Initiated in 1989 for TAMC to provide medical care to US Associated Pacific Islanders (Public Law 99-239, Jan. 1986)
- From FY97 - FY06 funded by Congress ($4.5M annually)
- Beginning FY07 funding stopped by Congress – MEDCOM UFR & a TAMC funding shortfall
- Since 1997 – 3100 patient consults seen at TAMC & Continuing Medical Education to over 337 remote providers
- Initial prototype for telemedicine consultation to island nations established in 1992

Pacific Island Health Care Project

Jurisdiction	Population	Area*	Islands	US Association
Guam	151,716	541	1	Territory
American Samoa	63,786	199	7	Territory
Commonwealth of Northern Marianas	69,398	477	21	Commonwealth
Republic of Marshall Islands	65,507	181	1,225	Free Association
Federated States of Micronesia	131,500	702	607	Free Association
Republic of Palau	18,467	458	350	Free Association
Total	500,371			

Population based on 2000 estimates
*** Square miles**

Compact of Free Association of the United States with the RMI, FSM, ROP

In accordance with Public Law 99-239, Jan 14, 1986
48 U.S.C. 1905(k) Amended, July 14, 2003

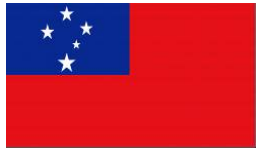

RMI


FSM


ROP


Guam


CNMI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"The Secretary of Defense shall make available the medical facilities of the Department of Defense for use by individuals from the FSM, the RMI and the ROP who are properly referred to such facilities by government authorities responsible for provision of medical services of the FSM, the RMI, the ROP, Guam, … the CNMI and American Samoa"…

PIHCP Map


Hawaiian Islands
Tropic of Cancer
Kauai
Oahu
Honolulu
Maui
Hawaii
Johnston Atoll
(U.S.)
Northern
Mariana
Islands
Saipan
Guam
Marshall Islands
Yap
Koror
Palau
Chuuk
Pohnpei
Ebeye
Kwajalein
Majuro
Kosrae
Federated States of Micronesia
Kiritimati
(Christmas Island)
(KIRIBATI)
Sorong
Jayapura
Wewak
Bismark Sea
PAPUA NEW GUINEA
New Guinea
Madang
Lae
Arafura Sea
Torres Strait
Port
Moresby
Darwin
Gulf of
Carpentaria
Coral Sea
Islands
(AUSTRALIA)
Cairns
Townsville
Coral Sea
New
Caledonia
(FRANCE)
Port-vila
Vanua
Levu
FIJI
Viti
Levu
Suva
TONGA
SAMOA
Apia
Pago
Pago
American
Samoa
KIRIBATI
Cook
Islands
(N.Z.)

Tripler Army Medical Center Telemedicine Programs

- Pacific Island Health Care Project
- Pacific Asynchronous Telehealth (PATH)
  - Tele-Auscultation Heartsounds
  - Tele-Education Asynchronous Local/Overseas Hospital Academic System (ALOHA)
  - Pediatric Diabetes Education Portal
- Telehealth Voice Therapy in Remote Regions in the Pacific Basin
- ICU Multi-Point Military Pacific Consultation Using Telehealth (IMMPACT)
- Telehealth Traumatic Brain Injury

GECHO
Global Electronic Children's Hospital

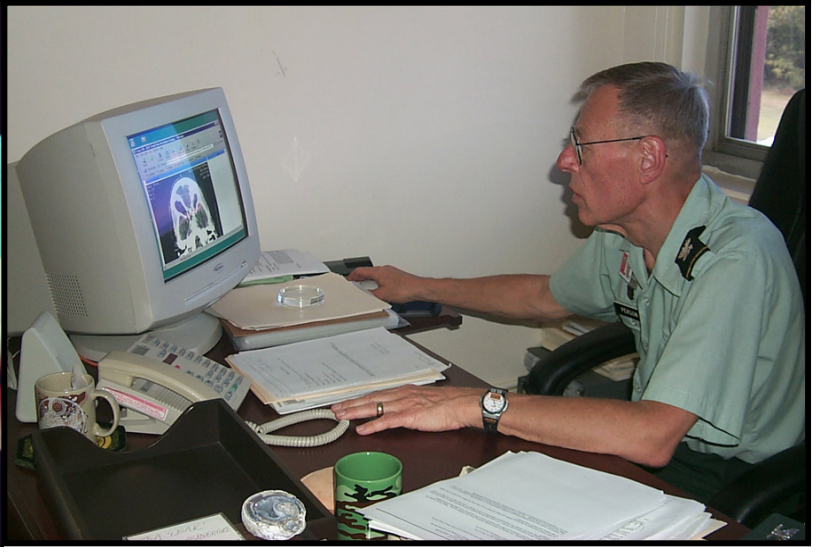
LTC C. Becket Mahnke, MD
COL/R Donald A. Person, MD
Marc Eble, Software Engineer

