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14. ABSTRACT

The U.S. Air Force Medical Service presented the sixth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency's Research and Development Division (AFMSA/SGRS). The symposium was held 2-4 August 2011 at the Gaylord National Hotel & Convention Center, National Harbor, MD. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session. It was organized into five tracks to include: Operational Medicine (In-Garrison Care), Enroute Care and Expeditionary Medicine, Force Health Protection, Traumatic Brain Injury (TBI) and Psychological Health, and Healthcare Informatics. These proceedings are organized into six volumes to include one that provides a general overview and all presentation and poster abstracts; the other five each address a specific track. Volume 4 contains abstracts and presentation slides for the Healthcare Informatics Track.

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Proceedings of the 2010 AFMS Medical Research Symposium

Volume 4. Heathcare Informatics Track Abstracts and Presentations

Volume 4 of 6

AIR FORCE MEDICAL SERVICE

2011 AFMS Medical Research Symposium

2-4 August 2011

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201 Waterfront Street
National Harbor, MD 20745
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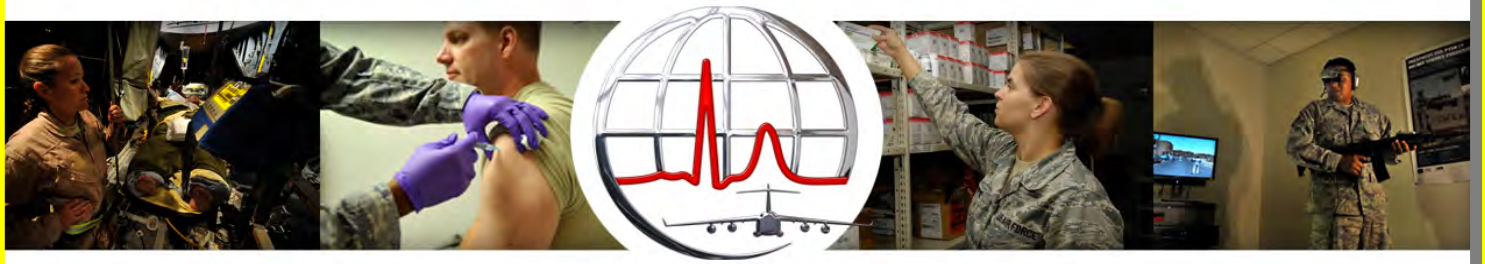

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Proceedings of the 2011 AFMS Medical Research Symposium
Volume 4. Healthcare Informatics Track Abstracts and Presentations

Edited by: Major Walter Cato

Held
2-4 August 2011
at the
Gaylord National Resort Hotel and Convention Center
201 Waterfront Street
National Harbor, MD 20745

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Proceedings of the 2011 AFMS Medical Research Symposium

Introduction

The U.S. Air Force Medical Service presented the sixth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency's Research and Development Division (AFMSA/SGRS). The symposium was held on 2-4 August 2011 in the Washington DC area at the Gaylord National Resort Hotel and Convention Center in National Harbor, MD. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session.

The symposium was organized into several tracks to include Enroute Care, Force Health Protection, Healthcare Informatics, Operational Medicine (In-Garrison Care), and Psychological Health/Traumatic Brain Injury, as follows:

- The Enroute Care Track addressed science and technology targeted at the continuum of care during transport from point of injury to definitive care including, but not limited to: Casevac, Medivac; Aeromedical Evacuation; Critical Care Air Transport; and Patient Staging. Further areas addressed included: patient stabilization; patient preparation for movement; impact of in-transit environment on patient and AE crew physiology; human factors concerns for AE crew or patient population; AE/medical personnel training; infectious disease/control; burn management; pain management; resuscitation; lifesaving interventions; and nutrition research in the enroute care environment.
- The Force Health Protection Track focused on prevention of injury and illness and the early recognition or detection of emerging threats for in-garrison or deployed operations. Topics of interest include research in bio-surveillance, infectious disease, emerging threats (pandemic response), protective countermeasures, disaster response/consequence management, toxicology/health risks (e.g., particulates nanomaterials, radiation, etc.), monitoring disease trends, other areas of preventive medicine, public and environmental health relevant to the military workforce.
- The Healthcare Informatics Track focused on the use of innovative information management & technology solutions that enhance healthcare delivery at any point of the full spectrum of patient care to include medical simulation and training.
- The Operational Medicine (In-Garrison Care) Track focused on care delivered in the outpatient or inpatient in-garrison setting and on enhancing the performance of airman in challenging operational and expeditionary environments.
- The Psychological Health/Traumatic Brain Injury Track addressed topics pertaining to screening, diagnosis, and treatment of TBI and/or Psychological Health in the military community. Specific focus areas within Psychological Health included depression, substance use disorders, family functioning, and suicide prevention. Topics of special interest included field-deployable diagnostic tests for mild TBI (concussion), blast modeling, large epidemiologic studies of Psychological Health and TBI, and strategies for translating research into practice.

These proceedings are organized into five volumes, as follows:

- Volume 1. This volume is a general overview of the entire 2011 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters. First presented is the symposium's opening plenary session, followed by the abstracts from the four technical tracks, and then the closing plenary session. The abstracts associated with the poster session are in the last section of these proceedings. The agenda for the overall symposium is in Appendix A, attendees are listed in Appendix B, and continuing education information is in Appendix C of this volume. Appendices D-J are copies of presentation slides from the plenary sessions.
- Volume 2. This volume contains abstracts and presentation slides for the Enroute Care Track.
- Volume 3. This volume contains abstracts and presentation slides for the Force Health Protection Track.
- Volume 4. This volume contains abstracts and presentation slides for the Healthcare Informatics Track.
- Volume 5. This volume contains abstracts and presentation slides for the Operational Medicine (In-Garrison Care) Track.
- Volume 6. This volume contains abstracts and presentation slides for the Psychological Health/Traumatic Brain Injury Track.

Patient-Centered Precision Care (PC2)

Dr. Ronald Miller, SG9Z, Air Force Medical Support Agency

The Air Force Patient-Centered Precision Care (PC2Z) Program has been established to guide the use of genomic information in clinical decision-making as the field of personalized medicine advances and medical evidence accumulates. Recent advances in genomic technology have suggested that analyses of a patient's genome can provide information on an individual's health, identifying a patient's response to medication or a person's risk of developing disease relative to the average population. In order to fully realize the potential of genomic medicine, further work must be done to demonstrate its clinical utility and to establish an effective infrastructure for the integration of genomics into clinical care. To achieve these goals, the PC2Z Program is composed of four major pillars:

1. Policy: to identify and address the ethical, legal, and social issues associated with the utilization of genomic information in clinic.

2. Research: to longitudinally assess the clinical utility of the genomic information in the delivery of health care. Additionally, de-identified genomic information will be provided to the government and academic partners for use in additional genetic studies aimed at discovering novel disease-gene associations.

3. Informatics: to evaluate methods for the storage, protection, and integration of genomic information into the existing electronic healthcare records.

4. Education: to provide educational resources for medical staff and patients on interpretation and benefits of genomic information in the delivery of health care.

Through the PC2Z program, genomic data will become a valuable resource, informing the efficient and targeted delivery of health care to patients in the future.

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AFMS Patient-Centered Precision Care (PC²Z)

Genomic Medicine Research

Chris Bradburne, PhD and Ruth Vogel, MPH
The Johns Hopkins University,
Applied Physics Laboratory
Major Heather Halvorson, MD, MPH
Major Cecili Sessions, MD, MPH
AFMS Medical Innovations Division

August 2011

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Agenda

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- Overview Patient-Centered Precision Care (PC²)
- Genomic Disease and Medicine
- Implementing Genomic-informed Medicine
- PC²Z Program Approach and Objectives
  - Knowledge Generation Research Pillar
  - Bioinformatics Research Pillar
  - Genomic Education Research Pillar
  - Ethical, Legal, and Social Issues / Policy Research Pillar
  - Systems Engineering / Advance Genomic Diagnostic System
- Whole Genome Sequencing and the future of PC²Z
- Future PC²Z Program Collaborative

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PC² Overview

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- Air Force Medical Service Patient-Centered Precision Care (PC²)
  - State of the art, evidence-based, personalized care incorporating all available patient information
  - Targeted prevention, diagnostics and therapy
  - Two parallel efforts
    - PC²-Clinical (Air Force Clinical Decision Support)
    - PC²-Z (Genomic Medicine Research)
- PC²-Z (Genomic Medicine Research)
  - Advance genome-informed personalized medicine in AFMS
    - Leverage existing AFMS resources, infrastructure, and data
    - Develop agile, scalable program

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Genomic Disease and Medicine

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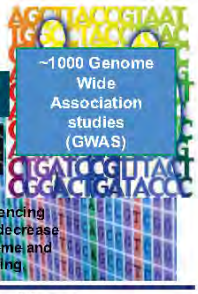
- The long road to realizing genome-informed medicine

1990
Structure and primary sequence of genomes

2000
Biology and variation of genomes

2011
Biology of disease



Advent of Next Generation Sequencing and exponential decrease in cost of full exome and genome sequencing

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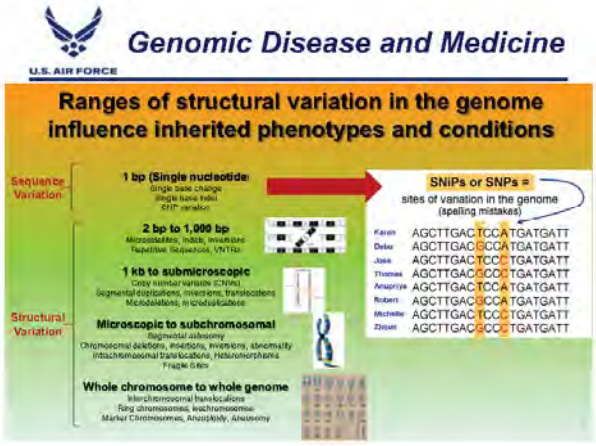
Genomic Disease and Medicine
U.S. AIR FORCE
Ranges of structural variation in the genome influence inherited phenotypes and conditions
Sequence Variation
Structural Variation
1 bp (Single nucleotide)
2 bp to 1,000 bp
1 kb to submicroscopic
Microscopic to subchromosomal
Whole chromosome to whole genome
SNiPs or SNPs =
sites of variation in the genome
(spelling mistakes)
AGCTTGACTCCATGATGATT
AGCTTGACGCCATGATGATT
AGCTTGACTCCCTGATGATT
AGCTTGACGCCCTGATGATT
AGCTTGACTCCATGATGATT
AGCTTGACGCCATGATGATT
AGCTTGACTCCCTGATGATT
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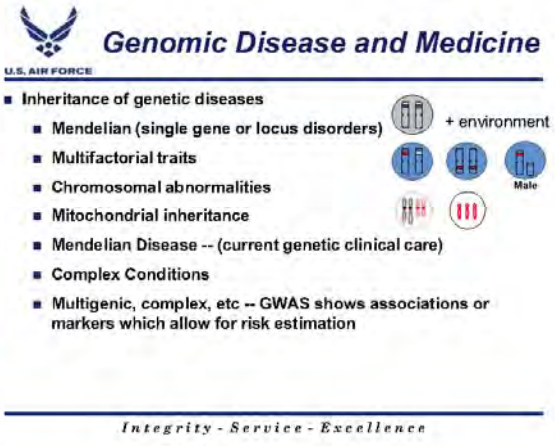
Genomic Disease and Medicine
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Inheritance of genetic diseases
Mendelian (single gene or locus disorders)
Multifactorial traits
Chromosomal abnormalities
Mitochondrial inheritance
Mendelian Disease -- (current genetic clinical care)
Complex Conditions
Multigenic, complex, etc -- GWAS shows associations or markers which allow for risk estimation
+ environment
Male
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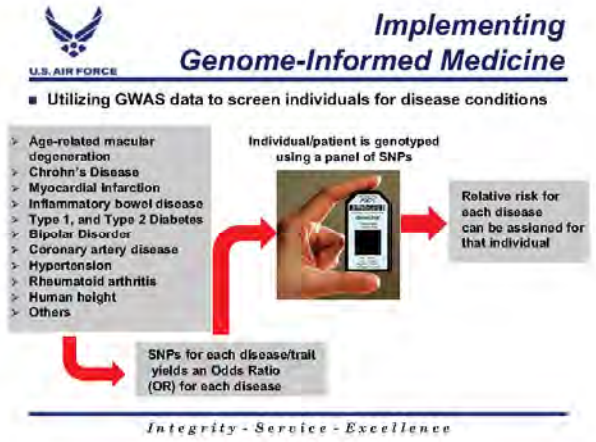
Implementing Genome-Informed Medicine
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Utilizing GWAS data to screen individuals for disease conditions
Age-related macular degeneration
Chrohn's Disease
Myocardial infarction
Inflammatory bowel disease
Type 1, and Type 2 Diabetes
Bipolar Disorder
Coronary artery disease
Hypertension
Rheumatoid arthritis
Human height
Others
Individual/patient is genotyped using a panel of SNPs
Relative risk for each disease can be assigned for that individual
SNPs for each disease/trait yields an Odds Ratio (OR) for each disease
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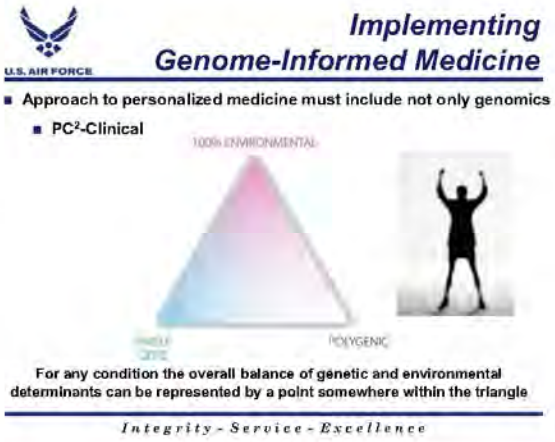
Implementing Genome-Informed Medicine
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Approach to personalized medicine must include not only genomics
PC²-Clinical
100% ENVIRONMENTAL
POLYGENIC
For any condition the overall balance of genetic and environmental determinants can be represented by a point somewhere within the triangle
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Implementing Genome-Informed Medicine

- Collaboration is absolutely necessary
- Technology outpacing medical evidence for clinical implementation
  - Perception: ability to sequence the genome = clinical action
  - Complex conditions? Clinical utility? Modest effect size?
- Show-stopping ethical, legal, and social issues for military
- Need to establish policy and to adapt to changes in field/society
- Healthcare teams and patients need education and experience
- Requires proven, robust health informatics in routine clinical use
- Solution system will need to incorporate regulatory requirements, need for accepted standards, interoperability across healthsystems, patient rights, intellectual property/reimbursement, translation function for rapid integration of new evidence

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PC²Z Program Approach

- Consortium of leading experts to direct / inform integrated program
  - Government and academic partners; JHU APL program integrator
  - Collaboration and transparency

APL The Johns Hopkins University APPLIED PHYSICS LABORATORY
dbGaP
National Human Genome Research Institute
JOHNS HOPKINS UNIVERSITY
NATIONAL CANCER INSTITUTE
AIR FORCE MEDICINE
DUKE HUMAN GENETICS
CORNELL INSTITUTE

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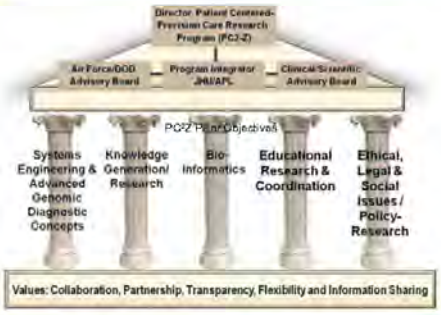
PC²Z Program Approach



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PC²Z Pillars

- Knowledge Generation / Research Pillar (KGR)
  - Objective: expand evidence for clinical utility of genomic information
    - Longitudinal Clinical Utility Study
      - Report genomic risk to participants
      - Complex conditions treated in Primary Care
      - Potentially clinically actionable
  - Objective: create digital biobank
    - Full sequence and clinical data
  - Objective: support knowledge generation / discovery studies
    - NIH NCBI dbGAP mechanism

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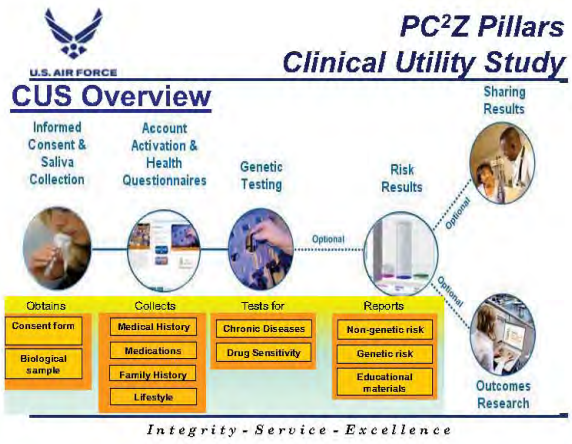
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PC²Z Pillars
Clinical Utility Study
CUS Overview
Informed Consent & Saliva Collection
Account Activation & Health Questionnaires
Genetic Testing
Risk Results
Sharing Results
Optional
Optional
Optional
Obtains
Collects
Tests for
Reports
Consent form
Biological sample
Medical History
Medications
Family History
Lifestyle
Chronic Diseases
Drug Sensitivity
Non-genetic risk
Genetic risk
Educational materials
Outcomes Research
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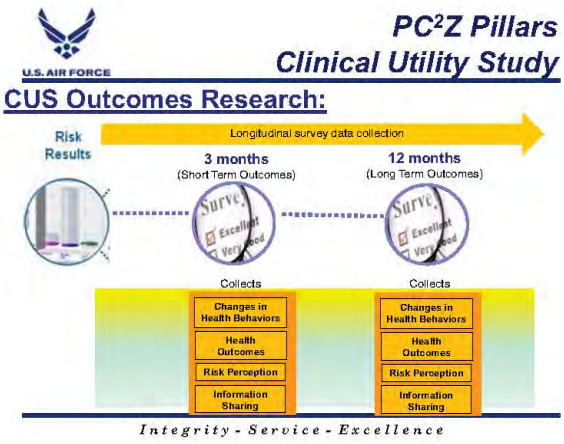
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PC²Z Pillars
Clinical Utility Study
CUS Outcomes Research:
Risk Results
Longitudinal survey data collection
3 months
(Short Term Outcomes)
12 months
(Long Term Outcomes)
Collects
Collects
Changes in Health Behaviors
Health Outcomes
Risk Perception
Information Sharing
Changes in Health Behaviors
Health Outcomes
Risk Perception
Information Sharing
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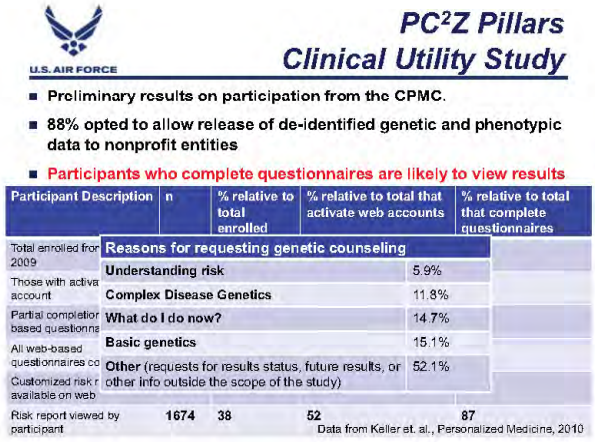
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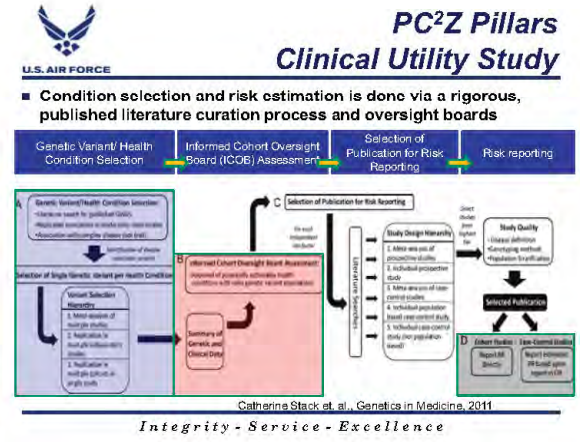
PC²Z Pillars
Clinical Utility Study
Preliminary results on participation from the CPMC.
88% opted to allow release of de-identified genetic and phenotypic data to nonprofit entities
Participants who complete questionnaires are likely to view results
Participant Description
n
% relative to total enrolled
% relative to total that activate web accounts
% relative to total that complete questionnaires
Total enrolled from 2009
Those with activa account
Partial completion based questionna
All web-based questionnaires co
Customized risk r available on web
Risk report viewed by participant
1674
38
52
87
Reasons for requesting genetic counseling
Understanding risk 5.9%
Complex Disease Genetics 11.8%
What do I do now? 14.7%
Basic genetics 15.1%
Other (requests for results status, future results, or other info outside the scope of the study) 52.1%
Data from Keller et. al., Personalized Medicine, 2010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PC²Z Pillars
Clinical Utility Study
Condition selection and risk estimation is done via a rigorous, published literature curation process and oversight boards
Genetic Variant/ Health Condition Selection
Informed Cohort Oversight Board (ICOB) Assessment
Selection of Publication for Risk Reporting
Risk reporting
Catherine Stack et. al., Genetics in Medicine, 2011
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PC²Z Pillars
Clinical Utility Study

- Current, board-approved conditions and drug/variant pairs

ICOB/PAG approved conditions	Risk factors (other than genetic variant)	Multi-variable adjustment
Age-related macular degeneration	Family history Smoking	None
Coronary Artery Disease	Family history Smoking Diabetes	Yes
Iron Overload / Hemochromatosis	None	None
Type 2 Diabetes	Family history Body Mass Index	Yes
Melanoma	Family history	None
Prostate Cancer	Family history	Yes
Lupus	Family history Smoking	None
Type 1 Diabetes	Family history	Yes
CYP2C19/ Clopidogrel	Use of Proton pump inhibitors	None

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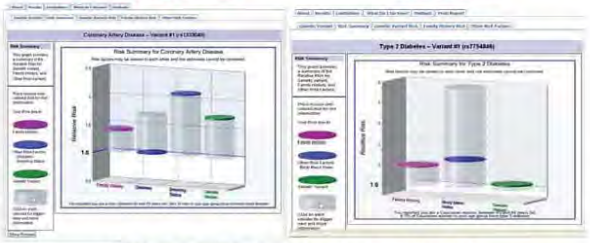
PC²Z Pillars
Clinical Utility Study

Coronary Artery Disease | Type 2 Diabetes



Risk reporting is not only genetic risk, but all known risk factors

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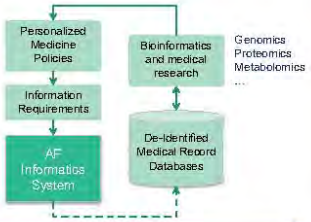
PC²Z Pillars
Bioinformatics

- Objective: develop learning system that incorporates genomic data into existing and future DoD informatics tools

System Adaptability

Architecture of AF Medical Informatics System must be flexible and adaptable to accommodate changing information requirements resulting from changing medical knowledge and practice.



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PC²Z Pillars
Education Research Pillar

- Objective: ensure healthcare team, to include the patient, has an adequate understanding of genomic medicine
- Objective: support graduate medical education research requirements

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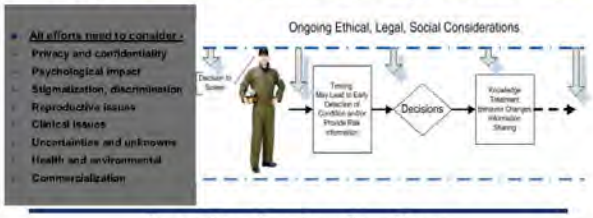
PC²Z Pillars
ELSI/ Policy Research Pillar

- Objective: develop agile, adaptable mechanism to enable AF/DoD policy that is evidence-based and current
- Objective: address ELSI issues throughout program

Program Needs to be Anticipatory, Not Reactive



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PC²Z Pillars

- Systems Engineering / Advanced Genomic Diagnostic Concepts
  - Objective: develop diagnostic system which enables delivery of full-sequence genomic information into health system workflow
    - integrate expanding evidence-base
    - informatics standards for interoperability across diverse platforms
    - ethical, legal, and social issues
    - patient autonomy/rights
    - regulatory, intellectual property, medical-legal documentation and reimbursement requirements

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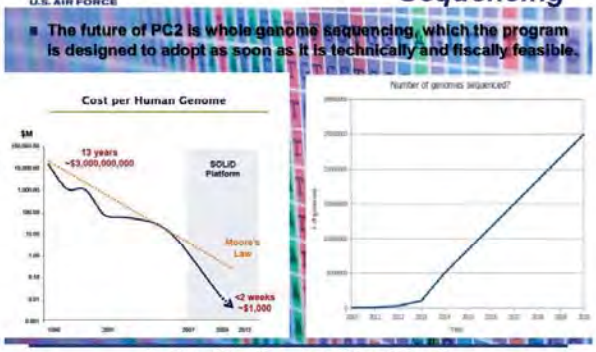
The Future - Whole Genome Sequencing

- The future of PC2 is whole genome sequencing, which the program is designed to adopt as soon as it is technically and fiscally feasible.



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Future PC²Z Collaborative

- Interested AFMS researchers
- Interested parties for ancillary studies
- Interested partners from other DOD medical services

APL The Johns Hopkins University APPLIED PHYSICS LABORATORY
dbGaP
National Institutes of Health
JOHNS HOPKINS UNIVERSITY
National Cancer Institute
National Human Genome Research Institute
DUKE Center for Human Genetics
Coriell Institute
Air Force Medicine

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Questions/Comments
UNITED STATES AIR FORCE
MEDICAL SERVICE
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Patient Health Record with Secure Messaging (PHR/SM) Implementation at Elmendorf AFB

Drs. Ritu Agarwal and Catherine Anderson, University of Maryland

We describe early results of a pilot patient health record (PHR) project implemented and deployed at Elmendorf Air Force Base in December 2010. The PHR tool supports entry and management of health information directly by patients, integrates with the patient's clinical record, and supports secure patient-provider messaging. It is a core component of the US Air Force's transition towards a healthcare delivery system that is patient-focused and incorporates principles of the Patient Centered Medical Home. We provide a brief summary of the project from its initial motivation through development and the go-live period. We outline our long-term research goal which is to gather evidence to demonstrate the value of this suite of tools on patients' health outcomes, their empowerment in making health-related decisions, engagement with healthcare, and the efficiency of health services delivery. Finally, we provide early evidence from surveys of users and providers conducted at the launch of the pilot to assess their baseline expectations about the system and insights on effectiveness of change management efforts. 1,639 patients registered during the project's three month baseline period. 283 patients responded to the email survey requests. Approximately half of the providers completed surveys. While it is very early in the implementation of the PHR and available data for analysis is limited, we are able to make a few recommendations based on preliminary findings. Early results indicate an overwhelmingly positive patient response to the PHR tool which is not reflected to the same degree by the providers. Consequently, training and messaging targeted toward providers should be positive but also realistically set expectations. As the PHR is deployed at other MTFs, opportunities to personally promote the PHR via registration desks and directly through providers and staff should be emphasized as findings suggest these mechanisms result in higher positive patient perceptions of and intentions to use the PHR.

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Patient Health Record with Secure Messaging (PHR/SM) Implementation at Elmendorf AFB

Drs. Ritu Agarwal and Catherine Anderson, University of Maryland
Col. J. Zarate, USAF
Maj. Claudine Ward, USAF

August 2011

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Agenda

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- Empowering patients with technology
- Project background & objectives
- Project inception and evolution
- Project organization
- System rollout
- Early adopters – who are they and what are their usage patterns?
- Research study overview & baseline highlights
- Next steps

Empowering Patients with Technology

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- Consumers are interested in self management of health info (Pew 2011; Deloitte 2008)
- 91 'viable' PHR products with different features and characteristics (Jones et al. 2010)
- Despite importance of PHR tools for patient engagement and potential benefits in cost reduction and improved quality of care, there exists limited evidence about PHR deployment and use

Project Background & Objectives

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- AFMS key aims are to improve overall readiness, experience of care, population health and per capita cost
- AFMS is committed to pursuing strategies consistent with the principles of the patient-centered medical home (PCMH) initiative
- Goals of the PHR/SM implementation project:
  - Improve quality of healthcare
  - Increase staff productivity
  - Decrease staff workload
  - Increase patient control and empowerment

PCMH is the lynchpin to better decision support for patients and health teams
General Green, SG USAF

Project Inception and Evolution

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- Initiated in 2008 by AFSG
- Joint Base at Elmendorf-Richardson (JBER) selected
  - Approximately 37,000 patients; medical group staff of approximately 150
- Project Team consisted of 4 sub-teams each focused on specific tasks
  - Functional Team
  - Technical Team
  - Change Management Team
  - Study Design Team

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Project Organization Chart

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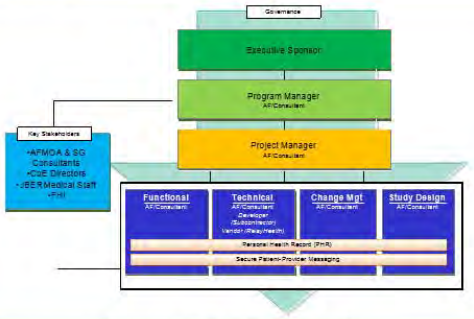

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System Rollout & Change Management

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SYSTEM ROLLOUT

Key activities requiring completion prior to go-live included:

- Obtaining information assurance compliance
- Establishment of a production support team
- Revisiting business rules
- User acceptance

CHANGE MANAGEMENT

Engage stakeholders throughout the process with primary goals to:

- Reduce resistance from and promote adoption by medical group staff
- Drive demand of and promote adoption by patient population
- Proactively identify and mitigate risks
- Prepare medical group to effectively use the tool and integrate secure messaging into existing clinical processes

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Patients' Perspectives: Benefits

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Efficiency

Avoid phone tag
Minimize unnecessary visits
Facilitate tracking of family information
Reminders
Fewer duplicate tests, immunizations

Empowerment

Control/ownership (print and take with you instead of relying on provider → efficiency/effectiveness
Improved self-care

Effectiveness

Improves accuracy due to patient verification of record
Record of exchange – no ambiguity
Reassurance that patient is doing the right thing for non-urgent concerns

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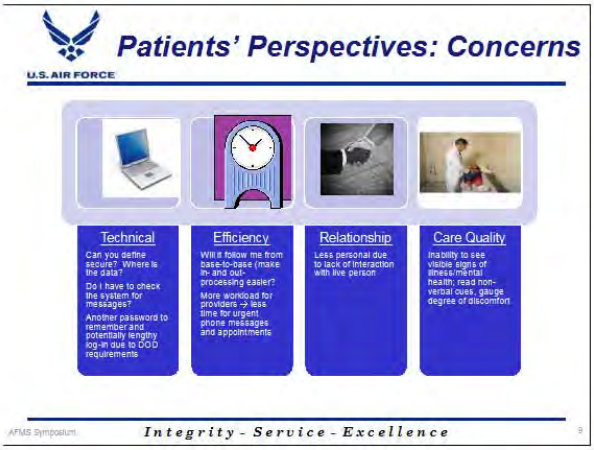
Patients' Perspectives: Concerns
U.S. AIR FORCE
Technical
Can you define secure? Where is the data?
Do I have to check the system for messages?
Another password to remember and potentially lengthy log-in due to DOD requirements
Efficiency
Will it follow me from base-to-base (make in- and out-processing easier?
More workload for providers → less time for urgent phone messages and appointments
Relationship
Less personal due to lack of interaction with live person
Care Quality
Inability to see visible signs of illness/mental health; read non-verbal cues, gauge degree of discomfort
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Branding & Messaging
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MiCare chosen as the name of the PHR/SM solution
Central marketing theme "Take Command of Your Healthcare"
Marketing material developed to appeal to different groups of patients (e.g., active duty, parents, retirees)
Key PHR/SM Capabilities and Benefits Used:
Request your next appointment
Request medication renewals
Receive your test and lab results
Maintain a Personal Health Record (PHR) to manage your health
Communicate online with your healthcare team about non-urgent symptoms
Avoid unnecessary office visits and telephone calls
Request a copy of your immunization record
Access a large library of patient education materials
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Branding Samples
U.S. AIR FORCE
Phase 1
MiCare
Take Command of Your Healthcare
Phase 2
MiCare
Take Command of Your Healthcare
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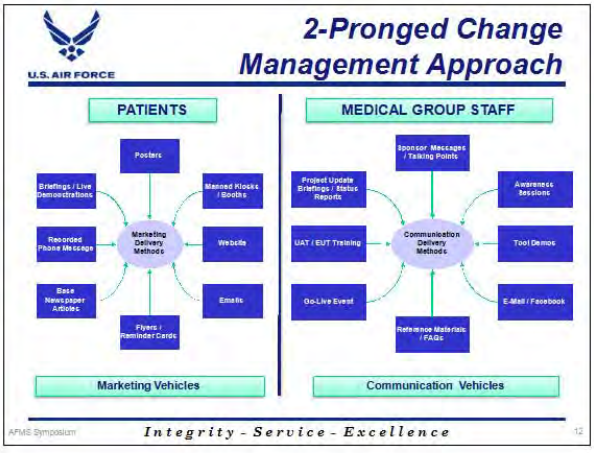
2-Pronged Change Management Approach
U.S. AIR FORCE
PATIENTS
MEDICAL GROUP STAFF
Posters
Briefings / Live Demonstrations
Manned Kiosks / Booths
Recorded Phone Message
Website
Base Newspaper Articles
Emails
Flyers / Reminder Cards
Marketing Delivery Methods
Marketing Vehicles
Sponsor Messages / Talking Points
Project Update Briefings / Status Reports
Awareness Sessions
UAT / EUT Training
Tool Demos
Go-Live Event
E-Mail / Facebook
Reference Materials / FAQs
Communication Delivery Methods
Communication Vehicles
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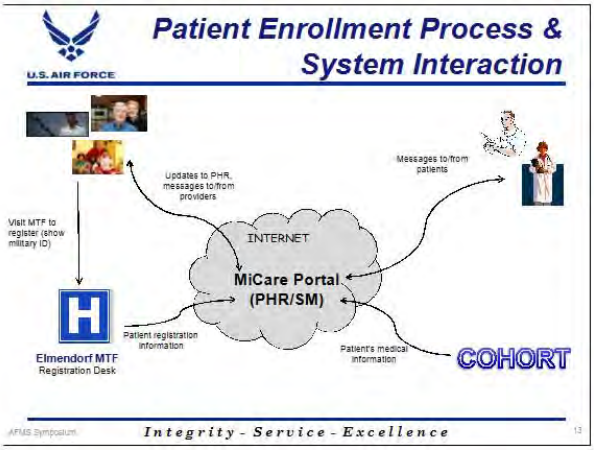
U.S. AIR FORCE
Patient Enrollment Process & System Interaction
Updates to PHR, messages to/from providers
Messages to/from patients
Visit MTF to register (show military ID)
INTERNET
MiCare Portal (PHR/SM)
Patient registration information
Patient's medical information
COHORT
Elmendorf MTF Registration Desk
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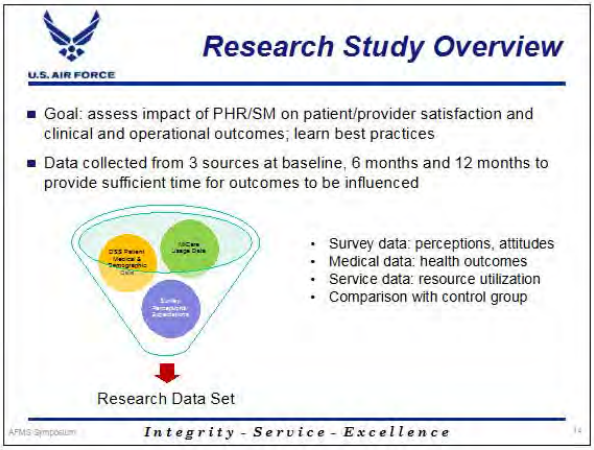
U.S. AIR FORCE
Research Study Overview
Goal: assess impact of PHR/SM on patient/provider satisfaction and clinical and operational outcomes; learn best practices
Data collected from 3 sources at baseline, 6 months and 12 months to provide sufficient time for outcomes to be influenced
Survey data: perceptions, attitudes
Medical data: health outcomes
Service data: resource utilization
Comparison with control group
Research Data Set
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EARLY FINDINGS
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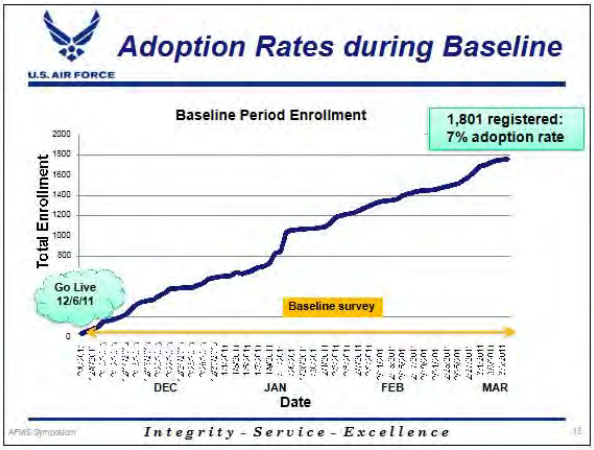
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Adoption Rates during Baseline
Baseline Period Enrollment
1,801 registered: 7% adoption rate
Total Enrollment
Go Live 12/6/11
Baseline survey
DEC
JAN
FEB
MAR
Date
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Who are the Early Adopters?

Variable	Elmendorf Population (1)	PHR/SM Early Adopters (2)	Survey Respondents (3)
Demographics			
Gender (Male=1)	.46	.37 (1*)	.36 (1*)
Age	40.0	32.1 (1*)	47.2 (1*,2*)
Sponsor Pay Grade	5.48	5.40 (1*)	5.69 (1*,2*)
Number of Dependents	.72	.63	.60
Dependents vs. Active Duty (Dependent Category = 1)	.52	.64 (1*)	.55 (2*)
Medical Condition			
Average Total Chronic Diseases	.39	.49 (1*)	.63 (1*,2*)
N	20,069	1,518	283

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How are they Using the Tool?

- 28% (compared to 25% of survey sample) of enrolled patients either sent/received messages or accessed their PHR in first month

	All Enrollees		Enrolled / Not Surveyed		Survey Sample	
Variable	N	Average Usage	N	Average Usage	N	Average Usage
Messages Sent/Received	486	20.84	422	22.05	64	12.89*
Webvisits	1	2.00	1	2.00	0	0
PHR Accesses	496	192.19	424	187.93	72	217.32
Total Activity	496	212.62	424	209.88	72	228.78

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Study Highlights – Patient Expectations

- **Patients are overwhelmingly positive**
  - *I think on line contact with doctor & medical records will **answer lots of questions** and save so **much time** for both doctor and patients.*
  - *I'm **excited** at this opportunity, and feel like it is always **empowering** to be able to communicate via the internet about routine health issues - and can very well **prevent visits** to the clinic…*
  - *I am really **excited** to use MiCare. I was extremely **impressed** that it has compiled all of my health information from all of my providers. Being in the military and moving a lot, sometimes you forget things or names and this is an extremely valuable tool to me.*

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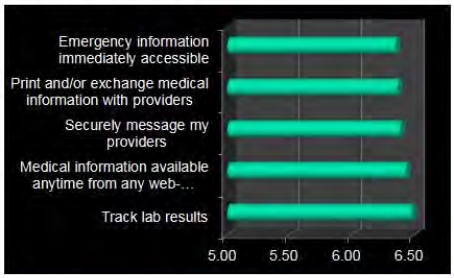
Study Highlights – What Patients Find of Value

- **Top 5 PHR/SM features of 18**



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Study Highlights – Change Management Effectiveness

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Study Highlights – Provider Expectations

- **Providers express concern in open-ended comments**
- *Initial promotion made many promises which have not been born out in practice and use. It has increased workload tremendously without improving patient satisfaction.*
- *Providers, nurses, techs and patients have all been frustrated by what is lacking.*
- *I realize that MiCare is a work in progress, but the content on the patient side is not currently as rich as I had been led to believe it would be. Many lab results seem to be missing.*
- *MiCare does not communicate with our current electronic medical records system--so everything we do in MiCare that needs to be part of the official medical records causes me to perform the tasks twice----waste of time!*

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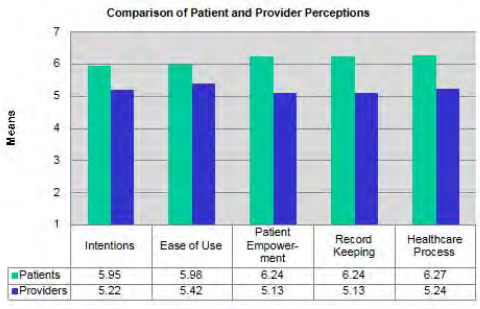
Study Highlights- Provider/Patient Perceptions



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Summary of Early Findings

- **Positive "expectations" among patients, less so for providers**
- **Adoption is trending up but still low**
  - Key is personal promotion and recommendation to patients by providers
- **Usage is low**
  - Provider-initiated secure messaging
  - Identification and designation of super users
  - Compelling "use" stories
- **Overcoming provider resistance**
  - Realistic messaging and expectation management
  - Sufficient training of providers/staff
  - Workflow and business rules

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Next Steps
September: 6 months from end of baseline period
Analyze usage data
Match Elmendorf sample with control group
Explore effects on medical outcomes
Medical conditions
Diabetes
Hypertension
Asthma
Polypharmacy
High utilizers
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Effects of COMPASS Workflow Documentation Quality of Family Medicine Physicians using the Military Electronic Health Record (AHLTA)

Lt Col Charles Motsinger, Workflow Division, Office of the Chief Information Officer, Air Force Medical Support Agency

Abstract: Electronic medical records are touted to be able to improve the documentation of medical care. To date there are no studies applying a standardized clinical workflow to an electronic medical record. AIMS: To determine if the COMPASS workflow improves the documentation and coding of family physicians using the military's electronic medical record (AHLTA). Method: 189 charts were reviewed retrospectively from two Air Force family medicine residency sites. Primary outcomes were compliance with Joint Commission (JC) and Health Services Inspection (HSI) requirements for outpatient documentation, relative value units (RVU's) per encounter, coding accuracy, and readability of notes. Results: The COMPASS workflow is associated with a significant increase in compliance with JC and HSI requirements ($P<.05$), a significant increase in RVU's per encounter ($P<.05$), a significant increase in coding accuracy ($P<.05$) and a significant increase in readability of notes ($P<.05$).

Headquarters U.S. Air Force

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Effects of COMPASS Workflow on Documentation Quality of Family Medicine Physicians using the Military Electronic Health Record (AHLTA)

U.S. AIR FORCE

Workflow Division
Office of the Chief Information Officer
AFMSA/ SG6
2 Aug 2011

Methods and Results

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- IRB approved research comparing documentation at Travis (non-COMPASS) and Nellis (COMPASS).
- Participants: Teaching staff and Intern records: 250 charts
- Results: COMPASS workflow associated with
  - Increased Joint Commission/HSI compliance
  - Increased Readability of notes
  - Increased coding accuracy
  - Increased RVU's per encounter

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Joint Commission/HSI Compliance

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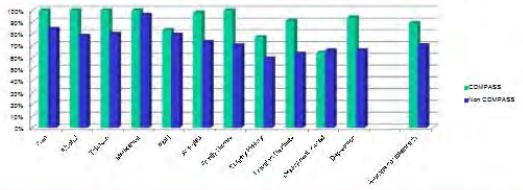
	Compass	Non Compass
Pain	100%	84%
Alcohol	100%	78%
Tobacco	100%	80%
Medication	92%	86%
PMH	83%	79%
Allergies	88%	73%
Family History	100%	70%
Surgical History	77%	68%
Learning Disability	91%	82%
Deployment Related	84%	66%
Depression	94%	66%
Average compliance	89%	70%



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Readability of Note

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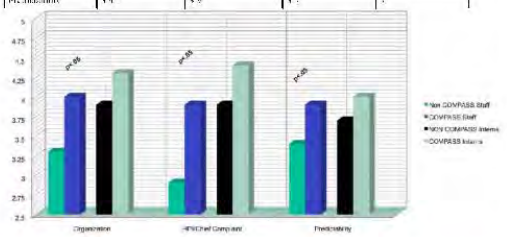
	Non Compass Staff	Compass Staff	Non Compass Interns	Compass Interns
Organization	3.3	4	3.9	4.3
HPI/Chief Complaint	2.9	3.9	3.9	4.4
Predictability	3.6	3.9	3.7	4



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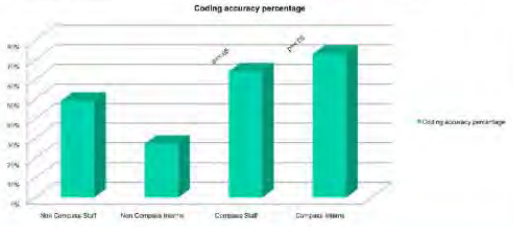
Coding Accuracy

Non Compass Staff	49%	
Non Compass Interns	27%	
Compass Staff	64%	z=2.289
Compass Interns	73%	z=4.666



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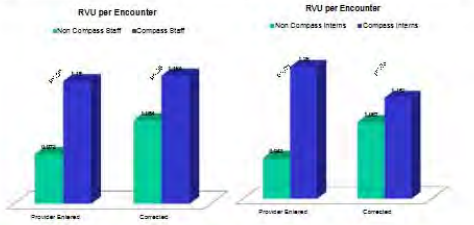
RVU's per Encounter

	Non Compass Staff	Compass Staff	Non Compass Interns	Compass Interns
Provider Entered	0.972	1.15	0.943	1.26
Corrected	1.054	1.164	1.067	1.152



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QUESTIONS

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Teamwork Factors Affecting Safe Blood Product Administration

Maj Jennifer Hatzfield, Travis AFB, United States Air Force

Background: Blood transfusion errors are a potentially fatal mistake that can occur within the hospital setting and often result from errors in patient identification at the bedside just prior to administration. Transfusion errors are most frequent in smaller facilities and primarily due to administering a correctly labeled unit of blood to the incorrect patient.

Methods: Between March 2009 and August 2009, the simulation center at David Grant Medical Center devised a scenario to test if appropriate patient identifiers were verified prior to administering a unit of packed red blood cells. Thirteen teamwork activities were scored for sixteen different clinical teams.

Results: Of the sixteen simulations, four teams (25%) hung the incorrect blood for the patient in the simulated environment. One teamwork factor (team cross-monitors and gives feedback) was statistically significantly lower for groups that gave the wrong blood ($p=0.03$). Four other items suggested differences between groups, but were not statistically significant because of the limited sample size. These factors included directing responsibility to individual team members ($p=0.13$), engaging the patient in treatment ($p=0.15$), making decisions through collective input ($p=0.13$), and clear goals articulated from the leader ($p=0.11$). There were no differences in the scores from the other teamwork factors ($p=1.0$ for all).

Conclusion: The simulation environment provides a valuable avenue to practice and evaluate high-risk activities, such as blood product administration. Additional study is needed to determine if the identified teamwork items are significantly different in a larger sample size and in other high-risk activities.

TEAMWORK FACTORS AFFECTING SAFE BLOOD PRODUCT ADMINISTRATION

Major Jennifer Hatzfeld, Major Sherry Smith, & Mr. Eugene Bryan

Major Jennifer Hatzfeld, PhD, RN, APHN-BC
Clinical Investigation Facility
Travis Air Force Base

Acknowledgements

Thanks to the staff at the David Grant Medical Center Simulation Center, particularly Mr. Brian Brubaker, for their assistance collecting and scoring the data for this study.

NOTE: The views expressed in the document are those of the author, and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government.

Overview

- Background
- Methods
- Results
- Implications
- Further Research

Blood Product Administration

- Blood transfusion errors are a potentially fatal mistake often from errors in patient identification at the bedside just prior to administration (Murphy et al., 2007)
- Risk of incompatible red cell transfusion is 1 in every 38,000 units administered—higher than the risk of developing a viral infection (Linden, Wagner, Voytovich & Sheehan, 2000)
- Transfusion errors are most frequent in smaller facilities (<2,000 units/yr) mostly due to administering a correctly labeled unit of blood to the incorrect patient (Linden et al., 2000).

Use of Simulation

- Simulation is an important tool to:
  - Evaluate teamwork and communication skills (Calhoun et al., 2009; Rosen et al., 2008; Manser, 2008)
  - Improve training (Ward-Smith, 2008; Overstreet, 2008)
  - Evaluate factors associated with blood product administration (Liu, Grundgeiger, Sanderson, Jenkins & Leane, 2009).