Pacific Asynchronous TeleHealth (PATH) System

- **Internet-based, HIPAA compliant, secure system**
- **Provider-to-Provider consultation**
- **Asynchronous (store & forward), multi-media**
- **Pediatric, adult, & "other" modules**
- **MEDEVAC Coordination/Case Management**
- **Decreased lost duty time & Reduced testing/duplication**
- **Remote Provider Education/Mentoring**



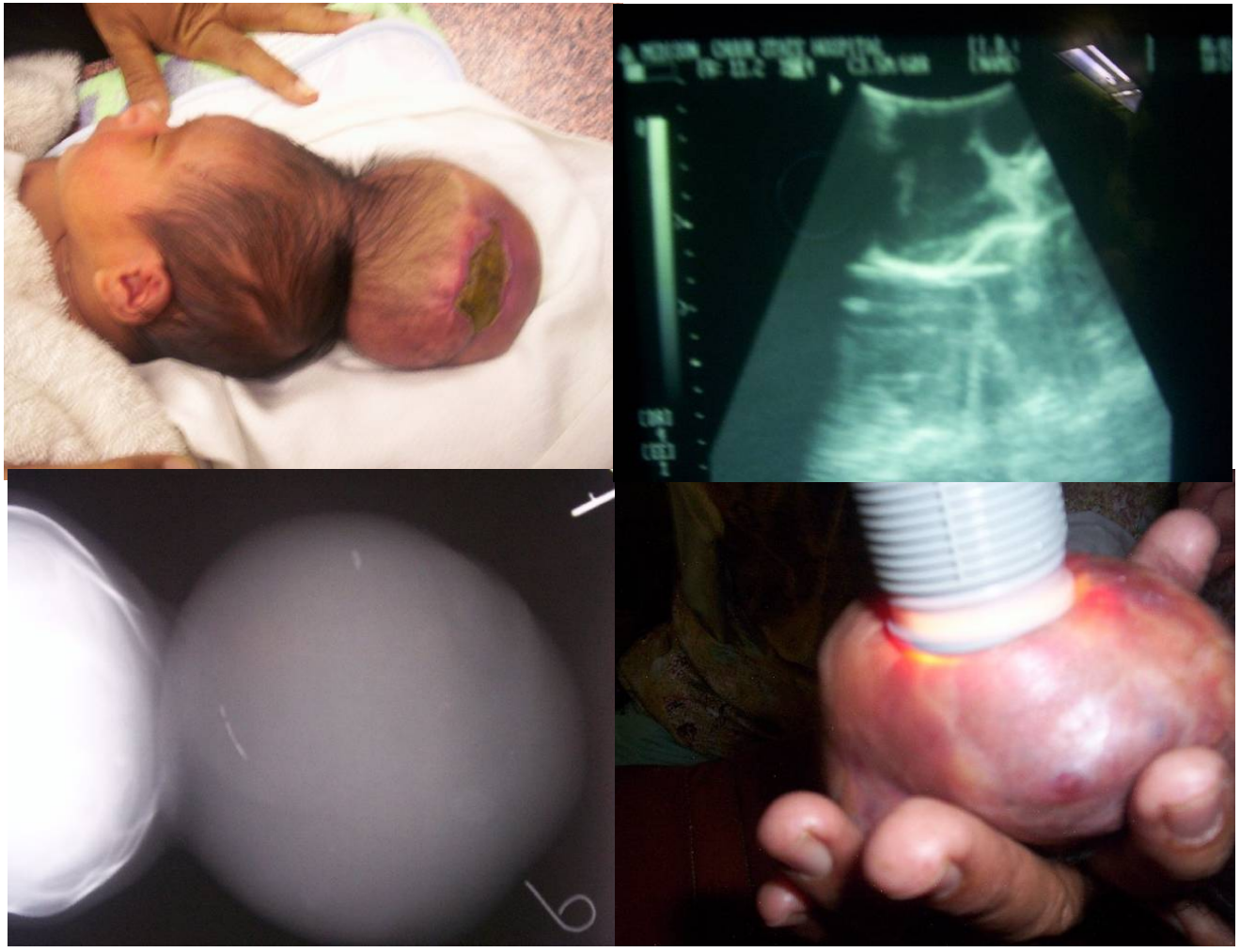


Pacific Asynchronous TeleHealth (PATH) Workload

	2004	2005	2006	2007	2008 Jan-Aug