TeamSTEPPS®

- Stands for: "Team Strategies and Tools to Enhance Performance and Patient Safety"
- Evidence-based, teamwork system to improve patient safety
- Developed by the DoD Patient Safety Program and the Agency for Healthcare Research and Quality (AHRQ)
- Comprised of four specific skills:
  - Communication
  - Leadership
  - Situation Monitoring
  - Mutual Support

(AHRQ, 2010)

Methods

- 17 different clinical teams were evaluated between March 2009 and August 2009
- Efforts part of scheduled Team STEPPS training accomplished in the simulation center by every inpatient unit
- Scenario designed to test if appropriate patient identifiers were verified prior to administering a unit of packed red blood cells (PRBCs).
- Scenarios were videotaped, and then scored by a single TeamSTEPPS trained staff member at the Simulation Center
- 13 teamwork factors were scored for each team

The Scenario

- Patient presented with signs/symptoms of low Hemoglobin/Hematocrit
- Nursing staff had to provide telephone report to physician
- Provider directed nursing staff to request 1 unit of packed red blood cells, and he/she would arrive shortly
- When physician arrived, brought the unit of PRBCs, and instructed the nursing staff to give it "right away"
- The PRBCs brought by the provider were for a different patient (different name, and different SSN) and was a different blood type

Scoring

Each element scored as: "Needs Improvement", "Met Standards", or "Exceeded Standards"

Verbal Communication

1. Use of SBAR format (Situation, Background, Assessment, Recommendation)
2. "Call Out"/Directing responsibility to a specific person
3. Check Back: Closed loop communication
4. Hand-Off/Debriefs at transitions in care
5. Team includes patient/family in communication
6. Team shares information/makes decisions through collective input

Scoring

Leadership

7. Leader articulates team goals
8. Team members express common understanding of problem and roles
9. Leader holds team members accountable
10. Team members empowered to speak-up and challenge

Situation Monitoring/Mutual Support

11. Team cross-monitors
12. Shared Mental Model
13. Effective Feedback

Results

- 17 scenarios completed
- Represented 80 staff members
- 16 scenarios were videotaped and scored (N=16)
- 4 teams (25%) incorrectly administered the packed red blood cells

NOTE: no mannequins were harmed during the course of the scenarios

Teamwork Factors

- Scores were compared between teams that "passed" and those that "failed" using Wilcoxon Signed-Rank Test (non-parametric test)
- Key Finding:
  One teamwork factor (team cross-monitors and gives feedback) statistically significantly lower for groups that gave the wrong blood (p=0.03).
- Because of small sample size (n=16), likely that other factors were associated with scenario "success"

Teamwork Factors

- Four other items suggested differences between groups:
  - Directing responsibility to individual team members (p=0.13)
    [higher for teams that gave the wrong blood]
  - Includes patient/family in communication (p=0.15)
  - Make decisions through collective input (p=0.13)
  - Clear goals articulated from the leader (p=0.11)

Teamwork Factors

No other differences in scores were observed from the remaining teamwork factors.

Verbal Communication
- Use of SBAR format (Situation, Background, Assessment, Recommendation) (p=0.67)
- Check Back: Closed loop communication (p=1.0)
- Hand-Off/Debriefs at transitions in care (p=1.0)
- Team shares information/makes decisions through collective input (p=1.0)

Leadership
- Team members express common understanding of problem and roles (p=1.0)
- Leader holds team members accountable (p=1.0)
- Team members empowered to speak-up and challenge (p=1.0)

Situation Monitoring/ Mutual Support
- Shared Mental Model (p=1.0)
- Effective Feedback (p=1.0)

Implications for Local Practice

- Scenario highlighted the need for further process improvement in blood product administration
  (Blood product checklist completed in 2010)
- Reinforces the need for continued TeamSTEPPS training using simulations
  (Is the investment of staff time worthwhile?)
- Supports the need for units to evaluate and improve teamwork factors
  (Does a teamwork score really matter?)

Implications for Patient Safety

- Specific teamwork factors appear to be associated with poor patient safety outcomes
- Initial and recurring teamwork training should emphasize the importance of each teamwork factor
- Simulations can provide a safe environment to learn from failure
  - Direct feedback for the participants
  - Ability to evaluate trends within an organization

Limitations

- Limited sample size
- Accomplished at one location
- TeamSTEPPS teamwork factors have face validity, but scores have not been validated with established teamwork measures
- Inter-rater reliability of scores has been a problem in the past, reason for a single rater in this project

Future Research

- Expand scenarios to include other low-volume, high-risk activities: is success associated with the same teamwork factors
- What is the role of experience and expertise on teamwork and patient safety outcomes
- Explore the relationship among teamwork factors (communication, leadership, situation monitoring & mutual support)
- Further validation of teamwork scoring elements is needed

"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."

-Colin Powell

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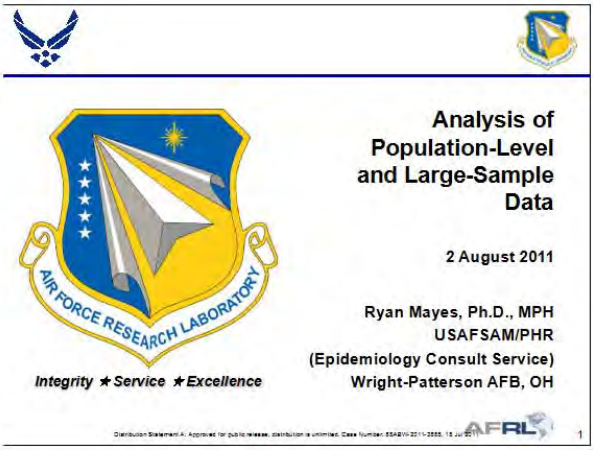
Analysis of Population-Level Data

Dr Ryan Mayes, United States Air Force, Wright-Patterson AFB, OH

Sampling techniques and statistical tests are required to estimate population parameters in the absence of data for a fully enumerated population. However, in the military, it is often the case that population-level data are available. This raises two interesting questions: (1) when a population is fully enumerated, is it appropriate to apply sample-based techniques (hypothesis tests, confidence intervals, etc.) and (2) if not, what procedures should be used? This presentation will address both questions. Discussion of the first question will review why it is inappropriate to simply treat population data as a sample of a larger population and use sample-based testing. Sample-based techniques are not needed to estimate a parameter if that parameter can be calculated; it is not appropriate to apply these techniques to data for a fully enumerated population. The second question will address alternatives to sample-based testing. Hypothesis tests answer the question of whether a difference between a parameter and a sample statistic (or between two statistics) is likely real ("significant") but remain silent on whether the difference is important. When comparing two parameters, any detected difference is real – a hypothesis test would be of no use. Because differences are very likely to occur, determining whether a difference is important becomes the predominant task. To evaluate the importance of detected differences, options based on both magnitude and probability will be presented. The magnitude-based option sets a priori differences in effect sizes, while the probability-based option uses a non-sample-based z-test (using the population standard deviation rather than a standard error). Multivariable analyses will also be discussed.


AIR FORCE RESEARCH LABORATORY
Integrity ★ Service ★ Excellence
Analysis of Population-Level and Large-Sample Data
2 August 2011
Ryan Mayes, Ph.D., MPH
USAFSAM/PHR
(Epidemiology Consult Service)
Wright-Patterson AFB, OH
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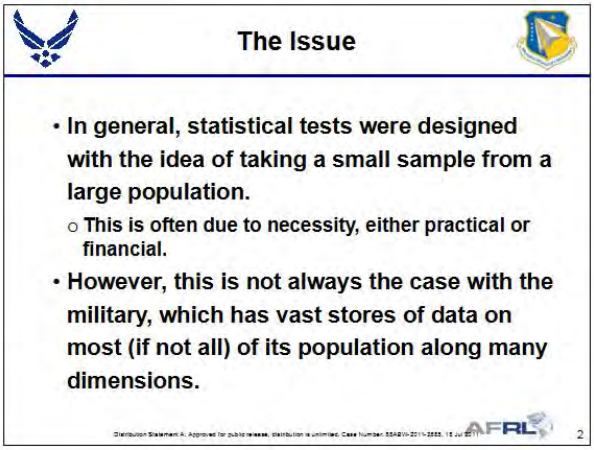
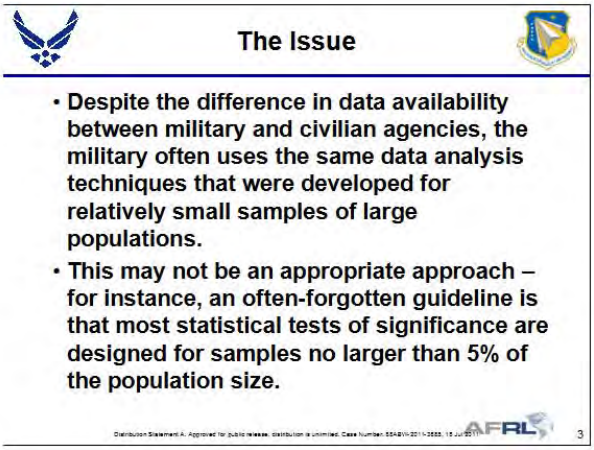
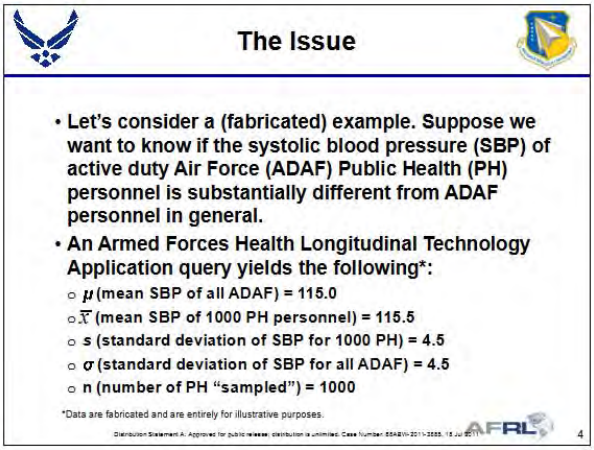

The Issue
• In general, statistical tests were designed with the idea of taking a small sample from a large population.
○ This is often due to necessity, either practical or financial.
• However, this is not always the case with the military, which has vast stores of data on most (if not all) of its population along many dimensions.
2


The Issue
• Despite the difference in data availability between military and civilian agencies, the military often uses the same data analysis techniques that were developed for relatively small samples of large populations.
• This may not be an appropriate approach – for instance, an often-forgotten guideline is that most statistical tests of significance are designed for samples no larger than 5% of the population size.
3


The Issue
• Let's consider a (fabricated) example. Suppose we want to know if the systolic blood pressure (SBP) of active duty Air Force (ADAF) Public Health (PH) personnel is substantially different from ADAF personnel in general.
• An Armed Forces Health Longitudinal Technology Application query yields the following*:
○ μ (mean SBP of all ADAF) = 115.0
○ x̄ (mean SBP of 1000 PH personnel) = 115.5
○ s (standard deviation of SBP for 1000 PH) = 4.5
○ σ (standard deviation of SBP for all ADAF) = 4.5
○ n (number of PH "sampled") = 1000
*Data are fabricated and are entirely for illustrative purposes.
4

The Issue

- With these data for 1000 individuals, there are three possibilities for the relationship between sample and sample population:
  1. The data could be a small sample (<5%) of a large population (this would mean that the entire population of PH personnel would need to be 20,000+).
  2. The data could be a large sample relative to the population size (such as 1000 sampled out of 2000 total).
  3. The data could comprise a census (an entire population).
- We'll examine approaches for each of these possibilities.

Scenario 1: Small Sample

- Generally, we would approach this problem as a typical, basic hypothesis test. This is entirely appropriate for a relatively small sample. We'd set up our null hypothesis as something like H_0: $\mu = 120$.
- We would next run the test:

$$z = \frac{(\bar{x} - \mu)}{(s)/\sqrt{n}} = \frac{(115.5 - 115.0)}{4.5/\sqrt{1000}} = 3.513$$

(s) → or σ

- This yields a very small *p*-value (0.000442); we conclude that the SBP of PH personnel is significantly different from that of the AF in general.

Scenario 2: Large Sample

- If the sample of n=1000 came from a population of N=2000, it would no longer be appropriate to use a typical hypothesis test.
  - One of the underlying assumptions of sampling theory is violated; our sample is well above 5% of the population size‡.
- The relatively large sample size would prompt the use of the finite population correction (FPC):

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{n-1}}$$

This is the FPC which is added to the usual standard error term.

  - Where N is the population size and n is the sample size.

‡ Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley & Sons, 1977.

Scenario 2: Large Sample

- If the sample of n=1000 came from a population of N=2000, the relatively large sample size would prompt the use of the FPC:

$$z = \frac{(\bar{x} - \mu)}{\sigma_{\bar{x}}} = \frac{(\bar{x} - \mu)}{\frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{N-1}}} = \frac{(115.5 - 115.0)}{\frac{4.5}{\sqrt{1000}}\sqrt{\frac{2000-1000}{2000-1}}} = 4.968$$

- Here, *p*=0.000000339.
  - Recall that *z*=3.513 and *p*= 0.000442 using traditional analysis.
- This is good news: compared to the results using traditional analysis, analysis *with* the FPC produces stronger evidence (and has the benefit of being technically correct).

Scenario 2: Large Sample

- Take-home message: when the sample is a large proportion of the population (>5%), use the FPC‡!
  - Substitute $\frac{\sigma}{\sqrt{n}}$ with $\frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{N-1}}$
- This appropriately adjusts for the relative sample size and provides stronger evidence for hypothesis tests.

‡ Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley & Sons, 1977.

Scenario 2: Large Sample

- The FPC can also be used with confidence intervals (CIs):

$$95\%\ CI = \bar{x} \pm z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{N-1}}$$

- This will make the confidence interval narrower (more precise) as compared to an interval without the FPC.

Scenario 3: Census

- Before delving in to census analysis, let's review the effect of sample size on hypothesis tests.
  - Imagine that we had taken a smaller sample (n=100) of PH personnel:

$$z = \frac{(\bar{x}-\mu)}{s/\sqrt{n}} = \frac{(115.0-115.5)}{4.5/\sqrt{100}} = 2.222$$

    - This yields a p-value of 0.0263. We would still reject the null, but the evidence isn't as strong . . .
  - If we take a still smaller sample (n=50),

$$z = \frac{(\bar{x}-\mu)}{s/\sqrt{n}} = \frac{(115.5-115.0)}{4.5/\sqrt{50}} = 1.571$$

    - Here, p=0.116: we would conclude that the SBP of PH personnel does *not* differ significantly from all ADAF.

Scenario 3: Census

- It's no mystery that a larger sample size generally results in smaller *p*-value, but is this always appropriate?
- Consider the case where the "sample" of n=1000 is not actually a sample but rather a census of all PH personnel (i.e., the population is 1000, all of which were included in the analysis).
- In this case, we're no longer dealing with the sampling distribution of sample means but rather with two fully described populations.
- Is hypothesis testing appropriate in this situation?

Scenario 3: Census

- If we are dealing with a population rather than a sample, the typical *z*-test is no longer appropriate, since we're not analyzing a sample:

$$z = \frac{(\bar{x} - \mu)}{\sigma / \sqrt{n}}$$

- Instead, we would calculate a *z* score for the population:

$$z = \frac{(x - \mu)}{\sigma} = \frac{(115.5 - 115.0)}{4.5} = 0.222$$

- Here, *p*=0.824 but has a very different interpretation than the previously calculated *p*-values.
  - In general, it means that there is an 82.4% chance that a given *individual* from this population will produce an average SBP at least this high.

13

Scenario 3: Census

- There are several approaches one could take when population-level data are available:
  - Treat the data as a sample from a super-population.
  - Take a sample of the population-level data.
  - Examine the magnitude of difference.

14

Scenario 3: Census Super-Population

- Perhaps the simplest approach is to treat the population as part of a larger, hypothetical super-population.
  - In this case, one would proceed using normal hypothesis testing methods (remember to use the FPC if the population is anticipated to be larger than 5% of the super-population).
  - This is often the approach used in existing literature.
- This may or may not be appropriate. As a guideline, if the problem at hand is specific to a particular group (place, time, etc.), the super-population approach probably doesn't apply.
  - This applies to many AF queries – the group of interest often consists of current personnel, not necessarily future/unknown personnel.

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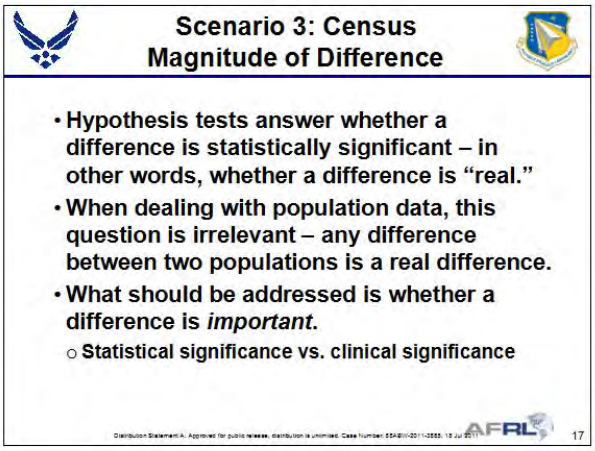
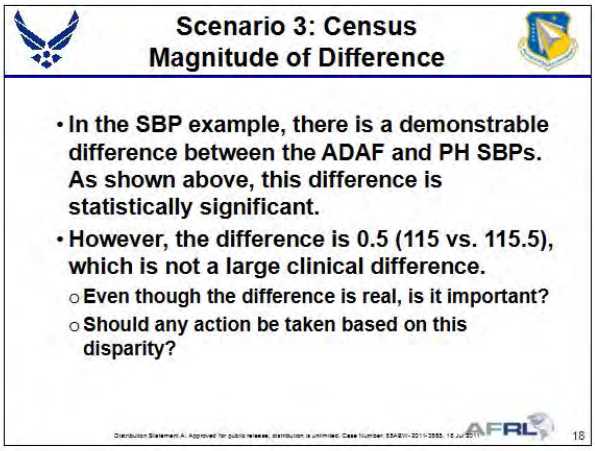
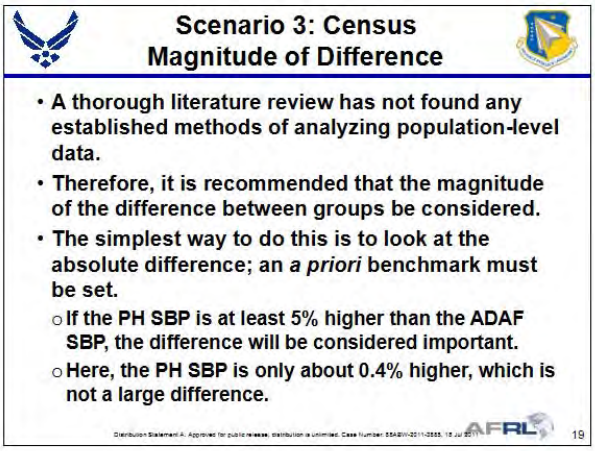
Scenario 3: Census Subsample

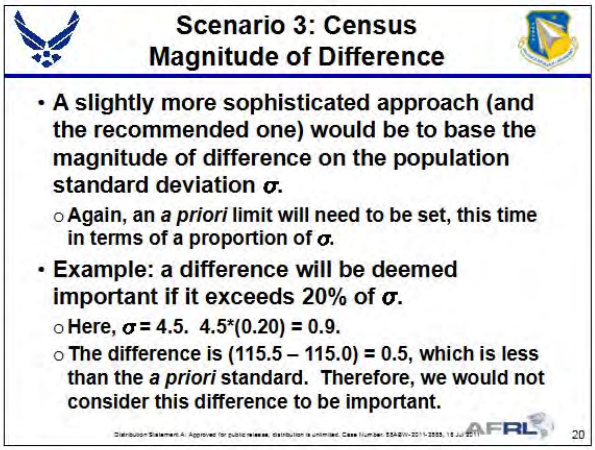
- Another approach is to subsample the population for which you have full data.
  - One advantage is that traditional hypothesis tests would be appropriate for analysis.
- However, this has some theoretical issues: the purpose of hypothesis testing is to estimate an unknown population. We don't actually need to do that if we have data for the entire population.
  - Therefore, this approach is only recommended if formal hypothesis testing is absolutely required (i.e., for publication).

16


Scenario 3: Census
Magnitude of Difference
• Hypothesis tests answer whether a difference is statistically significant – in other words, whether a difference is "real."
• When dealing with population data, this question is irrelevant – any difference between two populations is a real difference.
• What should be addressed is whether a difference is *important*.
○ Statistical significance vs. clinical significance
17


Scenario 3: Census
Magnitude of Difference
• In the SBP example, there is a demonstrable difference between the ADAF and PH SBPs. As shown above, this difference is statistically significant.
• However, the difference is 0.5 (115 vs. 115.5), which is not a large clinical difference.
○ Even though the difference is real, is it important?
○ Should any action be taken based on this disparity?
18


Scenario 3: Census
Magnitude of Difference
• A thorough literature review has not found any established methods of analyzing population-level data.
• Therefore, it is recommended that the magnitude of the difference between groups be considered.
• The simplest way to do this is to look at the absolute difference; an *a priori* benchmark must be set.
○ If the PH SBP is at least 5% higher than the ADAF SBP, the difference will be considered important.
○ Here, the PH SBP is only about 0.4% higher, which is not a large difference.
19


Scenario 3: Census
Magnitude of Difference
• A slightly more sophisticated approach (and the recommended one) would be to base the magnitude of difference on the population standard deviation σ.
○ Again, an *a priori* limit will need to be set, this time in terms of a proportion of σ.
• Example: a difference will be deemed important if it exceeds 20% of σ.
○ Here, σ = 4.5. 4.5*(0.20) = 0.9.
○ The difference is (115.5 – 115.0) = 0.5, which is less than the *a priori* standard. Therefore, we would not consider this difference to be important.
20

Scenario 3: Census Magnitude of Difference

- Formally:

$$\delta = (\bar{x} - \mu) - (\sigma\gamma)$$

  - Where γ is the desired proportion (20% in the previous example) to be taken from σ.
  - If $\delta > 0$, the difference is considered important.
- Compare this to a *z*-test

$$z = \frac{\bar{x} - \mu}{\sigma}$$

  - Note that δ is a difference statistic , while *z* is a proportion.

Scenario 3: Census Magnitude of Difference

- Advantages
  - Appropriate for population-level data
  - Easy to apply
  - Flexible: to be more conservative, use a smaller proportion of σ
  - Can be used with multiple data types (continuous, discrete, etc.)
- Disadvantages
  - Not in common use, may still need to supplement with a *p*-value
  - Fairly subjective, no standard proportion of σ in place
    - Of course, α is also highly arbitrary

Multivariable Analyses

- For multivariable analyses (regressions, survival analysis, etc.) of large samples, the FPC can be used.
  - It's possible to do this manually, but this approach would be challenging.
  - Use of the FPC for multivariable analyses is automated in many statistical software packages. It is generally accessed through the sampling options.
    - Note, however, that this may result in (too) many variables being significant.

Multivariable Analyses

- When dealing with full population data, the super-population approach is very tempting.
  - This approach may be more appropriate for multivariable analyses. Instead of whether there is a significant difference, multivariable analyses usually seek to answer *which* variables are important.
  - This information could be germane to future members of the population.
- Future research will focus on developing/finding alternative methods.

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Appendix

- FPC for Proportion of Finite Populations‡:

$$\sigma_{p_s} = \sqrt{\frac{p(1-p)}{n}}\sqrt{\frac{N-n}{N-1}}$$

‡ Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley & Sons, 1977.

26

Appendix

- Sampling Distribution of Sample Means
  - For a given population, the sampling distribution is the distribution of all possible sample means for a particular sample size *n*.
  - The mean of the sampling distribution is equal to the population mean.
  - The standard deviation of the sampling distribution is smaller than the population standard deviation *σ*. How much smaller depends on the sample size.

From http://www.comfsm.fm/~dleeling/statistics/notes/003.html

$$\bar{x} = \mu$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

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Appendix

- Why does the FPC only apply above 5% of the sample size?
  - Given *N*=1000, the value of the FPC with 3% of the population (*n*=30) is very close to 1:

$$\sqrt{\frac{N-n}{N-1}} = \sqrt{\frac{10{,}000-50}{10{,}000-1}} = 0.998$$

  - However, as the proportion of the population sampled increases, the value of the FPC becomes much lower. At 20% of the population (*n*=200):

$$\sqrt{\frac{N-n}{N-1}} = \sqrt{\frac{10{,}000-3000}{10{,}000-1}} = 0.837$$

28

The Research Maze and the Wheels of Progress: How the Health Services Data Warehouse Will Transform the Way Research is Done.

Lt Col David Carnahan, Office of the Chief Information Officer, Air Force Medical Support Agency

There are many challenges inherent in every observational study. In the Military Healthcare System (MHS), one of the biggest is accessing the many TB's of data that represent the medical care of 9.6 million MHS beneficiaries. The current process requires a clinical analyst to access multiple data sources with non-normalized files, determine relationships between the files, write computer code to establish linkages, which ultimately transforms flat files into analytic datasets needed for analysis. In some cases, to answer the research question appropriately requires multiple individuals to bring together data across different organizations to develop the dataset. This can be a great source of frustration, and a great deal of time spent which creates inertia, and hinders important health services research. By using a data warehouse, the data has already been brought together into a single source for researchers, saving time and effort in completing research projects, which allows a greater amount of projects to be accomplished. We will demonstrate efficiencies gained using a data warehouse to source the data by comparing it to current MHS practice of data acquisition and analysis using non-normalized data sources. The warehouse that has been created is named the Health Services Data Warehouse. We will be accessing the data warehouse using a data mart via SAS Enterprise Business Intelligence for analysis. To demonstrate practical application, we will use a research question on Traumatic Brain Injury and Mental Health as our proof of concept.


Headquarters U.S. Air Force
Integrity - Service - Excellence
The research maze and the wheels of progress
Lt Col David H Carnahan, MD MSCE
AFMSA, Healthcare Informatics
Jim Leonard, MPH
Intellicog Solutions
U.S. AIR FORCE


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Introduction
Aims
Background
Hypotheses
Methods
Results
Conclusions
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Aims
To determine efficiency gained by restructuring current data sources into an organized (normalized) data warehouse
To determine the validity of the current Health Services Data Warehouse architecture
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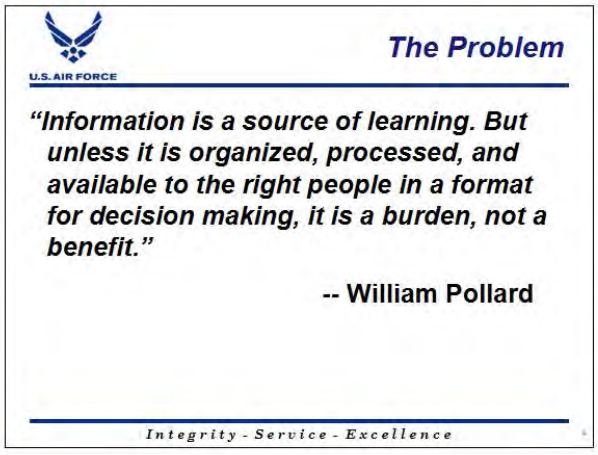
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The Problem
"Information is a source of learning. But unless it is organized, processed, and available to the right people in a format for decision making, it is a burden, not a benefit."
-- William Pollard
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Secondary Data Research Process

- Develop research question
- Establish data source
- Learn data elements for study design/IRB
- Get approval to use data (Data Use Agreement)
- IRB approval
- Data acquisition (flat files)
- Data quality checks/validation
- Data manipulation (flat files → dataset)
- Statistical analysis
- Manuscript
- Publication

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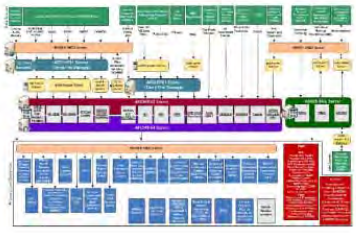
The Data Sources

- Data Aggregated from over 400 sites
- Over 140 different data feeds
- 25 Tb of data
- 65 Million records daily
- 100 different daily or monthly data products
- All core health service lines available—most MHS-wide



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Rules of Normalization

- Rule #1 – Eliminate Repeating Groups
- Rule #2 – Eliminate Redundant Information
- Rule #3 – All Entities Must Depend on their Primary Keys

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Current state of 'normalization'

Network Inpt	Network Outpt	Direct Care Inpt	Direct Care Outpt
personid	personid	patient_unique_id	[universal patient id]
Patient_name	Patient_name		
Patient_dob	Patient_dob	Date_of_birth	DateOfBirth
Patient_gender	Patient_gender	Gender	Gender
1 primary dx	1 primary dx	8 diagnoses	4 diagnoses
8 sec dx	4 sec dx		
1 primary procedure	1 procedure code	8 procedures	4 procedures
5 sec procedure			

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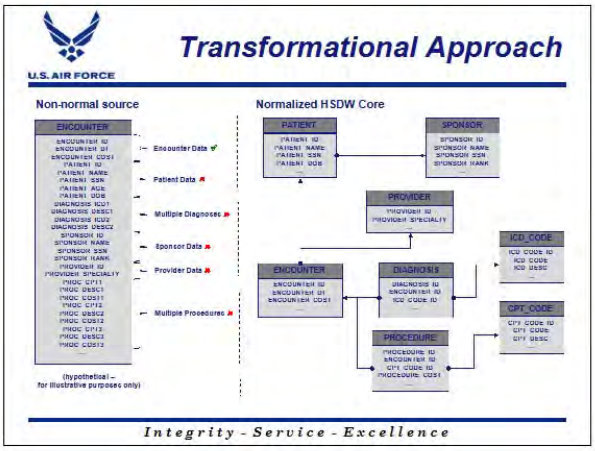
Transformational Approach
U.S. AIR FORCE
Non-normal source
Normalized HSDW Core
ENCOUNTER
Encounter Data
Patient Data
Multiple Diagnoses
Sponsor Data
Provider Data
Multiple Procedures
PATIENT
SPONSOR
PROVIDER
ICD_CODE
ENCOUNTER
DIAGNOSIS
CPT_CODE
PROCEDURE
(hypothetical) – for illustrative purposes only
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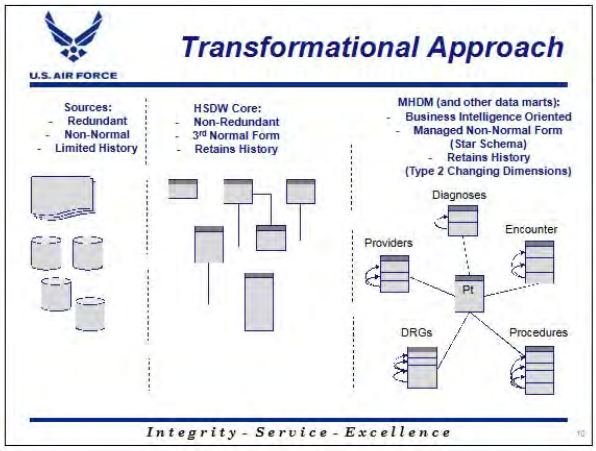
Transformational Approach
U.S. AIR FORCE
Sources:
- Redundant
- Non-Normal
- Limited History
HSDW Core:
- Non-Redundant
- 3rd Normal Form
- Retains History
MHDM (and other data marts):
- Business Intelligence Oriented
- Managed Non-Normal Form (Star Schema)
- Retains History
(Type 2 Changing Dimensions)
Diagnoses
Encounter
Providers
Pt
DRGs
Procedures
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Design Philosophy
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Eliminate redundancy
Allows matching of like variables
Renames variables in consumer friendly terms
Patient-centered
Consolidation
Retain history
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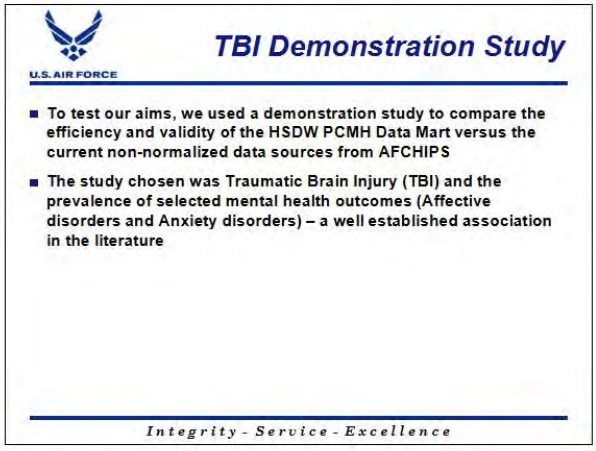
TBI Demonstration Study
U.S. AIR FORCE
To test our aims, we used a demonstration study to compare the efficiency and validity of the HSDW PCMH Data Mart versus the current non-normalized data sources from AFCHIPS
The study chosen was Traumatic Brain Injury (TBI) and the prevalence of selected mental health outcomes (Affective disorders and Anxiety disorders) – a well established association in the literature
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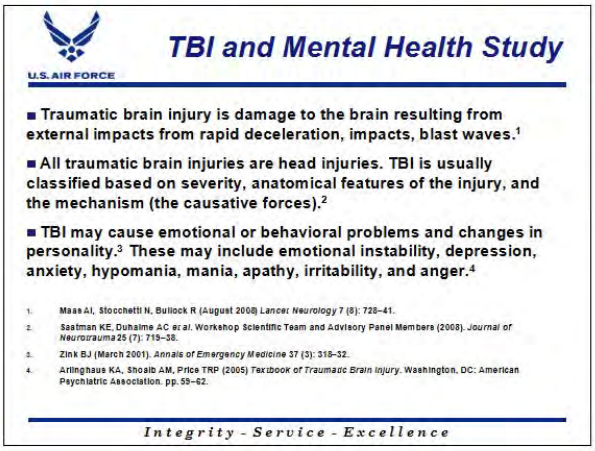
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TBI and Mental Health Study
Traumatic brain injury is damage to the brain resulting from external impacts from rapid deceleration, impacts, blast waves.[1]
All traumatic brain injuries are head injuries. TBI is usually classified based on severity, anatomical features of the injury, and the mechanism (the causative forces).[2]
TBI may cause emotional or behavioral problems and changes in personality.[3] These may include emotional instability, depression, anxiety, hypomania, mania, apathy, irritability, and anger.[4]
1. Maas AI, Stocchetti N, Bullock R (August 2008) Lancet Neurology 7 (8): 728–41.
2. Saatman KE, Duhaime AC et al. Workshop Scientific Team and Advisory Panel Members (2008). Journal of Neurotrauma 25 (7): 719–38.
3. Zink BJ (March 2001). Annals of Emergency Medicine 37 (3): 318–32.
4. Arlinghaus KA, Shoaib AM, Price TRP (2005) Textbook of Traumatic Brain Injury. Washington, DC: American Psychiatric Association. pp. 59–62.
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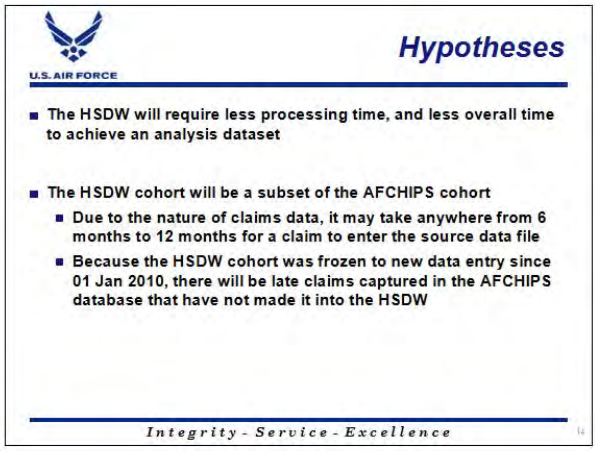
U.S. AIR FORCE
Hypotheses
The HSDW will require less processing time, and less overall time to achieve an analysis dataset
The HSDW cohort will be a subset of the AFCHIPS cohort
Due to the nature of claims data, it may take anywhere from 6 months to 12 months for a claim to enter the source data file
Because the HSDW cohort was frozen to new data entry since 01 Jan 2010, there will be late claims captured in the AFCHIPS database that have not made it into the HSDW
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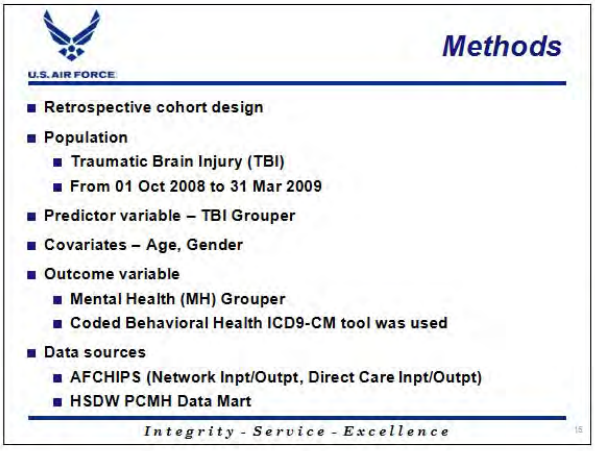
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Methods
Retrospective cohort design
Population
Traumatic Brain Injury (TBI)
From 01 Oct 2008 to 31 Mar 2009
Predictor variable – TBI Grouper
Covariates – Age, Gender
Outcome variable
Mental Health (MH) Grouper
Coded Behavioral Health ICD9-CM tool was used
Data sources
AFCHIPS (Network Inpt/Outpt, Direct Care Inpt/Outpt)
HSDW PCMH Data Mart
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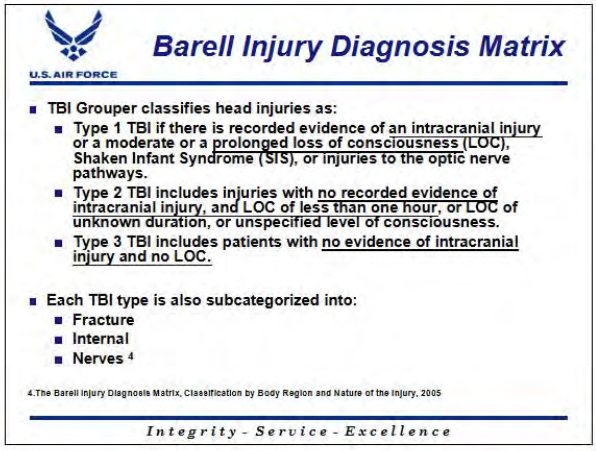
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Barell Injury Diagnosis Matrix
TBI Grouper classifies head injuries as:
Type 1 TBI if there is recorded evidence of an intracranial injury or a moderate or a prolonged loss of consciousness (LOC), Shaken Infant Syndrome (SIS), or injuries to the optic nerve pathways.
Type 2 TBI includes injuries with no recorded evidence of intracranial injury, and LOC of less than one hour, or LOC of unknown duration, or unspecified level of consciousness.
Type 3 TBI includes patients with no evidence of intracranial injury and no LOC.
Each TBI type is also subcategorized into:
Fracture
Internal
Nerves [4]
4.The Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury, 2005
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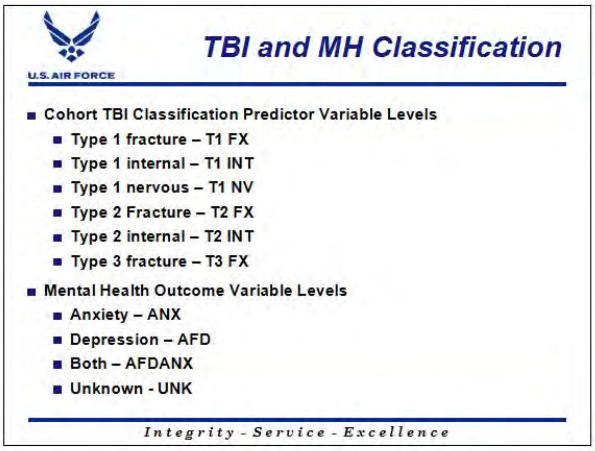
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TBI and MH Classification
Cohort TBI Classification Predictor Variable Levels
Type 1 fracture – T1 FX
Type 1 internal – T1 INT
Type 1 nervous – T1 NV
Type 2 Fracture – T2 FX
Type 2 internal – T2 INT
Type 3 fracture – T3 FX
Mental Health Outcome Variable Levels
Anxiety – ANX
Depression – AFD
Both – AFDANX
Unknown - UNK
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RESULTS
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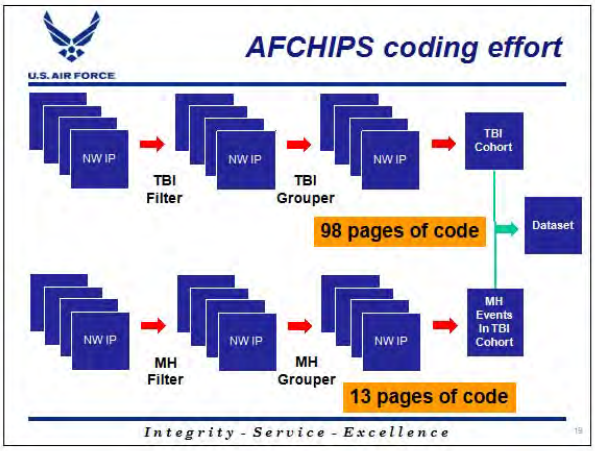
U.S. AIR FORCE
AFCHIPS coding effort
NW IP
TBI Filter
NW IP
TBI Grouper
NW IP
TBI Cohort
98 pages of code
Dataset
NW IP
MH Filter
NW IP
MH Grouper
NW IP
MH Events in TBI Cohort
13 pages of code
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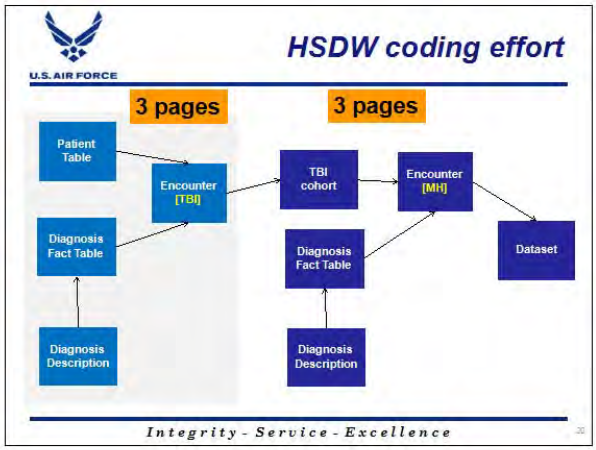
U.S. AIR FORCE
HSDW coding effort
3 pages
3 pages
Patient Table
Encounter [TBI]
TBI cohort
Encounter [MH]
Diagnosis Fact Table
Diagnosis Fact Table
Dataset
Diagnosis Description
Diagnosis Description
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Time Comparisons

Computer Runtimes	AFCHIPS	HSDW
Cohort Identification	5 hrs 53 min	2 hrs 22 min
Incorporating Cohort Care	1 hr 3 min	2 hrs 41 min
Analysis	2 min	2 min
Total	6 hrs 58 min	5 hrs 5 min

Analyst Time	AFCHIPS	HSDW
Pages of Code Written	111 pages	6 pages
Estimated Total Analyst Time	3 days	1 day

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Demographics

Variable	AFCHIPS	HSDW
Sample Size	27,724	22,983
Age	39.7 (± 26)	38.8 (± 26)
Gender		
Female	10,418 (38)	8,778 (38)
Male	17,306 (62)	14,205 (62)

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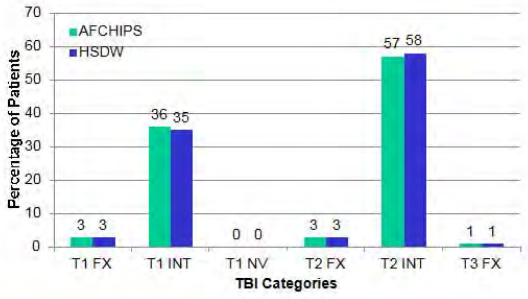
TBI Classification Results



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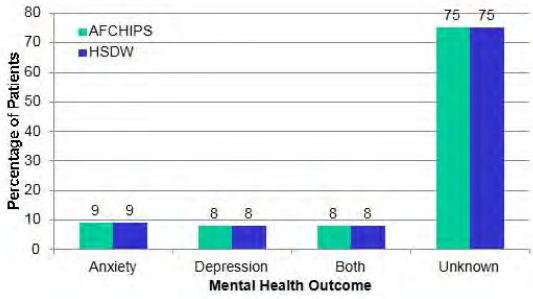
Mental Health Outcomes



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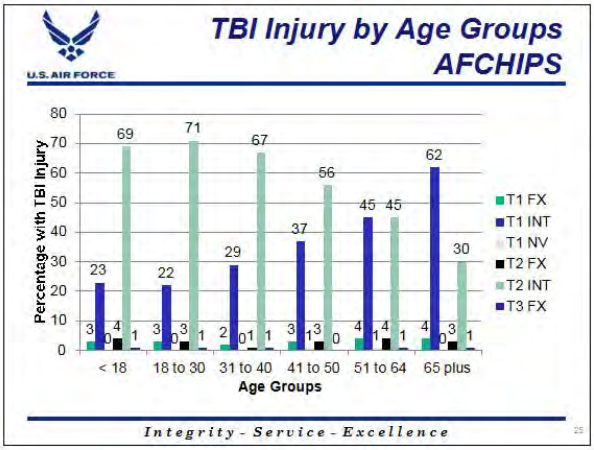
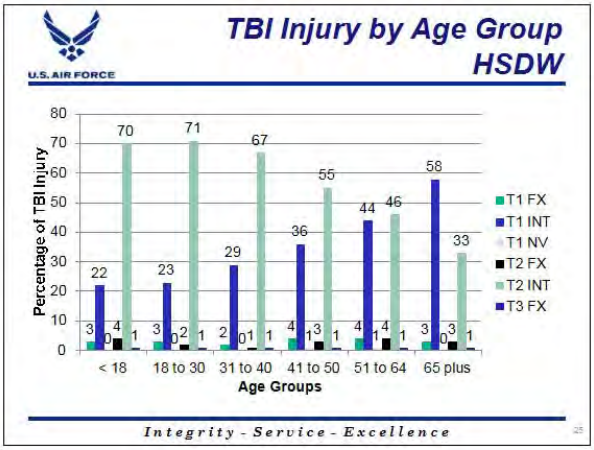
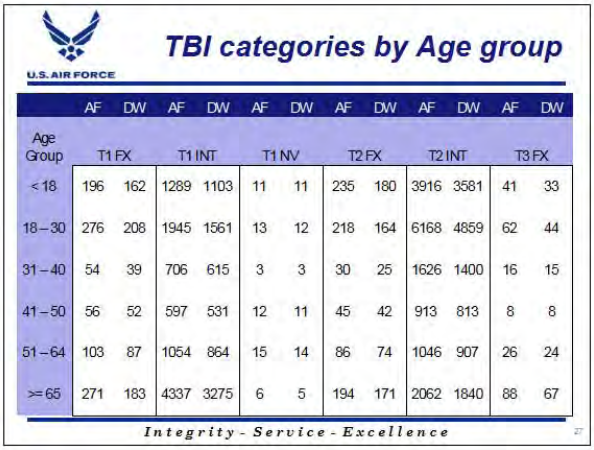
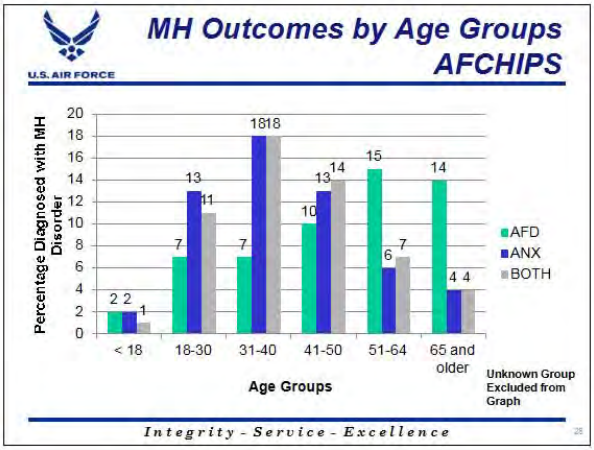
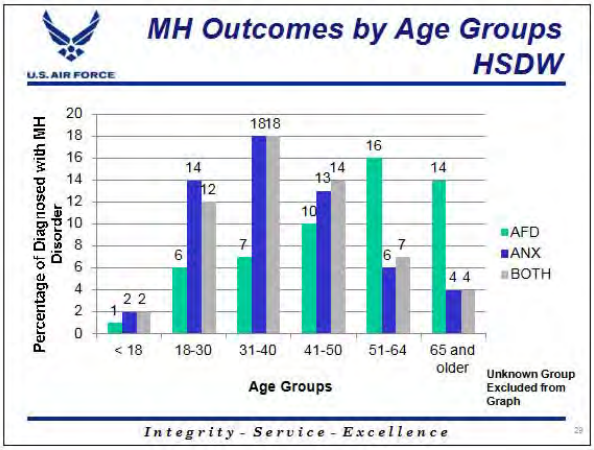


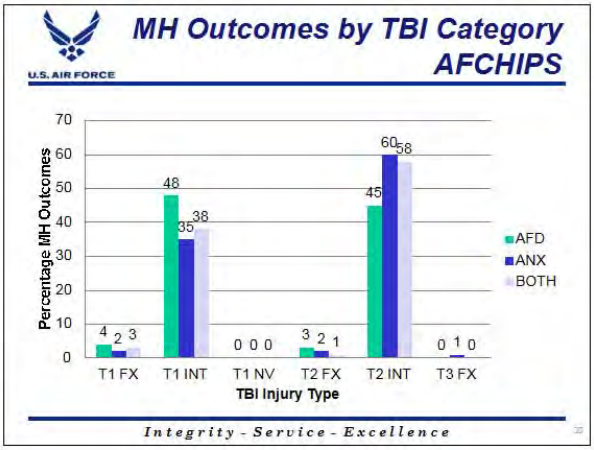


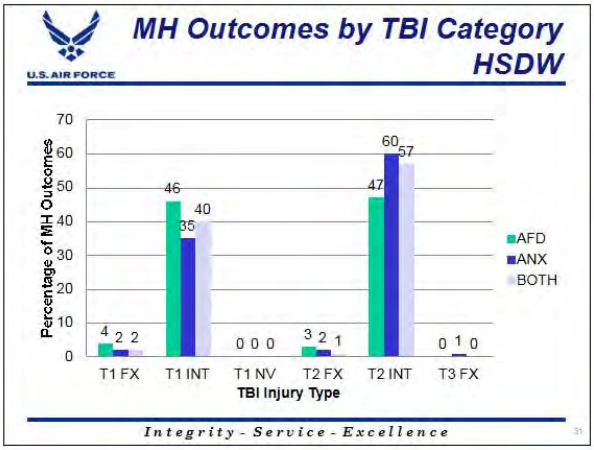


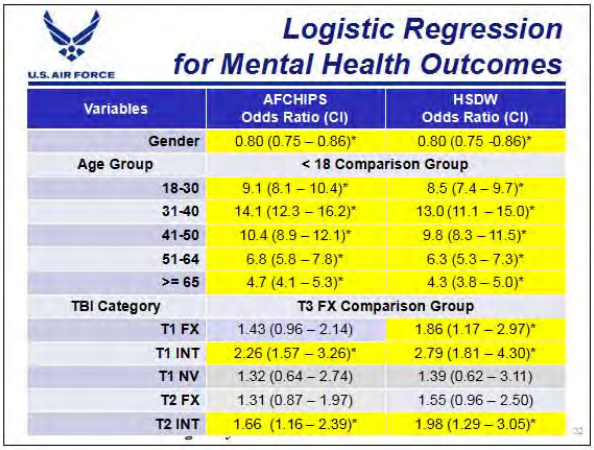
Age Group	T1 FX AF	T1 FX DW	T1 INT AF	T1 INT DW	T1 NV AF	T1 NV DW	T2 FX AF	T2 FX DW	T2 INT AF	T2 INT DW	T3 FX AF	T3 FX DW
< 18	196	162	1289	1103	11	11	235	180	3916	3581	41	33
18 – 30	276	208	1945	1561	13	12	218	164	6168	4859	62	44
31 – 40	54	39	706	615	3	3	30	25	1626	1400	16	15
41 – 50	56	52	597	531	12	11	45	42	913	813	8	8
51 – 64	103	87	1054	864	15	14	86	74	1046	907	26	24
>= 65	271	183	4337	3275	6	5	194	171	2062	1840	88	67











Logistic Regression for Mental Health Outcomes

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Variables	AFCHIPS Odds Ratio (CI)	HSDW Odds Ratio (CI)
Gender	0.80 (0.75 – 0.86)*	0.80 (0.75 -0.86)*
Age Group	< 18 Comparison Group	
18-30	9.1 (8.1 – 10.4)*	8.5 (7.4 – 9.7)*
31-40	14.1 (12.3 – 16.2)*	13.0 (11.1 – 15.0)*
41-50	10.4 (8.9 – 12.1)*	9.8 (8.3 – 11.5)*
51-64	6.8 (5.8 – 7.8)*	6.3 (5.3 – 7.3)*
>= 65	4.7 (4.1 – 5.3)*	4.3 (3.8 – 5.0)*
TBI Category	T3 FX Comparison Group	
T1 FX	1.43 (0.96 – 2.14)	1.86 (1.17 – 2.97)*
T1 INT	2.26 (1.57 – 3.26)*	2.79 (1.81 – 4.30)*
T1 NV	1.32 (0.64 – 2.74)	1.39 (0.62 – 3.11)
T2 FX	1.31 (0.87 – 1.97)	1.55 (0.96 – 2.50)
T2 INT	1.66 (1.16 – 2.39)*	1.98 (1.29 – 3.05)*

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Study Limitations

- Data Sources were updated more recently in AFCHIPS than in HSDW which accounts for the differences in study sample size
- Diagnoses in encounter and claims data is difficult to verify without a sample chart review to determine accuracy
- Infrastructure issues could affect runtimes depending on the time of day the code was run

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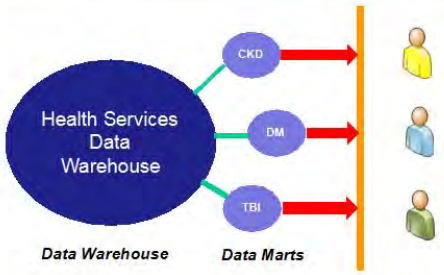
Future of DoD/MHS Research



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Conclusions

- The Health Service Data Warehouse has demonstrated
  - Accuracy: Over 99.5% of the population identified in the current population was found in the HSDW
  - Efficiency:
    - Query run times were reduced by 30% (2 hours)
    - Number of pages the data analyst needed to write was reduced by 95% (from 111 pages to 6 pages)
    - Estimated total analyst time was reduced by 67% (from 3 days to 1 day)
  - The efficiency gains will be increased with more complicated analyses
- The capacity to support future research will be amplified using the HSDW as the foundation of the informatics infrastructure

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QUESTIONS?