# pediatric consults	181	259	290	301	283
# adult consults	97	167	117	131	166
# images	248	353	457	622	915

Chuukese infant with encephalocele



22 y/o Wounded Warrior (Pohnpeian)* with multiple amputations

Peak JB. Beyond the Purple Heart – Continuity of Care for the Wounded in Iraq. New England Journal of Medicine, 2005 Jan; Vol. 352:219-222.

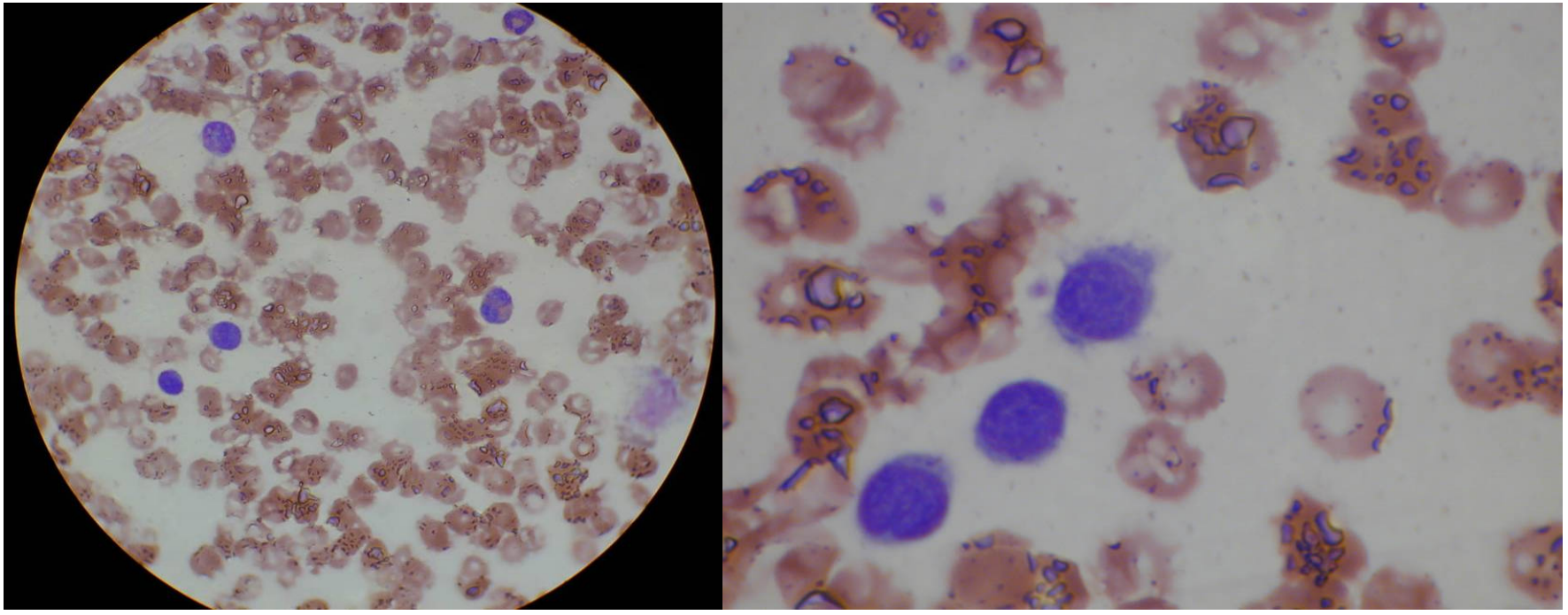
***Older brother was treated for rheumatic heart disease at TAMC and had mitral valve replacement in 1995.**