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The Health Services Data Warehouse (HSDW) in Action: Focus on Patient Centered Medical Home (PCMH)

Maj Claudine Ward, Office of the Chief Information Officer, Air Force Medical Support Agency

Background: Acquisition of healthcare data, streamlined data management, and effective information delivery are trouble areas within our current military medical system. Healthcare data is collected across multiple forums, resulting in confusion among users and differing metrics for similar measures depending on which source is referenced. Information delivery is often slow and inefficient, resulting in decision delays.

Intro: The Air Force Medical Service Office of the Chief Information Officer (AFMS OCIO) is striving towards consolidating healthcare data into one location, the Health Services Data Warehouse (HSDW), to allow for centralized data management and standardized data transformation. The HSDW will also focus on improved information delivery by providing easily accessible, usable information to senior level leadership and medical staff through deliverables such as push-reports and dashboards.

Methods: To illustrate how the HSDW will be used, Patient Centered Medical Home (PCMH) data will be examined. Rather than measuring performance measures based on production, PCMH focuses on healthcare outcomes of patients and efficient use of medical services. These new metrics must first be defined. Once defined, a PCMH data mart is created from HSDW, and contains the designated data elements related specifically to PCMH. With the data mart in place, PCMH push reports and dashboards are now created.

Conclusion: The HSDW is intended to serve as the 'cornerstone of an informatics strategy to better support clinical decision support, business intelligence, agile development, and improved analysis including a de-identified research view of the data' (FY10 Air Force HSDW SOW v4) as is demonstrated through PCMH.

Headquarters U.S. Air Force

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Patient Centered Medical Home Metrics and the HSDW

Claudine Ward
Maj, USAF, MC
AFMSA / SG6
3 August 2011

Overview

Objectives
Discuss the primary aspects of PCMH
Create relevant, measurable, actionable outcome metrics for PCMH
Share ideas regarding how to improve these metrics using the HSDW

- Patient Centered Medical Home (PCMH) Model
- Current PCMH Metrics
- Wish List
- Way Ahead: Health Services Data Warehouse (HSDW)
- Future PCMH Metrics

Patient Centered Medical Home Model

- Core Features:
  - Patient Centered
  - Whole Person Orientation
  - Team-based Care
  - Coordinated & Integrated Care
  - Quality and Safety
  - Enhanced Access
  - Payment Reform

How can we use data to evaluate how we're doing?

Current PCMH Measures

Measures
Continuity of Care
Emergency and Urgent Care Utilization
HEDIS Measures
Patient Satisfaction
Specialty Care Utilization
Procedure Capture
RVU Business Plan Execution
Support Staff Per Provider Ratio Trend
MTF Weekly Average Appointments Per Provider

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Current PCMH Measures

Measures	
Continuity of Care	Incentivized Metrics
Emergency and Urgent Care Utilization	
HEDIS Measures	
Patient Satisfaction	
Specialty Care Utilization	
Procedure Capture	
RVU Business Plan Execution	
Support Staff Per Provider Ratio Trend	
MTF Weekly Average Appointments Per Provider	

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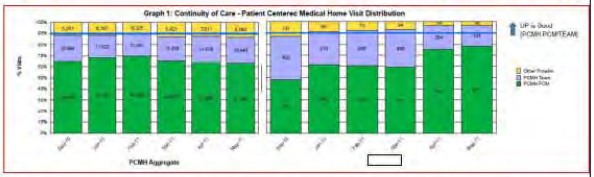
Current PCMH Metrics
Continuity of Care



- Numerator: Patient visits by PCM, PCMH Team, or other provider
- Denominator: total PCMH visits
- Goal is >90% visits with PCM and PCMH team

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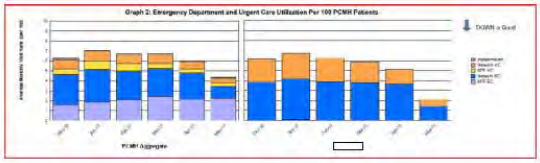
Current PCMH Metrics
Emergency Dept and Urgent Care Utilization



- Numerator: ED and UC visits
- Denominator: 100 PCMH patients
- Goal is <3 visits per 100 PCMH patients
- May be incomplete due to data lag (includes purchased care)

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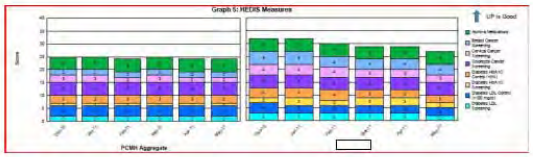
Current PCMH Metrics HEDIS Measures



- 8 HEDIS measures (maximum composite score of 40)
- Scale of 0-5 (10%, 25%, 50%, 75%, 90%)
- Score based upon average national percentile ranking

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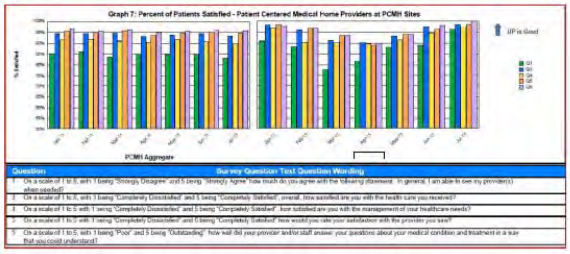
Current PCMH Metrics Patient Satisfaction



- Service Delivery Assessment (telephone survey)
- 10 Questions within 1 month of visit
- Goal is > 95% Satisfaction (score of 4 or 5)

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Wish List for the Future

- Accessible data
- Drill-down and slice & dice
- Flexibility
- Speed
- Comparisons
- Reproducible Results
- Improved Presentation

Health Services Data Warehouse

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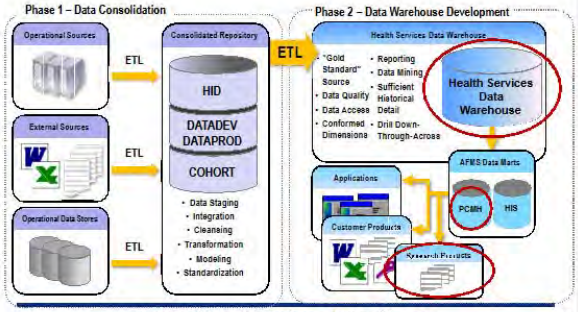
Health Services Data Warehouse



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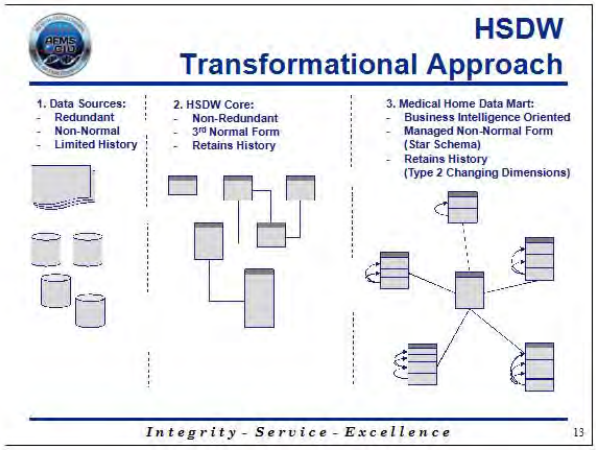
HSDW
Transformational Approach
1. Data Sources:
- Redundant
- Non-Normal
- Limited History
2. HSDW Core:
- Non-Redundant
- 3rd Normal Form
- Retains History
3. Medical Home Data Mart:
- Business Intelligence Oriented
- Managed Non-Normal Form (Star Schema)
- Retains History (Type 2 Changing Dimensions)
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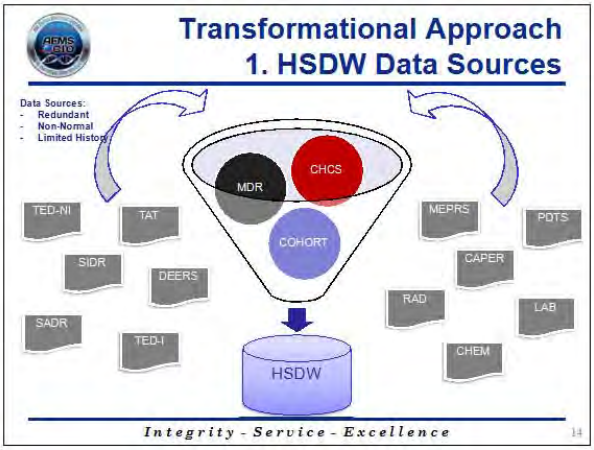
Transformational Approach
1. HSDW Data Sources
Data Sources:
- Redundant
- Non-Normal
- Limited History
MDR
CHCS
COHORT
TED-NI
TAT
SIDR
DEERS
SADR
TED-I
MEPRS
PDTS
CAPER
RAD
LAB
CHEM
HSDW
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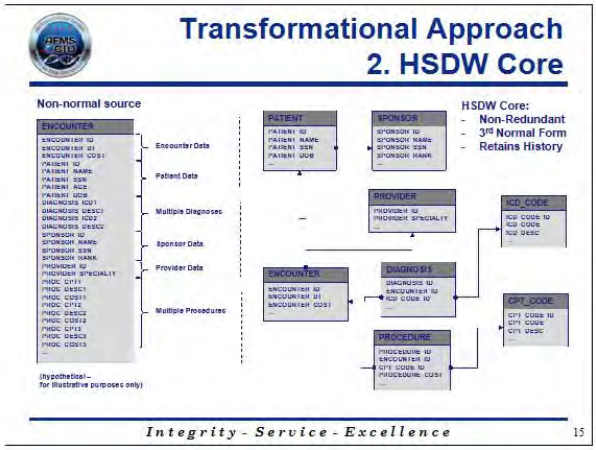
Transformational Approach
2. HSDW Core
Non-normal source
ENCOUNTER
Encounter Data
Patient Data
Multiple Diagnoses
Sponsor Data
Provider Data
Multiple Procedures
(hypothetical – for illustrative purposes only)
PATIENT
SPONSOR
PROVIDER
ICD_CODE
ENCOUNTER
DIAGNOSIS
CPT_CODE
PROCEDURE
HSDW Core:
- Non-Redundant
- 3rd Normal Form
- Retains History
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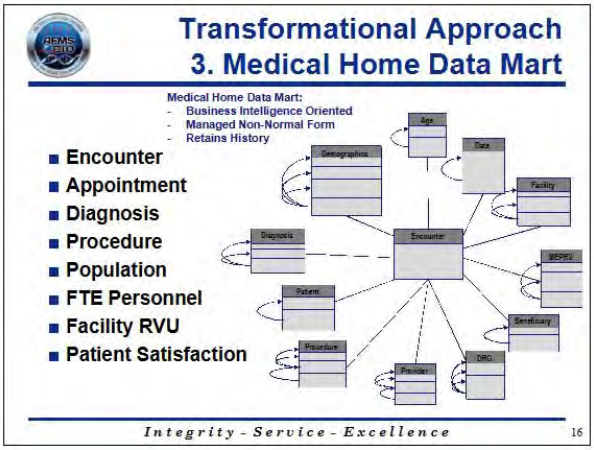
Transformational Approach
3. Medical Home Data Mart
Medical Home Data Mart:
- Business Intelligence Oriented
- Managed Non-Normal Form
- Retains History
Encounter
Appointment
Diagnosis
Procedure
Population
FTE Personnel
Facility RVU
Patient Satisfaction
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How can we use data
to better evaluate
how we're doing?

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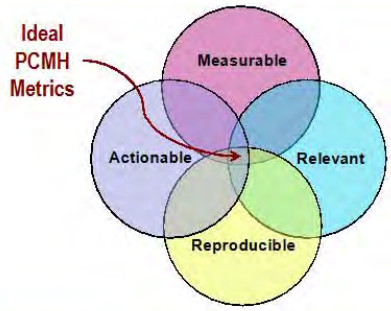
Future PCMH Metrics



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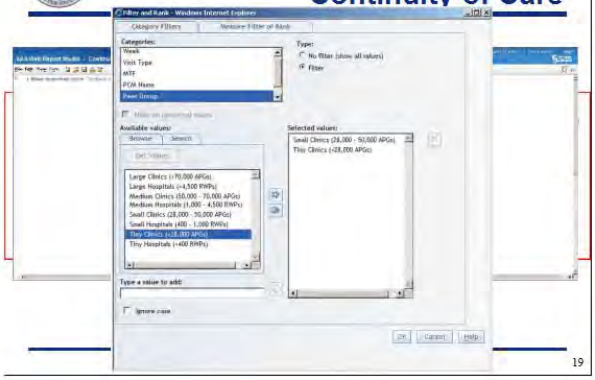
Improve Current PCMH Metrics
Continuity of Care



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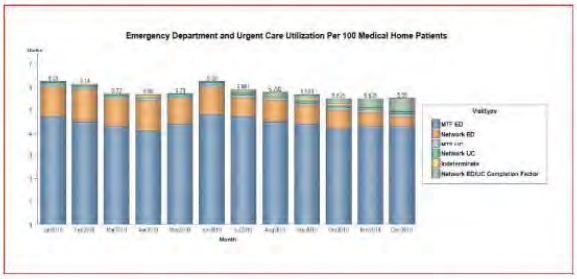
Improve Current PCMH Metrics
ED/UC Utilization



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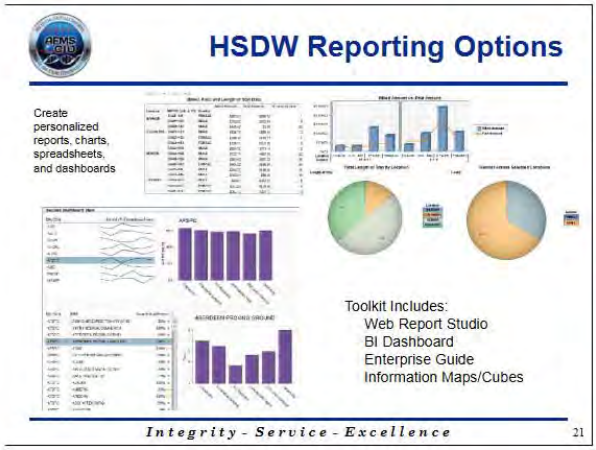
HSDW Reporting Options
Create personalized reports, charts, spreadsheets, and dashboards
Toolkit Includes:
Web Report Studio
BI Dashboard
Enterprise Guide
Information Maps/Cubes
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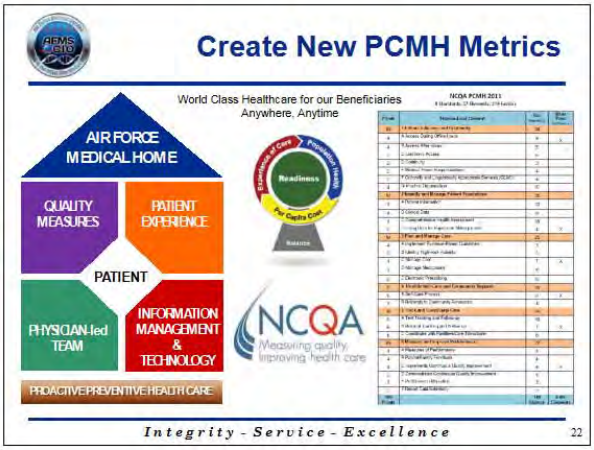
21


Create New PCMH Metrics
World Class Healthcare for our Beneficiaries
Anywhere, Anytime
AIR FORCE MEDICAL HOME
QUALITY MEASURES
PATIENT EXPERIENCE
PATIENT
PHYSICIAN-led TEAM
INFORMATION MANAGEMENT & TECHNOLOGY
PROACTIVE PREVENTIVE HEALTH CARE
NCQA
Measuring quality. Improving health care
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22


Thank You!
Questions?
Claudine.Ward@us.af.mil
DSN 761-6115
703-681-6115
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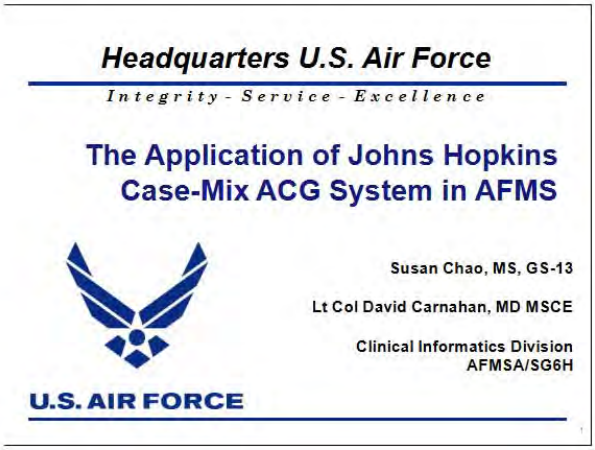
The Application of Johns Hopkins Adjusted Clinical Group Case-mix System in AFMS

Ms Susan Chao, Office of the Chief Information Officer, Air Force Medical Support Agency

The Adjusted Clinical Group (ACG) Case-Mix System is a diagnosis- and medication-based risk-adjustment tool that has been adopted by more than 200 healthcare organizations in US and abroad and validated extensively in commercial and research settings over 15 years, but has only recently been implemented in AFMS. ACG offers a comprehensive family of measurements designed to help explain and predict how healthcare resources are delivered and consumed. Through its unique 'person-focused' approach, ACG captures the multidimensional nature of individual's health and morbidity burden of patient population, and it also can be used to identify and predict health care resource needs, enhance equitable distribution of limited resources, improve accuracy in provider profiling, streamline healthcare delivery, evaluate population health risk, and provide actionable information. FY09-FY10 M2 data were used to demonstrate capabilities of ACG and to validate its predictive models in AFMS-enrolled population. Sensitivity of predictive models for high total healthcare cost, high pharmacy cost and hospitalization were 39%, 69% and 28%, respectively, whereas the corresponding specificity were 97%, 98% and 96%, respectively. The performance of ACG in AFMS was comparable to that found in commercial HMO populations where the sensitivity for high total healthcare costs and hospitalization were 37% and 33%, respectively. This suggests that ACG can be applied to AFMS even though it was originally developed using commercial HMO and state Medicaid populations. AFMS leadership should take advantage of the readily available measures generated by ACG and, with these unparalleled and comprehensive measures, in turn develop effective population health policies.