cLJ2182

51 y/o Marshallese man with extensive post-infectious neck wound

cEL9058

39 y/o man with hairy cell leukemia



Belnap CP, Freeman JH, Hudson DA, Person DA. A versatile and economical method of image capture for telepathology. J Telmed Telecare. 2002;8(2): 117-20

cNM5066

Leptospirosis: 4 cases from FSM

Musgrave JE, Person DA. Acute renal failure in children due to Leptospirosis. Pacific Health Dialog 3: 200-201, 1996

Heartsounds

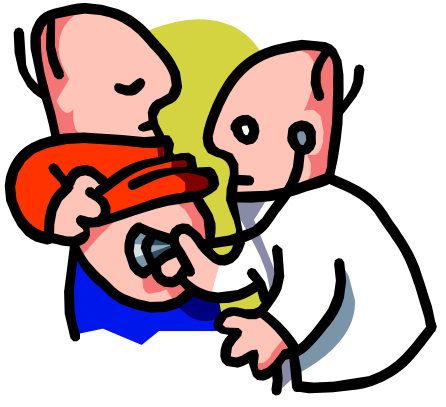
Tele-Auscultation

Heart Murmurs

Common

Scary

Difficult to dx



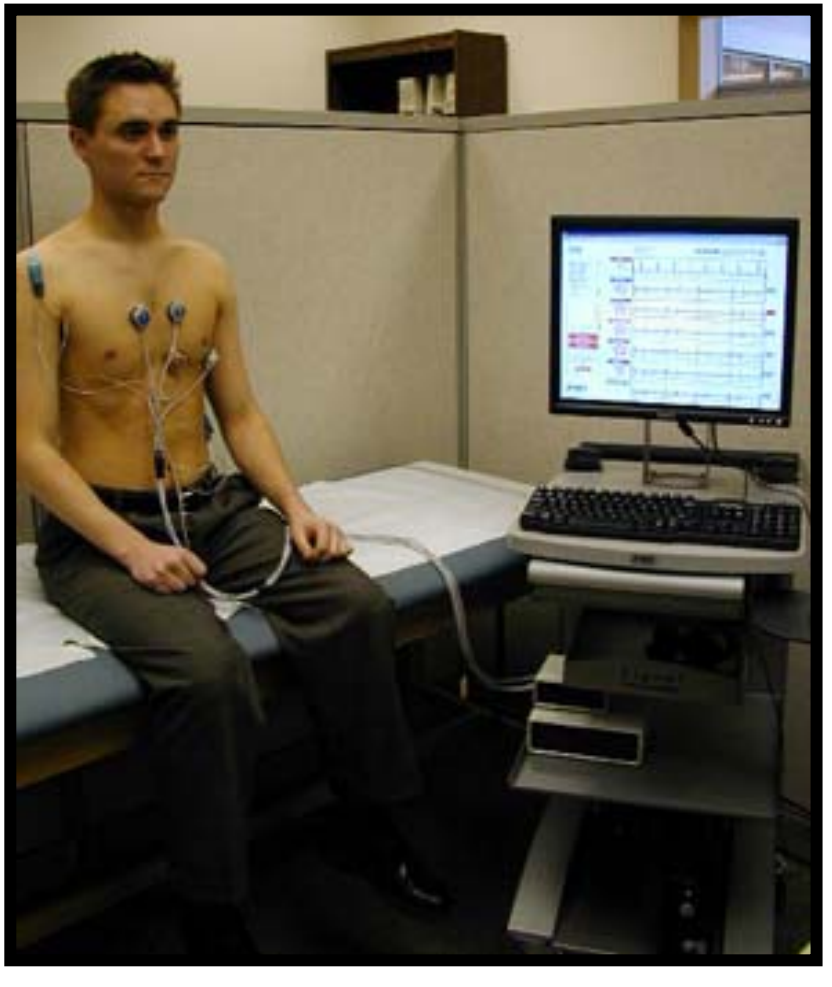
Pacific Asynchronous Tele-Health (PATH)
Tele – Auscultation Heartsounds

Problem:

- Congenital heart disease affects approximately 1% of all live births
- 90% of all pediatric patients will have a heart murmur detected at some point in their life
- high prevalence of auscultatory findings & poor auscultation skills results in frequent evaluations of innocent heart murmurs (the most common reason for pediatric cardiology referral

Heartsounds

Tele-Auscultation



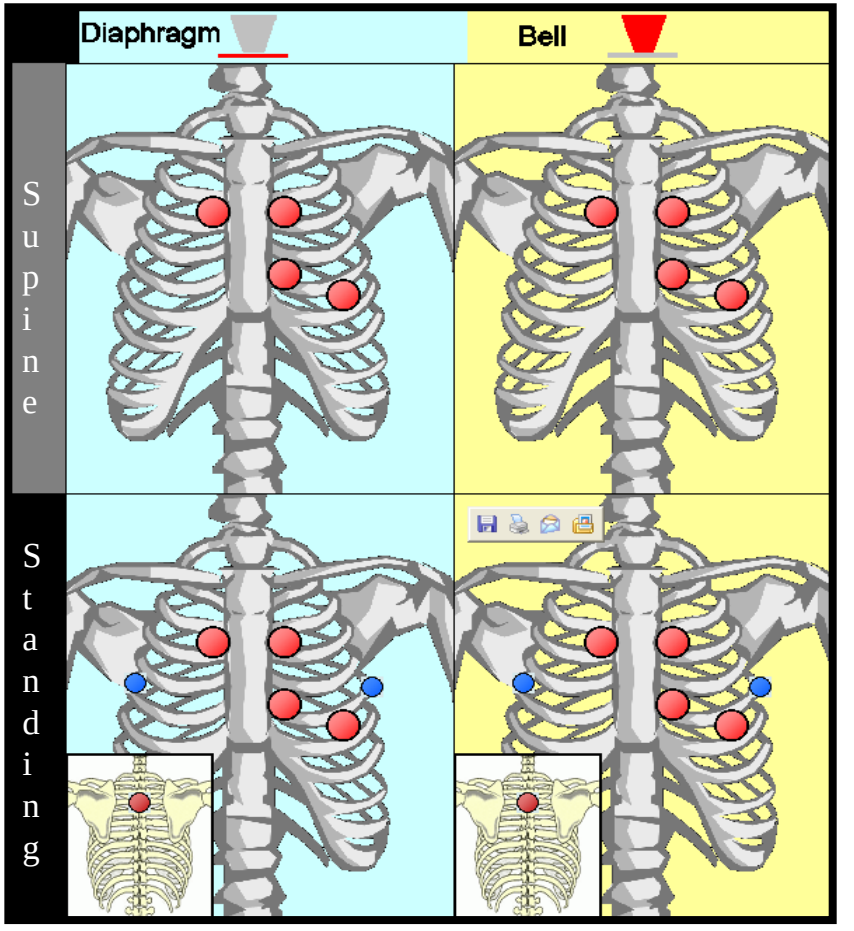
Pacific Asynchronous Tele-Health (PATH)
Tele – Auscultation Heartsounds

Solution:

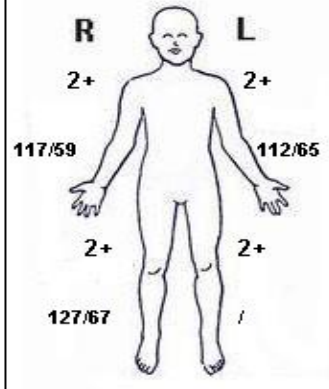
- created a unique heartsounds recording device - utilizes adhesive sound sensors to record 6 auscultation sites simultaneously - reduced recording time to <1 minute
- user-friendly electronic stethoscopy of digital heartsounds allows transmission of these sounds to a computer for evaluation via telecardiology
- Validation study - compared with “face-to-face” evaluations, 89% of the cases were accurately classified as either normal/innocent or pathologic, with a sensitivity of 91% and specificity of 88% (Clinical Pediatrics, in press)
- received funding through the US Army Advances in Medical Practice (AMP) program to deploy six recording devices throughout the Pacific Region