Headquarters U.S. Air Force
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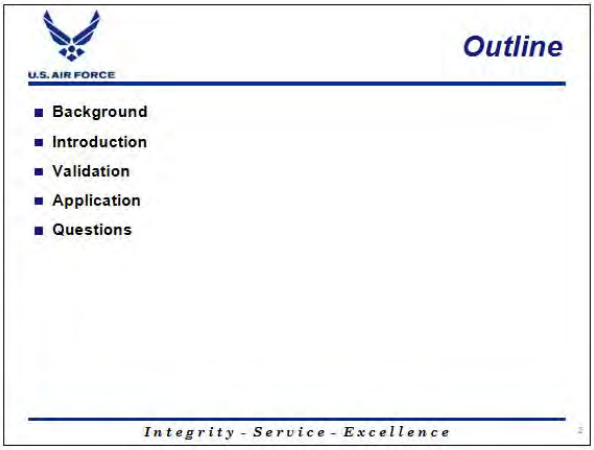
The Application of Johns Hopkins Case-Mix ACG System in AFMS
Susan Chao, MS, GS-13
Lt Col David Carnahan, MD MSCE
Clinical Informatics Division
AFMSA/SG6H
U.S. AIR FORCE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Outline
Background
Introduction
Validation
Application
Questions
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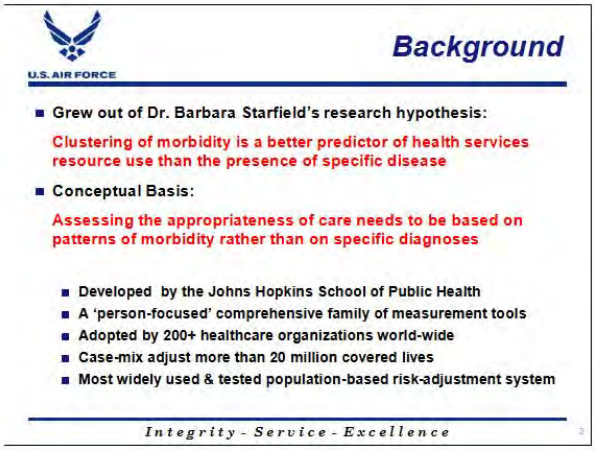
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Background
Grew out of Dr. Barbara Starfield's research hypothesis:
Clustering of morbidity is a better predictor of health services resource use than the presence of specific disease
Conceptual Basis:
Assessing the appropriateness of care needs to be based on patterns of morbidity rather than on specific diagnoses
Developed by the Johns Hopkins School of Public Health
A 'person-focused' comprehensive family of measurement tools
Adopted by 200+ healthcare organizations world-wide
Case-mix adjust more than 20 million covered lives
Most widely used & tested population-based risk-adjustment system
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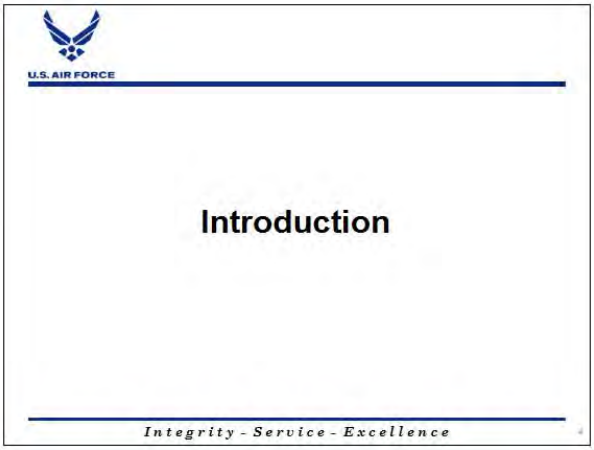
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Introduction
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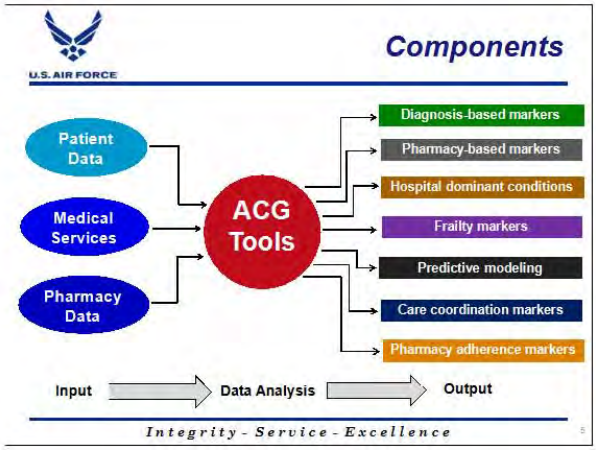
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Components
Patient Data
Medical Services
Pharmacy Data
ACG Tools
Diagnosis-based markers
Pharmacy-based markers
Hospital dominant conditions
Frailty markers
Predictive modeling
Care coordination markers
Pharmacy adherence markers
Input
Data Analysis
Output
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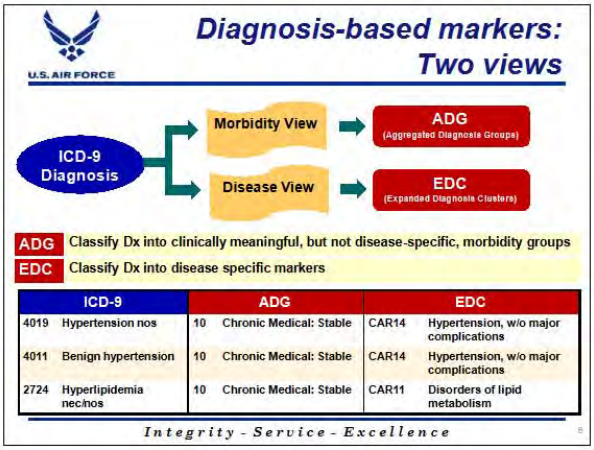
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Diagnosis-based markers: Two views
ICD-9 Diagnosis
Morbidity View
Disease View
ADG
(Aggregated Diagnosis Groups)
EDC
(Expanded Diagnosis Clusters)
ADG Classify Dx into clinically meaningful, but not disease-specific, morbidity groups
EDC Classify Dx into disease specific markers
ICD-9 ADG EDC
4019 Hypertension nos 10 Chronic Medical: Stable CAR14 Hypertension, w/o major complications
4011 Benign hypertension 10 Chronic Medical: Stable CAR14 Hypertension, w/o major complications
2724 Hyperlipidemia nec/nos 10 Chronic Medical: Stable CAR11 Disorders of lipid metabolism
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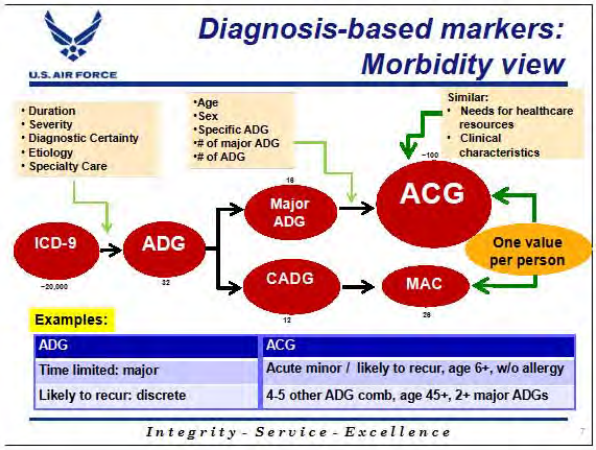
U.S. AIR FORCE
Diagnosis-based markers: Morbidity view
• Duration
• Severity
• Diagnostic Certainty
• Etiology
• Specialty Care
•Age
•Sex
•Specific ADG
•# of major ADG
•# of ADG
Similar:
• Needs for healthcare resources
• Clinical characteristics
ICD-9
ADG
Major ADG
CADG
ACG
MAC
One value per person
Examples:
ADG ACG
Time limited: major Acute minor / likely to recur, age 6+, w/o allergy
Likely to recur: discrete 4-5 other ADG comb, age 45+, 2+ major ADGs
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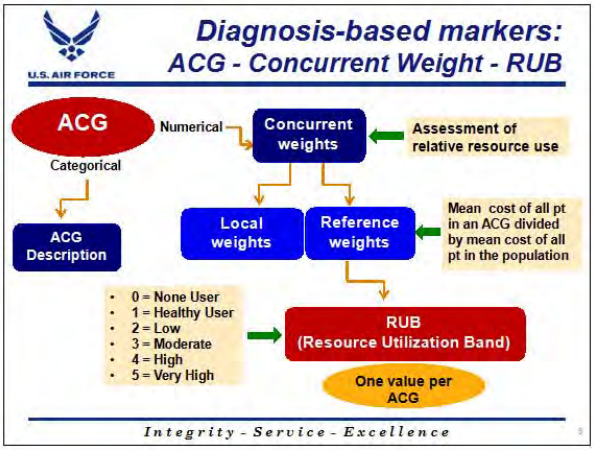
U.S. AIR FORCE
Diagnosis-based markers: ACG - Concurrent Weight - RUB
ACG
Categorical
Numerical
Concurrent weights
Assessment of relative resource use
ACG Description
Local weights
Reference weights
Mean cost of all pt in an ACG divided by mean cost of all pt in the population
• 0 = None User
• 1 = Healthy User
• 2 = Low
• 3 = Moderate
• 4 = High
• 5 = Very High
RUB (Resource Utilization Band)
One value per ACG
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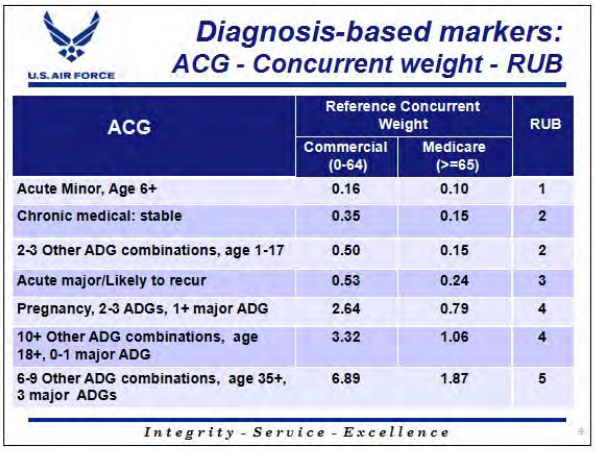
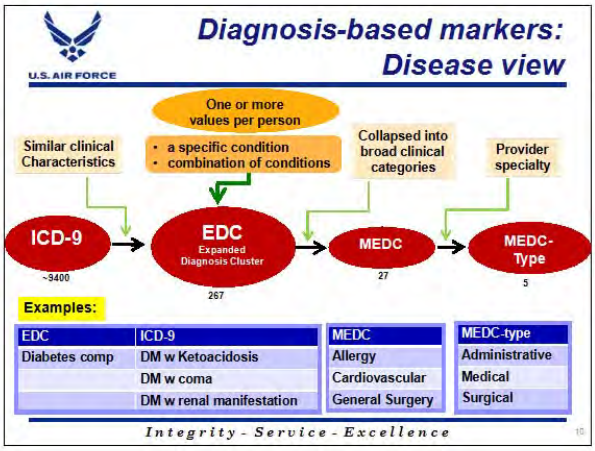
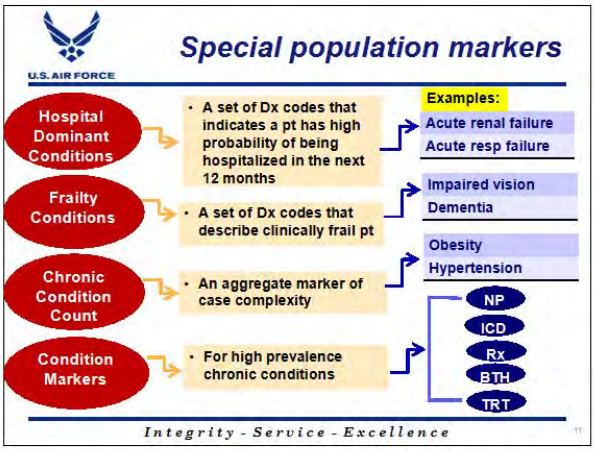
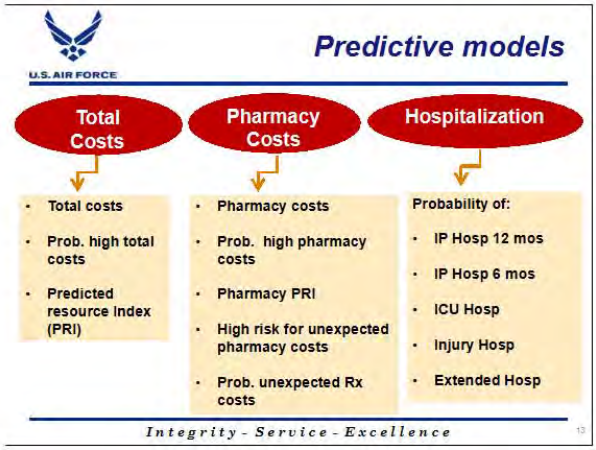


ACG	Reference Concurrent Weight		RUB
	Commercial (0-64)	Medicare (>=65)	
Acute Minor, Age 6+	0.16	0.10	1
Chronic medical: stable	0.35	0.15	2
2-3 Other ADG combinations, age 1-17	0.50	0.15	2
Acute major/Likely to recur	0.53	0.24	3
Pregnancy, 2-3 ADGs, 1+ major ADG	2.64	0.79	4
10+ Other ADG combinations, age 18+, 0-1 major ADG	3.32	1.06	4
6-9 Other ADG combinations, age 35+, 3 major ADGs	6.89	1.87	5






U.S. AIR FORCE
Predictive models
Total Costs
Pharmacy Costs
Hospitalization
Total costs
Prob. high total costs
Predicted resource index (PRI)
Pharmacy costs
Prob. high pharmacy costs
Pharmacy PRI
High risk for unexpected pharmacy costs
Prob. unexpected Rx costs
Probability of:
IP Hosp 12 mos
IP Hosp 6 mos
ICU Hosp
Injury Hosp
Extended Hosp
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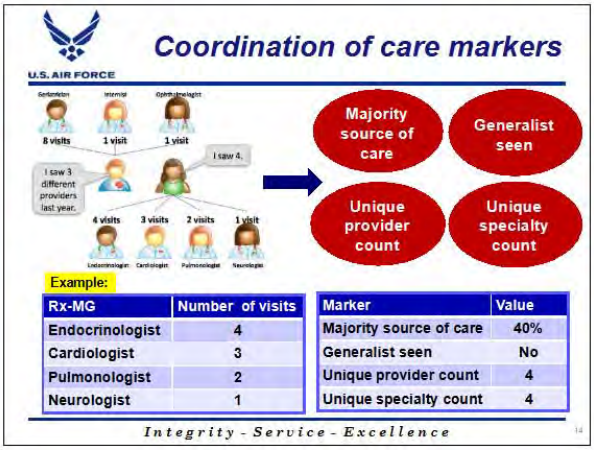
U.S. AIR FORCE
Coordination of care markers
8 visits
1 visit
1 visit
I saw 3 different providers last year.
I saw 4.
4 visits
3 visits
2 visits
1 visit
Majority source of care
Generalist seen
Unique provider count
Unique specialty count
Example:
Rx-MG | Number of visits
Endocrinologist | 4
Cardiologist | 3
Pulmonologist | 2
Neurologist | 1
Marker | Value
Majority source of care | 40%
Generalist seen | No
Unique provider count | 4
Unique specialty count | 4
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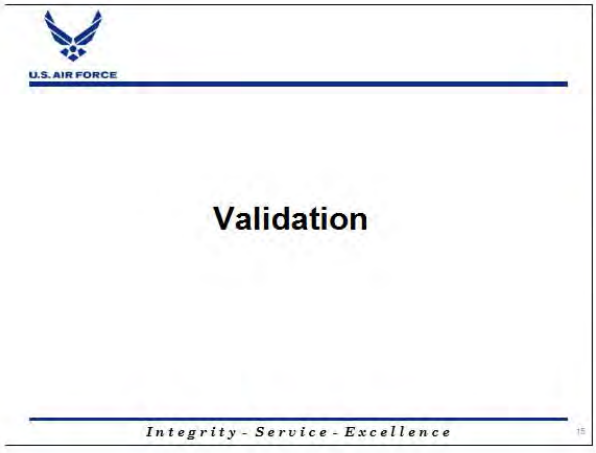
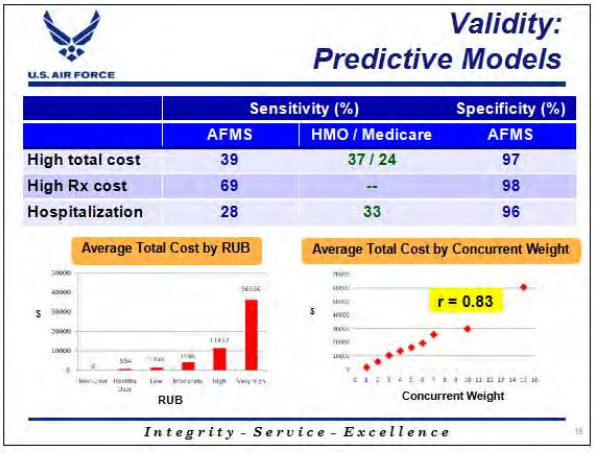

U.S. AIR FORCE
Validation
Integrity - Service - Excellence


U.S. AIR FORCE
Validity:
Predictive Models
Sensitivity (%)
Specificity (%)
AFMS
HMO / Medicare
AFMS
High total cost | 39 | 37 / 24 | 97
High Rx cost | 69 | -- | 98
Hospitalization | 28 | 33 | 96
Average Total Cost by RUB
RUB
Average Total Cost by Concurrent Weight
r = 0.83
Concurrent Weight
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Validity: Hospital Dominant Conditions

Effects of Hospital Dominant Conditions on Next Year's Outcomes

Baseline Year Risk Factor	Next Year's Outcomes: % with 1+ hospitalization		Mean total healthcare cost		Mean pharmacy cost	
Hospital Dominant Conditions	AFMS	US pop	AFMS	US pop	AFMS	US pop
<65 years old						
None	3.8	4.2	$3,492	$1,875	$427	$445
1	19.0	20.4	$16,272	$12,652	$3,181	$2,342
2+	39.9	45.8	$45,641	$35,802	$5,731	$4,098
>=65 years old						
None	15.0	14.4	$14,386	$5,189	$1,838	$1,007
1	32.2	35.3	$34,997	$14,810	$4,203	$2,112
2+	47.9	35.0	$55,407	$28,407	$4,757	$2,361

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Application

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What can ACG do for AFMS?

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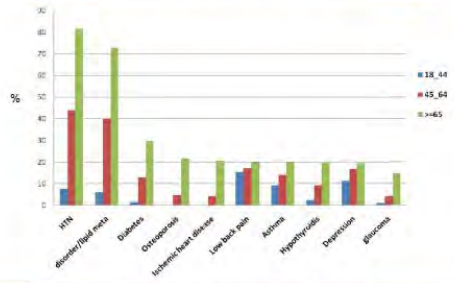
Population profiling: Prevalence

Prevalence of common chronic conditions by age



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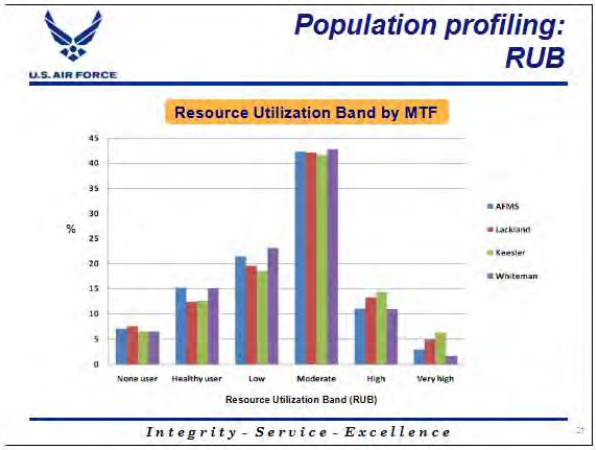
U.S. AIR FORCE
Population profiling: RUB
Resource Utilization Band by MTF
%
AFMS
Lackland
Keesler
Whiteman
None user
Healthy user
Low
Moderate
High
Very high
Resource Utilization Band (RUB)
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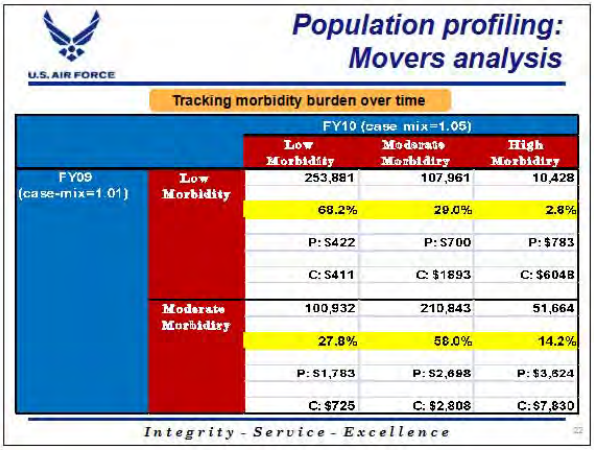
U.S. AIR FORCE
Population profiling: Movers analysis
Tracking morbidity burden over time
FY10 (case-mix=1.05)
Low Morbidity
Moderate Morbidity
High Morbidity
FY09 (case-mix=1.01)
Low Morbidity
253,881
107,961
10,428
68.2%
29.0%
2.8%
P: $422
P: $700
P: $783
C: $411
C: $1893
C: $6048
Moderate Morbidity
100,932
210,843
51,664
27.8%
58.0%
14.2%
P: $1,783
P: $2,698
P: $3,524
C: $725
C: $2,808
C: $7,830
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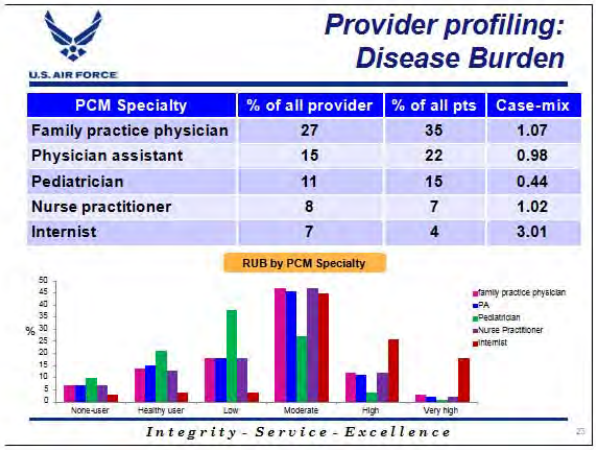
U.S. AIR FORCE
Provider profiling: Disease Burden
PCM Specialty | % of all provider | % of all pts | Case-mix
Family practice physician | 27 | 35 | 1.07
Physician assistant | 15 | 22 | 0.98
Pediatrician | 11 | 15 | 0.44
Nurse practitioner | 8 | 7 | 1.02
Internist | 7 | 4 | 3.01
RUB by PCM Specialty
%
family practice physician
PA
Pediatrician
Nurse Practitioner
Internist
None-user
Healthy user
Low
Moderate
High
Very high
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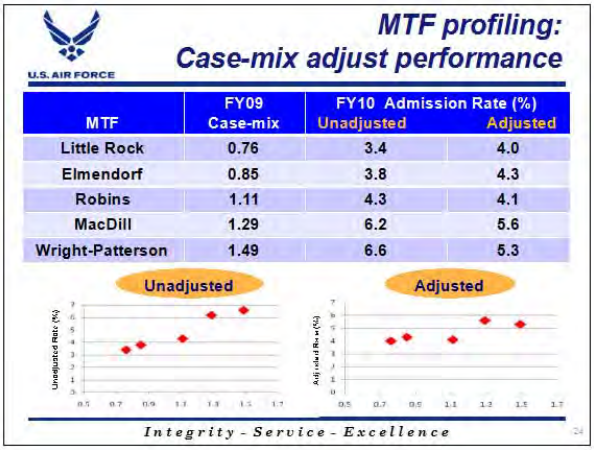
U.S. AIR FORCE
MTF profiling: Case-mix adjust performance
MTF | FY09 Case-mix | FY10 Admission Rate (%) Unadjusted | Adjusted
Little Rock | 0.76 | 3.4 | 4.0
Elmendorf | 0.85 | 3.8 | 4.3
Robins | 1.11 | 4.3 | 4.1
MacDill | 1.29 | 6.2 | 5.6
Wright-Patterson | 1.49 | 6.6 | 5.3
Unadjusted
Adjusted
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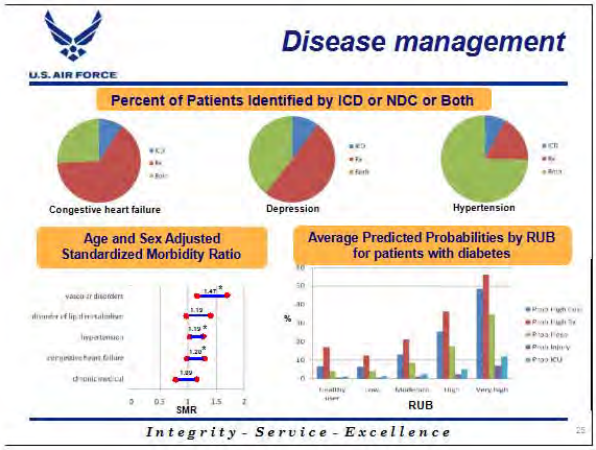

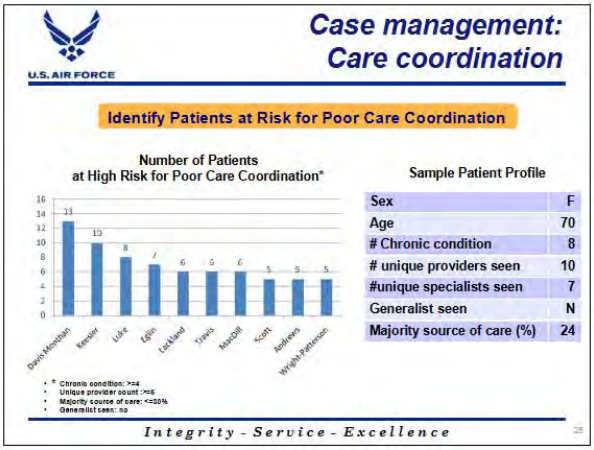

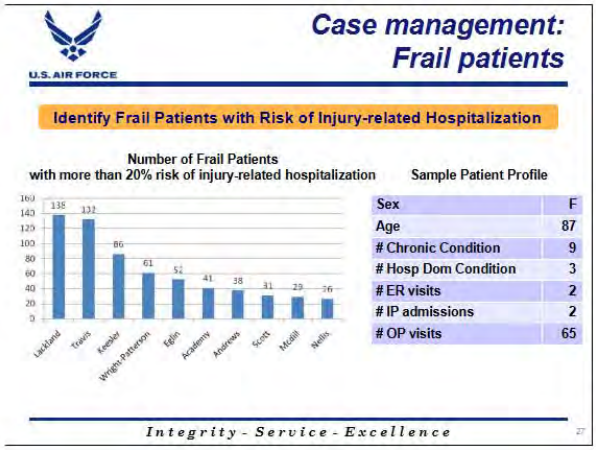

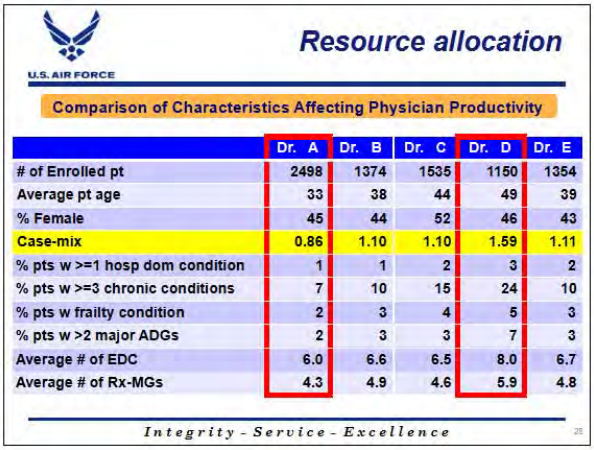

	Dr. A	Dr. B	Dr. C	Dr. D	Dr. E
# of Enrolled pt	2498	1374	1535	1150	1354
Average pt age	33	38	44	49	39
% Female	45	44	52	46	43
Case-mix	0.86	1.10	1.10	1.59	1.11
% pts w >=1 hosp dom condition	1	1	2	3	2
% pts w >=3 chronic conditions	7	10	15	24	10
% pts w frailty condition	2	3	4	5	3
% pts w >2 major ADGs	2	3	3	7	3
Average # of EDC	6.0	6.6	6.5	8.0	6.7
Average # of Rx-MGs	4.3	4.9	4.6	5.9	4.8


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Questions?
Contact: susan.chao@us.af.mil
Comprehensive slide set available upon request
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Pediatric Critical Care Training Validation Using High-Fidelity Pediatric Simulation

Lt Col (Dr) Daniel Bruzzini, 711 HPW/USAFSAM-ETS

Purpose: First-year pediatric residents and those deployed to natural disasters, humanitarian crises, and counterinsurgency battlefields must have the capability of treating children with critical care needs.