Heartsounds

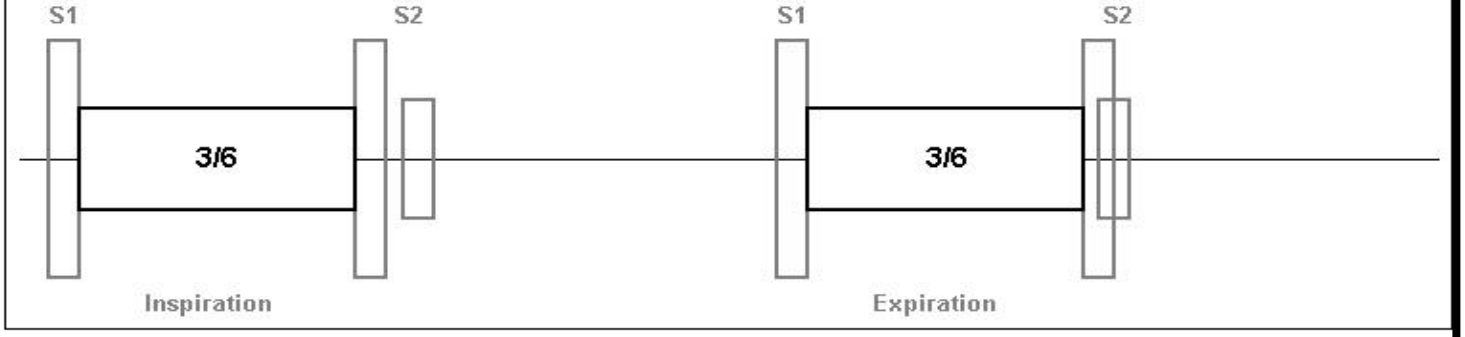
Tele-Auscultation



Blood Pressure



Murmur



Tele-education

ALOHA

Asynchronous Local/Overseas Hospital Academic

SYSTEM

- PEDIATRICS -

- OB/GYN -

Patient-to-Provider

Shriners Hospital for Children in Honolulu (SHCH)

- Provides pediatric/orthopaedic teleconsultations and distance educational opportunities to:
  - Guam
  - Common Northern Mariana Islands/Saipan
  - American Samoa
  - Federated States of Micronesia (Chuuk and Kosrae)
  - Republic of the Marshall Islands (Majuro)
- Member of Pacific Islands Chapter of ATA (PICATA)
- POC: Jana Lindsey, Telemedicine Coordinator, 808.951.3637

State Telehealth Access Network (STAN) & the Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT)

- Managed by the University of Hawaii Telecommunications & Information Policy Group (TIPG)
- Connects 22 Pacific Island jurisdictions and 40 health care facilities and provider networks in the State of Hawaii
- FCC Rural Health Pilot Program recently awarded $4.9M to link 96 health care facilities throughout Hawaii and the Pacific Islands with the STAN network
- POC: Norman Okamura, Director UH TIPG; 808.956-2909

The Role of Cell Phones in Clinical Care – Consultation and Education

Cell Phones for TBI Care:
"Personal Tele-Rehabilitation"

-Utilize cell phones for TBI care

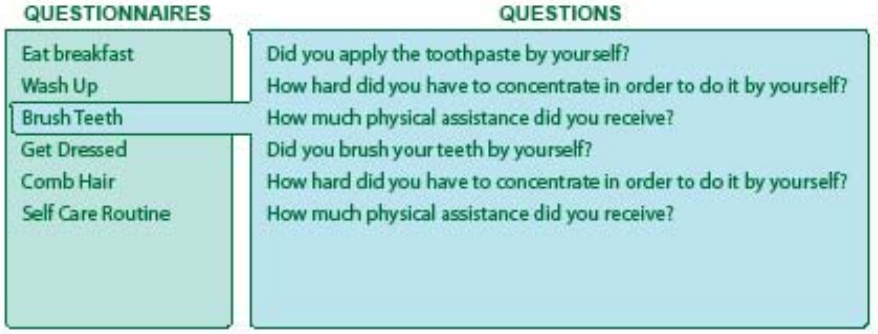
-Provide daily prompts & upload results to a web server

-3 phase R&D effort
- -R&D effort
  - -IRB protocol
- -U.S. Army expansion

-Consortium of expertise
- -USAMRMC/TATRC
- -Academic Research Partner
- -Commercial vendor

-Prior Clinical Uses
- -Diabetes
- -Stroke Rehabilitation

1. Organize questions into questionnaires.



2. Schedule custom times for questionnaires to be sent to each subject.

3. At the scheduled time questionnaires are sent to subject's mobile phone for a response

Conclusions

- DoD Telehealth:
  - Provides mission & cost benefits for US based & deployed forces
  - Uses simple and inexpensive solutions – cell phones & email
  - Demonstrated measurable levels of clinical effectiveness
- Pacific Telehealth has a longstanding record of success:
  - Multiple civilian & federal programs
  - Clinical effectiveness demonstrated for many clinical specialties
- Telehealth can augment care for Pacific Islands only if a basic local infrastructure is in place (electricity, bandwidth, computers)
- Telehealth support for the Insular Island nations will require dedicated funding and a coordinated federal response from pre-existing telehealth programs

Thank-you

Questions??

Contact information:

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Back-up Slides

Continental Micronesia (Air Mike)

Pacific Island Referral Form

Island Referred From: Kwajalein

Patient's Passport Name: _____ Passport No: _____
(Lastname, Firstname)

Birthdate: 04/25/1948 Age: 53.8 Sex: F Nationality: Marshallese Weight: 149.0

Emergency: X Routine: ___ Patient Type: ___

Government Authorization: Yes ___ No ___

Island Referral Case Manager Approved Referral: Yes X No ___

Diagnosis (Include Primary & Secondary): persistent post-cataract conjunctivitis, right

Name of Person Accompanying Patient: Relationship _____

Passport # _____
(Lastname, Firstname)

Date of TB test (MM/DD/YYYY): _ PPD Reading: 0 mm

Chest X-Ray Results:

No. of Seats Required by Patient: 1 Wheelchair: Yes ___ No X

Oxygen: Yes ___ No X How much Oxygen per liter: 0

Medication: Yes ___ No X Medication Type: none

Intra Venous Fluids: Yes ___ No X Stretcher Case: Yes ___ No X

Date of Patient's TB test (MM/DD/YYYY): 11/08/2005 PPD Reading: 25mm

Chest X-Ray Results: negative

Name of Medical Attendant Accompanying Patient: ____
(Lastname, Firstname)

Title: _ Passport Number: _____

Date of TB test (MM/DD/YYYY): _ PPD Reading: 0 mm

Chest X-Ray Results:

TAMC Physician Contacted: Le, Lam Date Contacted: 10/30/2005
(Lastname, Firstname) (MM/DD/YYYY)