Hypothesis: Teaching the Society for Critical Care Medicine's (SCCM's) Pediatric Fundamentals of Critical Care Support (PFCCS) course and incorporating high-fidelity simulation pediatric critical care scenarios will improve the fund of knowledge, self-confidence, and performance capability of first-year pediatric residents.

Methods: All pediatric residents at the St. Louis University School of Medicine and the University of Missouri were taught the SCCM PFCCS Course. Each student completed an SCCM standardized and validated pretest and posttest, a survey of 10 five-point Likert scale questions on managing critical children before and after, and 2 videotaped pediatric critical care simulations with debriefings after each scenario.

Results: Fund of knowledge improved from a pretest score of 60% to a posttest score of 80%. Pediatric residents reported feelings of preparation increased by an average of 0.97 points on the Likert scale. Ten of 11 pediatric residents indicated they thought the course was "extremely helpful." Pediatric critical care simulation time to recognize a failed airway went from 72 s to 46 s. The time to perform CPR, defibrillate with paddles, and give intravenous epinephrine decreased from 3.50 to 1.33 min.

Conclusions: Pediatric critical care fund of knowledge, self-confidence, and clinical performance were improved in pediatric first-year residents by the SCCM PFCCS Course with high-fidelity simulation, thereby validating it as an important training methodology in building pediatric critical care capability.


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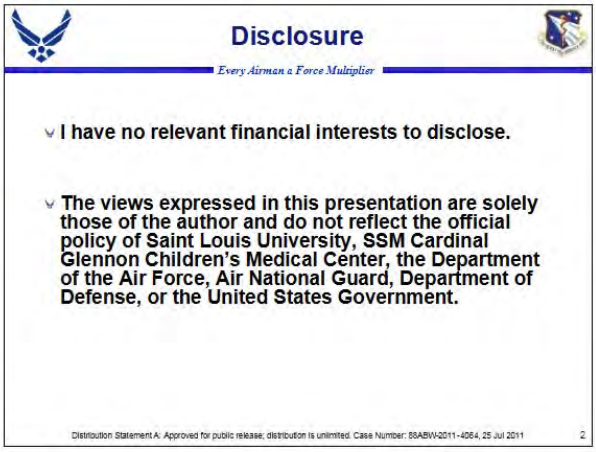
Pediatric Critical Care Training Validation Using High-Fidelity Simulation
Col (s) Daniel B. Bruzzini, MD
C-STARS Director of Pediatric Intensive and Emergency Medicine
Every Airman a Force Multiplier
August 2011 AFMS Research Symposium
Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-4064, 25 Jul 2011


Disclosure
Every Airman a Force Multiplier
I have no relevant financial interests to disclose.
The views expressed in this presentation are solely those of the author and do not reflect the official policy of Saint Louis University, SSM Cardinal Glennon Children's Medical Center, the Department of the Air Force, Air National Guard, Department of Defense, or the United States Government.
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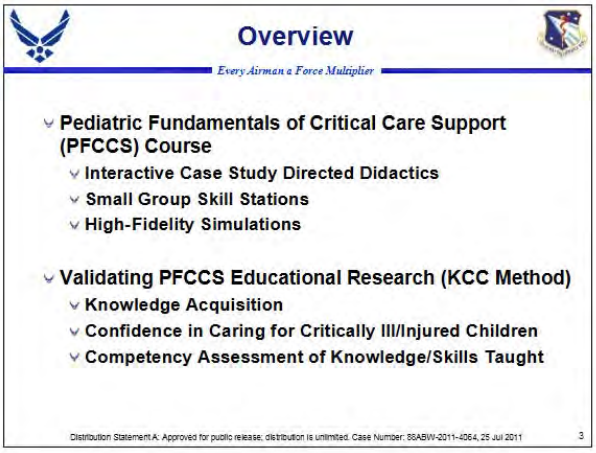
Overview
Every Airman a Force Multiplier
Pediatric Fundamentals of Critical Care Support (PFCCS) Course
Interactive Case Study Directed Didactics
Small Group Skill Stations
High-Fidelity Simulations
Validating PFCCS Educational Research (KCC Method)
Knowledge Acquisition
Confidence in Caring for Critically Ill/Injured Children
Competency Assessment of Knowledge/Skills Taught
Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-4064, 25 Jul 2011
3


PFCCS Notable Military Applications
Every Airman a Force Multiplier
1st PFCCS course held at the Air National Guard's Readiness Frontiers National Meeting June 2011
CERFP – CBRNE Enhanced Response Force Package
HRF – Homeland Response Force
Travis AFB rapid response team requirement for its pediatricians
Iraq/Afghanistan training requirement for deploying Air Force pediatricians
Distribution Statement A: Approved for public release; distribution is unlimited. Case Number: 88ABW-2011-4064, 25 Jul 2011
4

PFCCS Mission

Every Airman a Force Multiplier

- Prepare nonintensivists for pediatric critical care
  - Physicians/surgeons
  - Residents
  - Physician assistants
  - Nurse practitioners
  - Nurses
  - Respiratory therapists
  - Critical care EMTs/paramedics
  - Transport/Air Evacuation Teams
- Society of Critical Care Medicine (SCCM)

PFCCS
Pediatric Fundamental Critical Care Support

 5

PFCCS Content

Every Airman a Force Multiplier

- Core subjects
  - Initial Approach to Pediatric Trauma
  - Airway Evaluation and Management
  - Cardiovascular Shock and Management
  - Mechanical Ventilation Management
  - Sedation, Analgesia, and Paralytic Usage
  - Transport of Critically ill Child

 6

PFCCS Content (cont.)

Every Airman a Force Multiplier

- Core subjects
  - Arterial Blood Gas Interpretation
  - Post-Operative Care
  - Fluid and Electrolytes
  - Acute Renal Failure
  - Neurological Emergencies
  - Diagnosis and Management of Acute Infection

 7

Case Study Directed Didactics

Every Airman a Force Multiplier

 8

Clinical Skill Stations

Every Airman a Force Multiplier

- Small groups of 6-8 students
- Airway management
- Mechanical ventilation
  - Train on ventilators used in practice or in deployed setting
- Transport emphasizing care and proper documentation
- Sedation, analgesia, and paralytics
  - Medication usage
  - Morphine PCA usage
- Invasive device pediatric critical care X-ray/CT review

 9

Mechanical Ventilation

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 10

Mechanical Ventilation

Every Airman a Force Multiplier

 11

PFCCS High-Fidelity Simulation

Every Airman a Force Multiplier

- Two high-fidelity simulations
- Pediatric intensivist video analysis and debriefing
- Competency areas
  - Recognition and treatment of dysfunctional airway
  - Recognition and treatment of fatal arrhythmias
    - Appropriate use of CPR, defibrillation, and epinephrine

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PFCCS Educational Research

Every Airman a Force Multiplier

- Drs. Bruzzini, Werner, Garrett, and H. Sallee
  - Institutional Review Board approved
- Study Groups
  - 1st year pediatric residents from Saint Louis University and University of Missouri at Columbia
  - 3rd year pediatric residents from Saint Louis University

 14

PFCCS Validation Process KCC Methodology

Every Airman a Force Multiplier

- Knowledge Acquisition
  - Pre- and post-PFCCS tests
- Confidence in Caring for Critically Ill/Injured Children
  - Pre- and post-course surveys
- Clinical Competency and Integration Assessment
  - Group improvement from simulation 1 to number 2
  - Compared performance to traditionally trained 3rd year residents who had never taken PFCCS

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Test

Every Airman a Force Multiplier

- Must preread 11 of 24 PFCCS textbook chapters
  - Designed to be used for future reference textbook
- PFCCS pre-test and post-test
- Must score 70% or better to earn certification

 16

Test Results

Every Airman a Force Multiplier

- Pre-test N=42
- Mean 57.9 Std. 14.2
- Post-test N=42
- Mean 83.9 Std. 7.4

Pre-test – Post-test difference Mean 26 Std. 12.6

95% CI 22.1 – 29.9, p-value < 0.0001

* Combined Sample T-Test

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Pediatric Critical Care Confidence

Every Airman a Force Multiplier

- Pre-/post-surveys
- 10-question, 5-point Likert scale
  - 1 poorly prepared to 5 extremely prepared
- Ascertain feelings of competency
  - Overall
  - Nine key areas
- Overall pediatric crit. care
- Monitor intubation
- Operate a ventilator
- Choose ventilator modes
- RSI medication usage
- Lead a medical code
- Correct electrolytes
- Arrange peds. transport
- Provide sedation/analgesia
- Manage pediatric shock

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Pediatric Critical Care Confidence

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Significant

- Overall $p < 0.001$
- Choose vent mode $p < 0.002$
- RSI med. use $p < 0.016$
- Lead medical code $p < 0.017$
- Correct electrolytes $p < 0.0001$
- Sedation/analgesia $p < 0.012$
- Manage ped. shock $p < 0.001$

Not Significant

- Monitor intubation
  - $p < 0.06$
- Operate a ventilator
  - $p < 0.1$
- Arrange peds. transport
  - $p < 0.12$

* Paired samples T-Test

 20

Clinical Competency

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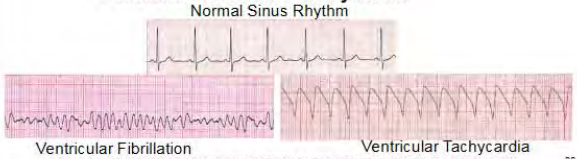
Simulation Scenarios

Every Airman a Force Multiplier

- Two physiologically identical critical care scenarios
  - #1 -- Respiratory failure due to pneumonia
    - Displaced endotracheal tube
    - Ventricular fibrillation
  - #2 -- Post operatively intubated patient
    - Obstructed endotracheal tube
    - Pulseless ventricular tachycardia



 22

Simulation Scenarios

Every Airman a Force Multiplier

- Standard scenario read to all in the beginning
- All vital signs, transitions, high-fidelity simulation responses to student inputs programmed
- Simulation operators behind 1-way glass
  - No verbal or nonverbal feedback during simulation
  - No adjustment of simulation physiology by sim. operator

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Simulation Scenarios

Every Airman a Force Multiplier

- All necessary equipment laid out on a table for use
  - Avoid time delays due to inability to find equipment
- Team leader assigned and wore a badge
  - Avoids no leader or too many leaders situations
- Same group but different team leader for second scenario

 24

Videotaped Debriefings

Every Airman a Force Multiplier

 25

Simulation Results

Every Airman a Force Multiplier

- Compared Simulation 1 to Simulation 2 performance
  - Delineates simulation and debriefing impact
- Compared 3rd-year residents to 1st-year residents
  - 3rd year residents have 3 mo of Pediatric ICU experience
  - Determines PFCCS course effect

 26

Simulation Results Measured

Every Airman a Force Multiplier

- 8 groups of 1st-year pediatric residents
  - New method
- 3 groups of 3rd-year pediatric residents
  - Control
- Total time
- Time to disconnect from ventilator
- Time to pull endotracheal tube (ETT)
- Time to recognize the arrhythmia
- Time to begin cardiopulmonary resuscitation (CPR)
- Time to deliver first electrical shock
- Time to deliver first dose of epinephrine

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Simulation 1 vs. 2 1st-Year Pediatric Residents

Every Airman a Force Multiplier

SIMULATION 1		SIMULATION 2
Total time	p < 0.001	Total time
10 min 22 s (622 s)		6 min 59 s (419 s)
Disconnect vent	p<0.042	Disconnect vent
70.5 s		52.25 s
Pull ETT	p < 0.004	Pull ETT
3 min 26 s (206 s)		1 min 40 s (99.6 s)

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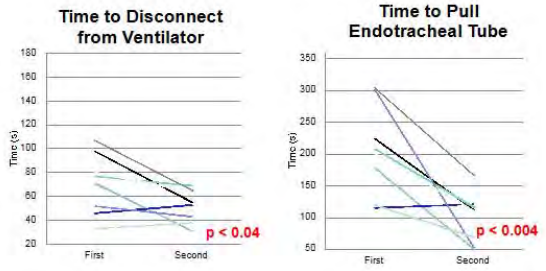
Simulation 1 vs. 2 1st-Year Pediatric Residents

Every Airman a Force Multiplier



Paired sample t-test

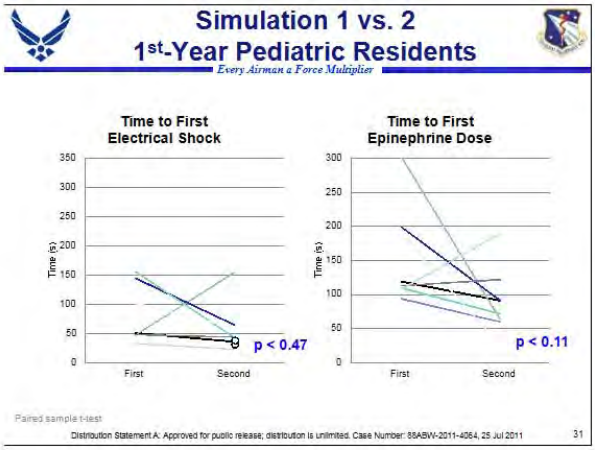
 29

Simulation 1 vs. 2 1st-Year Pediatric Residents

Every Airman a Force Multiplier

SIMULATION 1		SIMULATION 2
ID arrhythmia	p < 0.9	ID arrhythmia
16.9 s		7.5 s
Start CPR	p < 0.8	Start CPR
40.1 s		35.9 s
1st shock	p < 0.47	1st electrical shock
91.5 s		56.4 s
1st epi. dose	p < 0.11	1st epinephrine dose
2 min 34 s (154 s)		1 min 29 s (89 s)

 30


Simulation 1 vs. 2
1st-Year Pediatric Residents
Every Airman a Force Multiplier
Time to First
Electrical Shock
Time (s)
350
300
250
200
150
100
50
0
First
Second
p < 0.47
Time to First
Epinephrine Dose
Time (s)
300
250
200
150
100
50
0
First
Second
p < 0.11
Paired sample t-test
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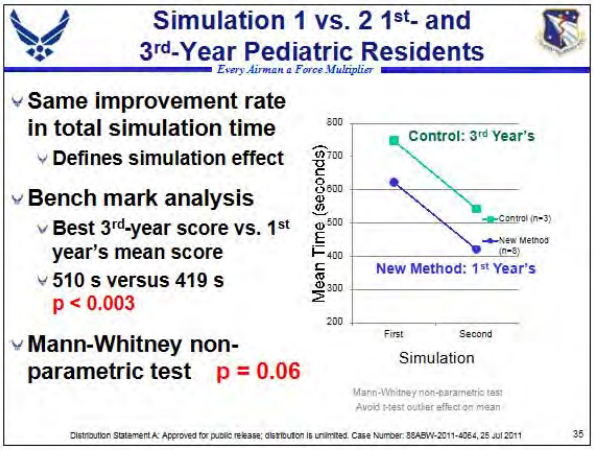
Simulation 1 vs. 2 1st- and
3rd-Year Pediatric Residents
Every Airman a Force Multiplier
Same improvement rate in total simulation time
Defines simulation effect
Bench mark analysis
Best 3rd-year score vs. 1st year's mean score
510 s versus 419 s
p < 0.003
Mann-Whitney non-parametric test p = 0.06
Mean Time (seconds)
800
700
600
500
400
300
200
Control: 3rd Year's
Control (n=3)
New Method (n=8)
New Method: 1st Year's
First
Second
Simulation
Mann-Whitney non-parametric test
Avoid t-test outlier effect on mean
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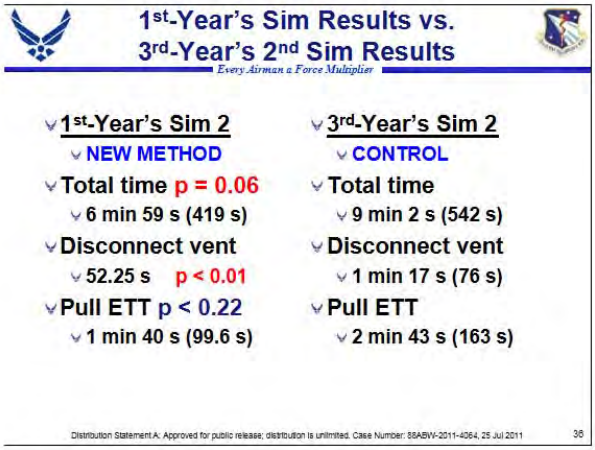
1st-Year's Sim Results vs.
3rd-Year's 2nd Sim Results
Every Airman a Force Multiplier
1st-Year's Sim 2
NEW METHOD
Total time p = 0.06
6 min 59 s (419 s)
Disconnect vent
52.25 s p < 0.01
Pull ETT p < 0.22
1 min 40 s (99.6 s)
3rd-Year's Sim 2
CONTROL
Total time
9 min 2 s (542 s)
Disconnect vent
1 min 17 s (76 s)
Pull ETT
2 min 43 s (163 s)
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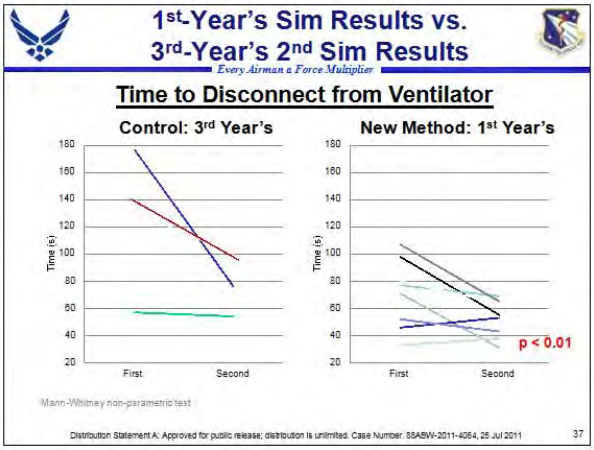
1st-Year's Sim Results vs.
3rd-Year's 2nd Sim Results
Every Airman a Force Multiplier
Time to Disconnect from Ventilator
Control: 3rd Year's
New Method: 1st Year's
Time (s)
180
160
140
120
100
80
60
40
20
First
Second
p < 0.01
Mann-Whitney non-parametric test
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1st-Year's Sim Results vs. 3rd-Year's 2nd Sim Results

Every Airman a Force Multiplier

1st-Year's Sim 2

- Identify arrhythmia
  - 7.5 s p < 0.9
- Start CPR
  - 35.9 s p < 0.84
- 1st electrical shock
  - 56.4 s p < 0.26
- 1st epinephrine dose
  - 1 min 29 s (89 s) p < 0.1

3rd-Year's Sim 2

- Identify arrhythmia
  - 12 s
- Start CPR
  - 48.3 s
- 1st electrical shock
  - 1 min 27 s (87 s)
- 1st epinephrine dose
  - 3 min (180 s)

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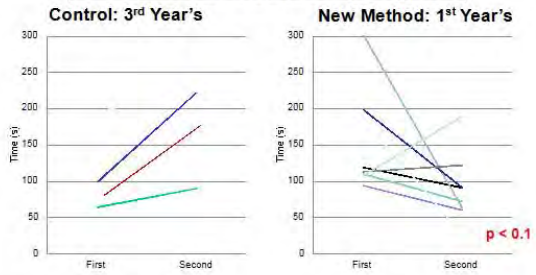
1st-Year's Sim Results vs. 3rd-Year's 2nd Sim Results

Every Airman a Force Multiplier

Time to Give 1st Dose of Epinephrine



Mann-Whitney non-parametric test

 40

Conclusions

Every Airman a Force Multiplier

- Knowledge acquisition improved
  - Post-test scores mean increase 26% (95% CI 22%-30%)
- Confidence significantly improved (all p < 0.02) in:
  - Caring for Critically Ill Children
  - Choosing the Appropriate Ventilation Mode
  - Rapid Sequence Intubation Medication Usage
  - Leading a Medical Code
  - Correcting Electrolytes
  - Providing Sedation and Analgesia
  - Managing Pediatric Shock

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Conclusions Simulation 1 to Simulation 2

Every Airman a Force Multiplier

- Simulation effect most evident in airway management
  - Disconnecting from the ventilator
  - Pulling the endotracheal tube
- Not significantly improved in dysrhythmia therapy
  - Initiating CPR
  - Defibrillation
  - Epinephrine administration
  - Taught in Pediatric Advanced Life Support (PALS)
    - All pediatric residents PALS certified

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1st-Year New Method vs. 3rd-Year Control

Every Airman a Force Multiplier

- Significantly decreased
  - Total time
    - 6 min 59 s vs. 9 min 2 s
  - Time to disconnect from vent
    - 52 s vs. 76 s
  - Time to 1st epinephrine dose
    - 1 min 29 s vs. 3 min
- Experience -- negative influence on airway management?
  - Give fluid boluses
  - Request x-ray evaluation
  - Limited 3rd-year group sample size

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Conclusions PFCCS Validation

Every Airman a Force Multiplier

- *KCC* Course Validation Methodology
  - Knowledge Testing
    - Pre- and post-tests
  - Confidence in Capabilities
    - Pre- and post-course surveys
  - Competency Demonstration
    - Properly designed high-fidelity simulation
- PFCCS is a valid training methodology to prepare for children with critical care needs.

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Thank you!

Every Airman a Force Multiplier

- Without the help and support of many people, my SCCM PFCCS course would not have happened:
- Hospital President Sherilyn Hailstone, SSM Cardinal Glennon Medical Chief of Staff Dr. Wilmott, Univ. of Mo Medical Chief of Staff Dr. Fete, Dir. of Nursing Jeannie Mollohan, ER and ICU Department Heads -- Dr. Flood, Dr. Ream, Instructors -- Dr. Garrett, Dr. Werner, Dr. Jamshidi, Dr. Doerhoff, Dr. Scalzo, Dr. H. Sallee, Dr. Lynch, Anne Gildehaus CCRN, Jessica Leet CCRN, Respiratory Therapists Mary Fairchild, Brian Eggenmeyer, Administrative -- Erin Donovan, Rita Stites, Deane Sagehorn, Barb Beguette, Nanette Parris, Kristy Deutchmann, Tammi Mooshigian, Simulation – 2nd Lt. Xiaoming Shi (AF HPSP Med. Student), Dave St. Andre, Mike Kaufmann, Ellen Pringle
- Statistical Support – Eric Armbrecht, Ph.D.