Dept/Service: Surgery Telephone Number: 433-6936

TB Status

Republic of the Marshall Islands

Kwajalein Atoll

RMI Consulate, Honolulu

Majuro Atoll

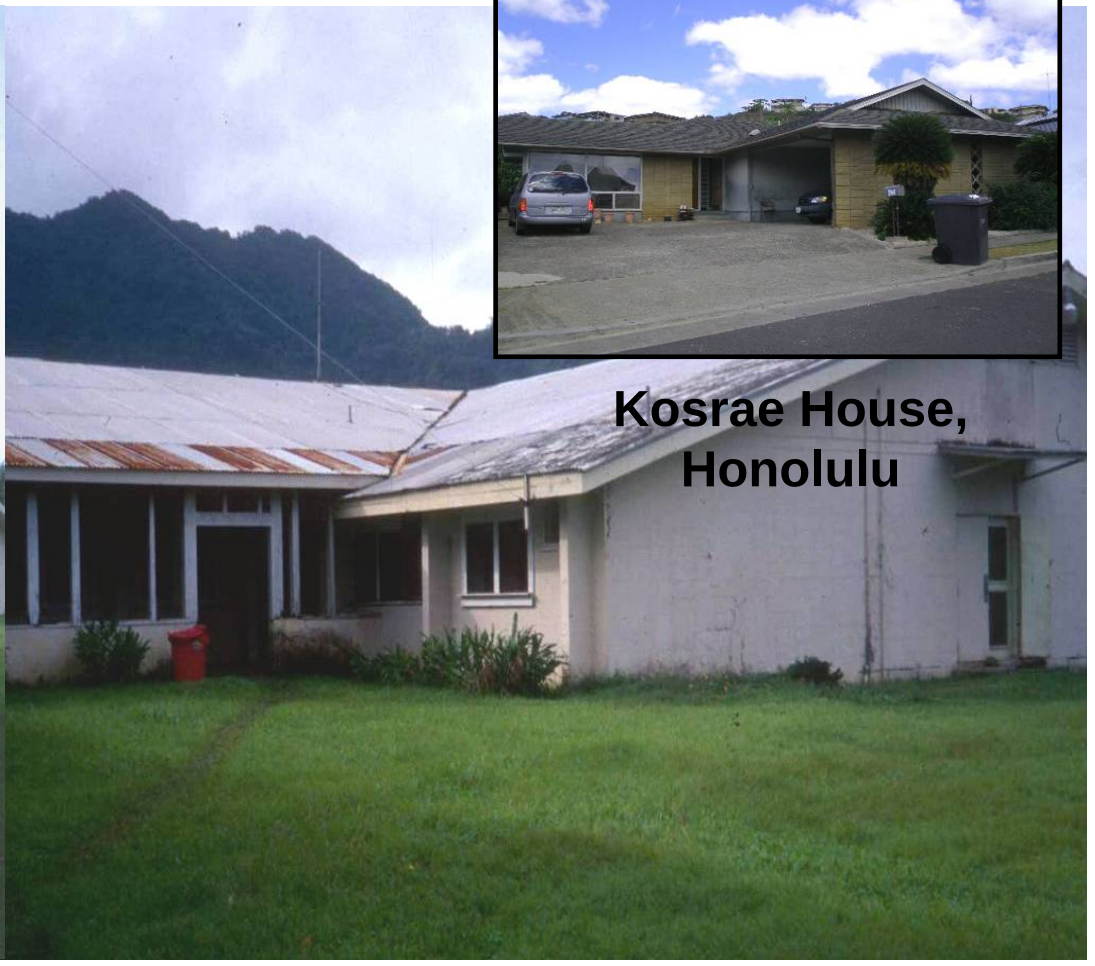
Chuuk State Hospital, FSM

Pharmacy

Women's Ward

Chuuk House, Honolulu

Kosrae State Hospital, FSM



Kosrae House, Honolulu

Pediatrics Ward

Pohnpei House, Honolulu

Outpatient Clinic

Pohnpei State Hospital, FSM


Yap State Hospital
Federated States of Micronesia

Belau National Hospital

Palau House, Honolulu

Koror, Republic of Palau

American Samoa

Personal Tele-Rehabilitation for mTBI Patients

- Use the patient's existing cell phones
- Used for frequent patient daily adherence reminders in the form of text messages or data exchanges.
- Web-based software platform that sends & receives information between the Case Manager & TBI patients
- Designed to augment care provided by the Case Managers
- Patient's self-report data automatically sent back to web server

TAMC Akamai Program

- Akamai (a Hawaiian word for clever)

  - congressionally directed project started by Sen. Daniel Inouye in 1992

  - funded multiple R&D projects at the TAMC and other sites until 2001

- DoD/VA Pacific Telehealth & Technology Hui (Hui- a Hawaiian word for partnership)

  - Joint R&D venture between TAMC & the VA Pacific Islands Health Care System.

  - 2005 TAMC transferred the Hui to the TATRC/USAMRMC where Hui now serves as a field office.

Cell Phone Use for TBI

"Personal Tele-Rehabilitation
for mild Traumatic Brain Injury (mTBI) Patients"

Goal: To develop an evidence-based support program for mTBI patients & their families that enhances their ability to meet therapy goals while at home utilizing cell phones & data responses uploaded to a secure central server.