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Questions

Every Airman a Force Multiplier

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Future C-STARS St. Louis PFCCS Courses
Every Airman a Force Multiplier
Fridays and Saturdays
23 & 24 September 2011
14 & 15 October 2011
27 & 28 April 2012
11 & 12 May 2012
Free to those attending C-STARS St. Louis
Must coordinate in advance with Col (s) Bruzzini, MD
Reduced rate if only taking the PFCCS course
Contact: pfccs.saintlouis@gmail.com to register
Can be exported off-site to train personnel locally
Contact: Col (s) Dan Bruzzini, MD -- dbruzzin@slu.edu
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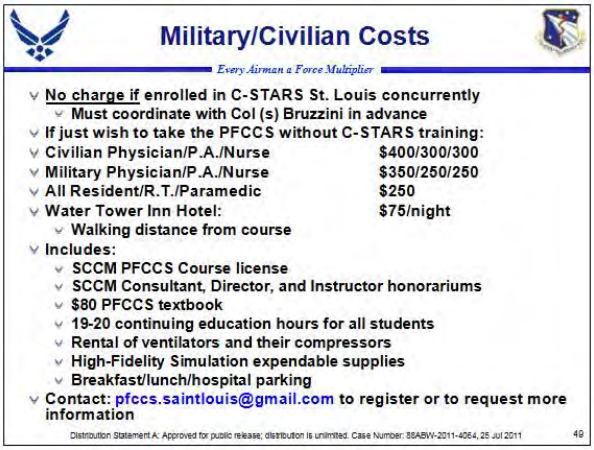
Military/Civilian Costs
Every Airman a Force Multiplier
No charge if enrolled in C-STARS St. Louis concurrently
Must coordinate with Col (s) Bruzzini in advance
If just wish to take the PFCCS without C-STARS training:
Civilian Physician/P.A./Nurse $400/300/300
Military Physician/P.A./Nurse $350/250/250
All Resident/R.T./Paramedic $250
Water Tower Inn Hotel: $75/night
Walking distance from course
Includes:
SCCM PFCCS Course license
SCCM Consultant, Director, and Instructor honorariums
$80 PFCCS textbook
19-20 continuing education hours for all students
Rental of ventilators and their compressors
High-Fidelity Simulation expendable supplies
Breakfast/lunch/hospital parking
Contact: pfccs.saintlouis@gmail.com to register or to request more information
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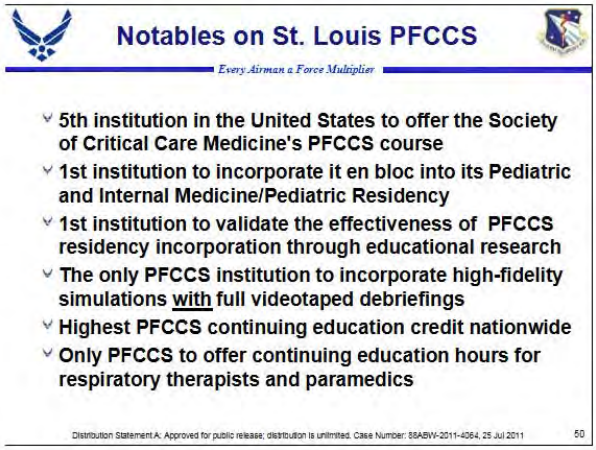
Notables on St. Louis PFCCS
Every Airman a Force Multiplier
5th institution in the United States to offer the Society of Critical Care Medicine's PFCCS course
1st institution to incorporate it en bloc into its Pediatric and Internal Medicine/Pediatric Residency
1st institution to validate the effectiveness of PFCCS residency incorporation through educational research
The only PFCCS institution to incorporate high-fidelity simulations with full videotaped debriefings
Highest PFCCS continuing education credit nationwide
Only PFCCS to offer continuing education hours for respiratory therapists and paramedics
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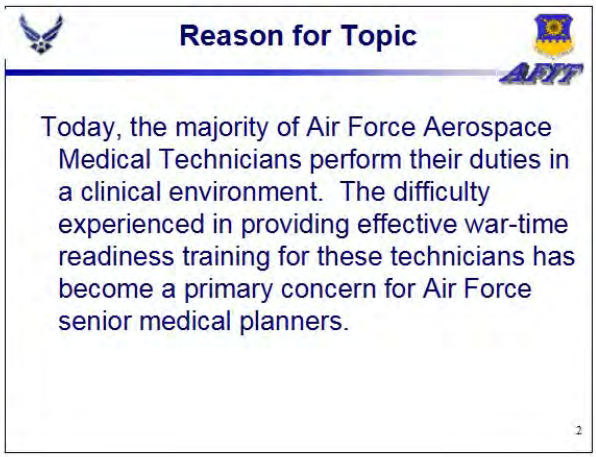
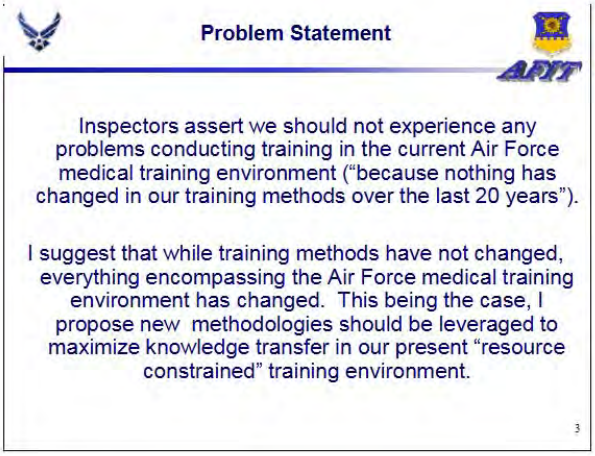
Contemplating a New Model for Air Force Aerospace Medical Technician Skills Sustainment Training

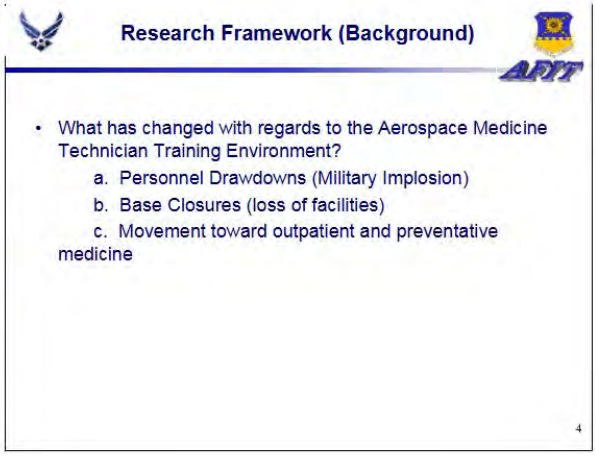
SMSgt Robert Corrigan, 59th Medical Wing, United States Air Force Medical Service

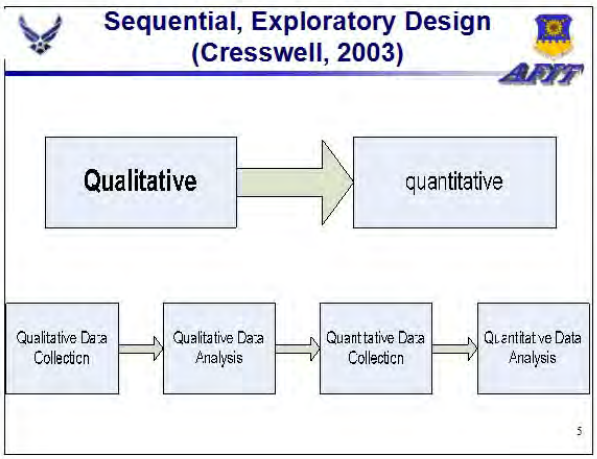
Two decades ago, Aerospace Medical Technicians received robust skills sustainment training through exposure to multi-faceted patient treatment environments. Available training environments included inpatient care, outpatient care, and emergency services. This diverse training environment made possible through large operating budgets and an extraordinary infrastructure could not last. Today (after five separate base closure and realignment initiatives), medical funding and infrastructure is but a shadow of what it once was. Budgetary constraints and rising healthcare costs have necessitated a purposeful movement away from inpatient and emergency care, toward outpatient and preventative medicine. While changes in Air Force health care delivery are necessary, the closure of inpatient and emergency services throughout the Air Force Medical Service significantly impacts our ability to prepare medical professionals and paraprofessionals for deployed operations. This research uses a mixed-methods framework (qualitative and quantitative) to demonstrate the importance of exploring alternative training models for medical skills sustainment training. Further, the study suggests an alternative training model that leverages existing network technologies (high fidelity patient simulation, asynchronous learning networks, and video-teleconferencing) to satisfy established learning objectives in the cognitive, affective, and psychomotor domains of learning. The proposed model offers a potential mitigation strategy for medical skills sustainment training limitations experienced in a post-BRAC era plagued by budgetary constraints and the near complete loss of inpatient and emergency services training platforms.

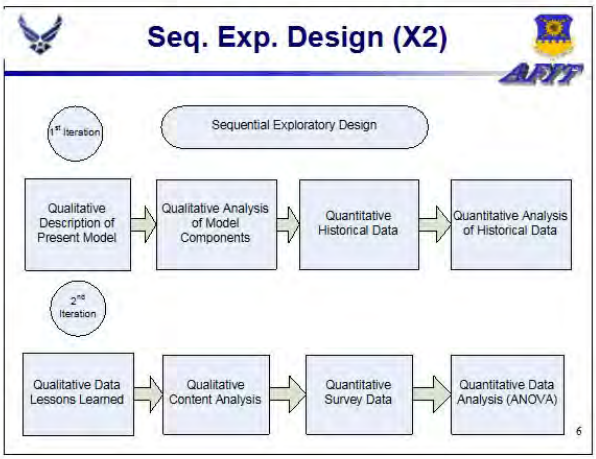

Contemplating a New Model for Air Force Aerospace Medical Technician Skills Sustainment Training
U.S. AIR FORCE
SMSgt Bob Corrigan
Strength Through Education
1

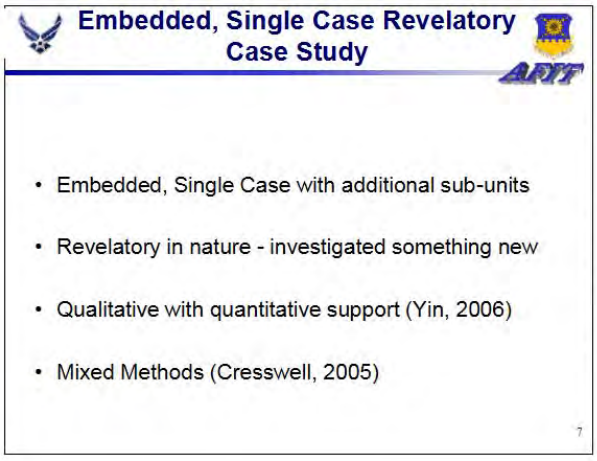

Reason for Topic
Today, the majority of Air Force Aerospace Medical Technicians perform their duties in a clinical environment. The difficulty experienced in providing effective war-time readiness training for these technicians has become a primary concern for Air Force senior medical planners.
2

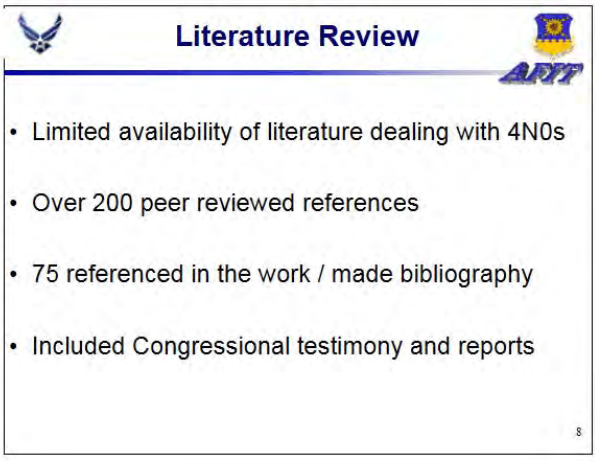

Problem Statement
Inspectors assert we should not experience any problems conducting training in the current Air Force medical training environment ("because nothing has changed in our training methods over the last 20 years").
I suggest that while training methods have not changed, everything encompassing the Air Force medical training environment has changed. This being the case, I propose new methodologies should be leveraged to maximize knowledge transfer in our present "resource constrained" training environment.
3


Research Framework (Background)
• What has changed with regards to the Aerospace Medicine Technician Training Environment?
a. Personnel Drawdowns (Military Implosion)
b. Base Closures (loss of facilities)
c. Movement toward outpatient and preventative medicine
4


Sequential, Exploratory Design (Cresswell, 2003)
Qualitative
quantitative
Qualitative Data Collection
Qualitative Data Analysis
Quantitative Data Collection
Quantitative Data Analysis
5


Seq. Exp. Design (X2)
1st Iteration
Sequential Exploratory Design
Qualitative Description of Present Model
Qualitative Analysis of Model Components
Quantitative Historical Data
Quantitative Analysis of Historical Data
2nd Iteration
Qualitative Data Lessons Learned
Qualitative Content Analysis
Quantitative Survey Data
Quantitative Data Analysis (ANOVA)
6


Embedded, Single Case Revelatory Case Study
• Embedded, Single Case with additional sub-units
• Revelatory in nature - investigated something new
• Qualitative with quantitative support (Yin, 2006)
• Mixed Methods (Cresswell, 2005)
7


Literature Review
• Limited availability of literature dealing with 4N0s
• Over 200 peer reviewed references
• 75 referenced in the work / made bibliography
• Included Congressional testimony and reports
8

Methodology

Completed using the five necessary components of Case Study Research Design (as described by Yin, 2003)

1. Research questions
2. Propositions
3. Unit of analysis
4. Logic linking the data to propositions
5. Criteria for interpreting the data

9

Methodology

Component #1: Research Questions

- RQ 1: What is the present model used to provide Air Force Aerospace Medical Technician skills sustainment training?
- IQ 1: What evidence suggests a formal model for aerospace medical technician skills sustainment training?

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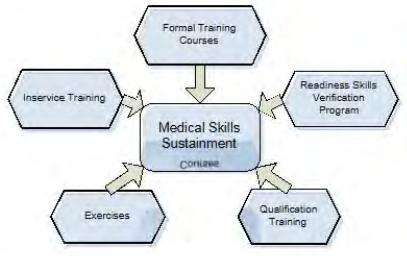
Improvised Model



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Research Questions (continued)

- RQ 2: Have there been recent changes to the aerospace medical skills sustainment training environment that may contribute to the success or failure of the current model?
  - ***IQ 2:*** What changes have occurred with respect to land, labor, capital, and the nature of work?
  - Personnel Reductions, Loss of MTFs, Declining Skill Sets for assigned personnel (Inpatient, ESD)

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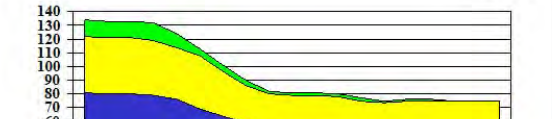
AFMS MTF Inventory



	88	89	90	91	92	93	94	95	96	97	98	99	OO	O1	O2	O3	O4	O5	O6
ConHosp	12	12	12	13	10	5	5	4	2	2	2	2	2	1	1	1	0	0	0
Clinic	41	41	41	40	38	39	32	27	25	31	32	38	36	45	51	51	52	53	56
Hospital	73	72	72	71	68	61	57	52	51	44	43	36	35	25	20	20	19	18	15
MC	8	8	8	8	8	8	7	7	4	4	4	4	4	4	4	4	4	4	4

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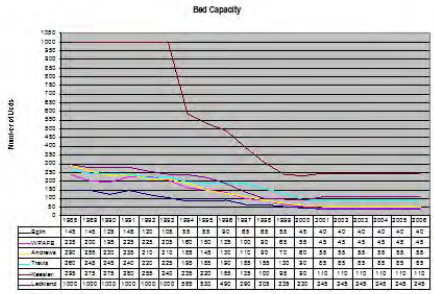
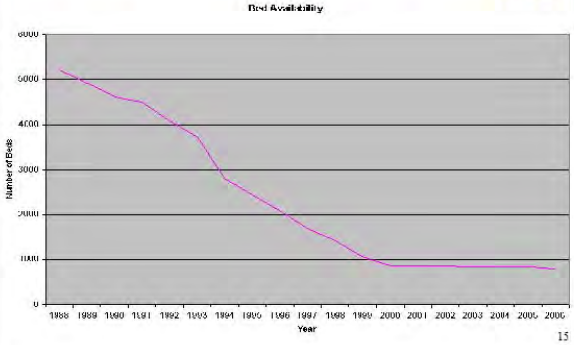
Declining Inpatient Bed Capacity 6 Largest Medical Facilities



14

Overall AF Inpatient Capacity



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Research Questions (continued)

- RQ 3: What indicators might be suggestive of problems with the current training model?
- ***IQ 3:*** *What* insights can be gained from Air Force Lessons Learned with respect to Aerospace Medical Technician Skills Sustainment Training?

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Quality Indicators

- Training Accessibility
- Training Effectiveness
  - (Bringslimark, 2004)

17

Content Analysis

- 59 Applicable Lessons Learned Evaluated Through Content Analysis
- 100% Reflected Negative Findings With Respect To Current Aerospace Medical Technician Skills Sustainment Training.
- Virtually all addressed training effectiveness and/or training availability issues.

18

- ***RQ 4:*** Is a new Aerospace Medical Technician skills sustainment training model warranted?
- ***IQ 4:*** What are some of the existing problem areas the new model should address?

19

Do we need a new model?

- Lessons Learned Say, "YES!"
- Should address versatility issues
- Effectiveness issues
- Accessibility issues
- Fidelity Issues (Realism)

20

Versatility

- Must apply to both deployed and Home-station training environments
- There is a statistically significant difference

21

Deployed vs. Home-station

"5" Skill Level ANOVA

ANOVA: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
DEP AD 5	371	8762	23.61725	280.3072
HS AD 5	371	7495	20.20216	233.1617

ANOVA

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	2163.462264	1	2163.462	8.426849	0.003807	3.854056
Within Groups	189983.4879	740	256.7344			
Total	192146.9501	741				

22

Deployed vs. Home-station

"7" Level ANOVA

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Dep AD 7	371	9418	25.38544	368.4257
HS AD 7	371	6722	18.1186	168.067

ANOVA

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	9795.708895	1	9795.709	36.51752	2.4E-09	3.854056
Within Groups	198502.8631	740	268.2468			
Total	208298.372	741				

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Methodology (cont.)

Component #2: Proposition

- Study Proposition: Numerous elements of the Aerospace Medical Technician training environment have changed.
- What must change with respect to current medical skills sustainment training if we hope to maintain a high degree of medical readiness for present and future Aerospace Medical Technicians?

•Training must become more versatile, accessible, effective, and realistic.

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Methodology (cont.)

Component #3: Unit of analysis

- The unit of analysis is the Aerospace Medical Technician Skills Sustainment Training Environment.
- Study included historical data analysis (SGN), content analysis of Lessons Learned, and quantitative analysis of survey data (AFOMS)

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Methodology (cont.)

Component #4: Logic linking the data to propositions (data analysis)

- Pattern-matching (Content Analysis)
- Inductive Logic links formed through historical analysis, content analysis, and quantitative data analysis (ANOVA)

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Methodology (cont.)

Component #5: Criteria for interpreting the data

- Do the results support the proposition?
- AFOMS data supported proposition through descriptive statistics and multiple applications of ANOVA.
- Propositions/Findings also supported by existing theory
  - Knowledge Management Theory
    - Training Effectiveness
    - Accessibility
  - Organizational Behavior Theory

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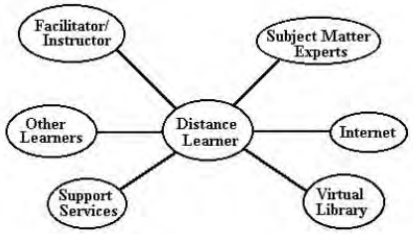
How Can IT Help?

Networked Learning Environment aka. ALN



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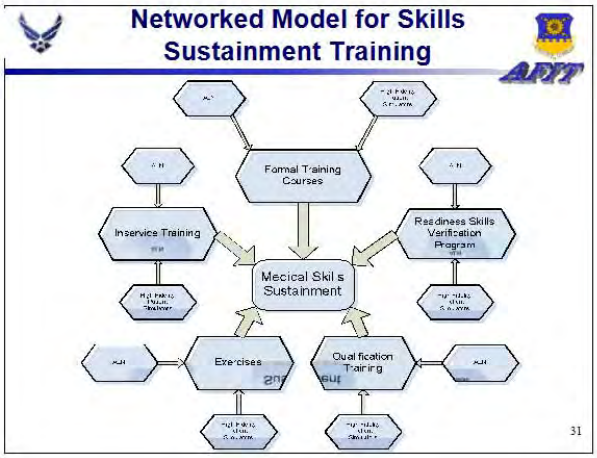
Barriers to distance based simulation training can be minimized through the integration of remote controlled high-fidelity patient simulators with an interactive 3D video teleconferencing / telepointing internet based network, whose geographical range is unlimited.



Design Quality Criteria

Tests	Case Study Tactic	Phase of research in which tactic occurs
Construct validity	• Use multiple sources of evidence	data collection
	• Establish chain of evidence	data collection
	• Have key informants review draft case study report	
Internal validity	• Do pattern-matching	data analysis
	• Do explanation-building	data analysis
	• Address rival explanations	data analysis
	• Use logic models	data analysis
External validity	• Use theory in single-case studies	research design
	• Use replication logic in multiple-case studies	research design
Reliability	• Use case study protocol	data collection
	• Develop case study database	data collection

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Research Benefits

This research provides:

- A broad-brush view of problem areas regarding required training as mandated in the CFETP.
- Confirmation of decreasing resources experienced by Air Force Aerospace Medical Technician trainees and trainers.
- Confirmation of decreasing experience levels exhibited by Air Force Aerospace Medical Technician trainers.
- Potential application of findings to other medical related AFSCs.
- A potential alternate training model that further exploits the advantages of existing resources such as IT.
- A starting point for future research to test model efficiency.
- Insight regarding Air Force Aerospace Medical Technician training issues/problems (as reported by AF trainees and trainers).

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Limitations

- Self-reported bias (surveys)
- Researcher bias
- Immaturity of the research area/lack of fundamental literature
- No test of proposed model effectiveness

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Questions?

36

Special Needs Assessment and Planning Environment for Emergency Operations Decision Making

Mr Aaron Miller, 711 HPW/USAFSAM-ETS

During man-made or natural disasters, significant segments of the population have special medical needs that are not addressed by current emergency operations processes. These patients are often neglected during disasters due to limited resources resulting from insufficient knowledge of a system's capacity to respond to their needs.

A research and development project was conducted to: (1) assess the availability of detailed infrastructure data regarding population, medical facilities, and transportation resources and (2) identify a simulation tool capable of modeling the human behaviors of victims and responders during an emergency. The combination of these data and tool resulted in the Special Needs Assessment and Planning (SNAP) environment. Modifications to the user interface include app-based access from mobile devices. SNAP is a decision support tool that quickly and easily conducts statistical predictions of resource needs for supporting special medical needs patients. Further, as actual data are provided to the Emergency Operations Center (EOC), reassessments using live data should provide a continuing series of predictions in real time.

To evaluate the fidelity of the SNAP environment, SNAP will be tested in Hamilton County, Ohio, in May during "Shaken Horizons," a multiregion exercise simulating local, regional, and national multidomain response to a large-scale earthquake. SNAP will be used inside the county's Emergency Planning Collaborative and provide medical facility and fire/rescue resource utilization predictions during the multiday event. Results from the actual event and the after-action review will be presented to illustrate SNAP's utility to EOC decision makers.

U.S. AIR FORCE

Special Needs Assessment and Planning (SNAP) Environment

Emergency Operations Decision Making
By Aaron Miller
Wright State Research Institute
National Center for Medical Readiness
3 August 2011

Every Airman a Force Multiplier
August 2011 AFMS Research Symposium

The Problem

- *Significant segments of the population have special needs that are not addressed by current emergency operations processes.*
- *Often these functional needs populations are neglected due to:*
  - *Limited resources resulting from insufficient knowledge of system capacity*
  - *People placed in shelters not equipped for them*
  - *Insufficient planning and preparation*
  - *Inadequate access of medications*

The Problem

- *Emergency planners and responders need to know:*
  - *How many people need to be evacuated? How many people will need medical attention?*
  - *How many neonatal patients will be in the disaster area?*
  - *How many dialysis patients will require treatment?*
  - *What equipment is needed to respond to this disaster and the associated population?*
  - *Where should the temporary field hospital be set up and how should I organize resupply?*

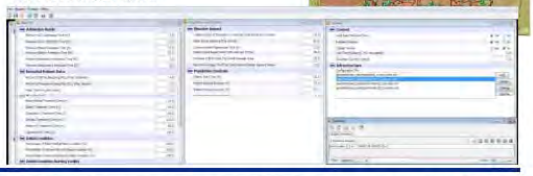
The Solution: SNAP Environment

- *SNAP is an environment to facilitate the analysis of the emergency response to a man-made or natural disaster.*
  - *Identify at-risk functional needs populations.*
    - *Neonatal patients/new births*
    - *Dialysis patients*
    - *Oxygen-dependent patients*
    - *Mental health patients*
    - *Medically dependent elderly*
  - *Support resource decisions.*
    - *Personnel*
    - *Equipment*
    - *Consumables*
    - *Transportation or evacuation*
  - *Provide relevant data earlier in a disaster to enable planning and expedited response.*

New Orleans, 2005: Elderly patients evacuated from a rehabilitation center following Hurricane Katrina.

The Solution: SNAP Environment

- Leverages existing government or academic databases.
- Ties data together using behavioral models.
- Predicts the number of people and their expected medical conditions who will likely need evacuation and medical care.



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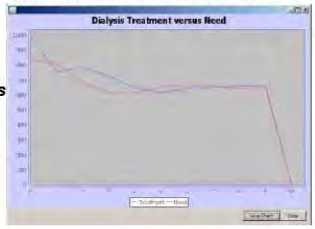
The Solution: SNAP Environment

- Connects functional needs care and evacuation requirements with critical disaster medical resources.
- Allows community planners to predict high-urgency resource requests within geographical context.
- Assists emergency management agencies with ADA Title II compliance for vulnerable functional needs/disabled populations.



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The Solution: SNAP Environment

- Provides emergency operations center personnel with a decision support tool containing data-validated, modeled outcomes both before and during events.
- Allows planners to tailor disaster planning needs to locally existing databases.
- Visualizes simulation results for easy recognition of significant findings.
  - Extremely valuable tool for mass gathering and large-scale public event planning

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SNAP Research & Development

- To validate the capabilities of SNAP, a research and development project was conducted to:
  - Identify and validate a simulation tool capable of modeling the human behaviors of victims and responders during an emergency
  - Assess the availability of detailed infrastructure data regarding population, medical facilities, and transportation resources

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Research Activities

- Conduct research to determine viability of using SNAP as:
  - Real-time decision support
  - Planning tool
  - Exercise tool
- Evaluate viability of data associated with SNAP environment by:
  - Identifying renewable accurate data sources for inputs
  - Determining value and appropriate level of complexity of data outputs

 9

Real-Time Decision Support

- While SNAP can be used as a real-time decision support tool, the current limitation on SNAP is the lack of integrated real-time data sources.
  - Currently behavioral models represent human behavior, first responder actions, and facility utilization.
    - As live data sources become available, they can replace the behavioral models to provide real-time data enabling integration into command and control (C2) platforms.
- Real-time capability is viable through periodic updates of data sources to support real-time planning during a disaster.
  - Update model with current information as it becomes available and rerun model to obtain planning information for decision makers (e.g., represent a hospital collapse).

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Incident Planning Tool

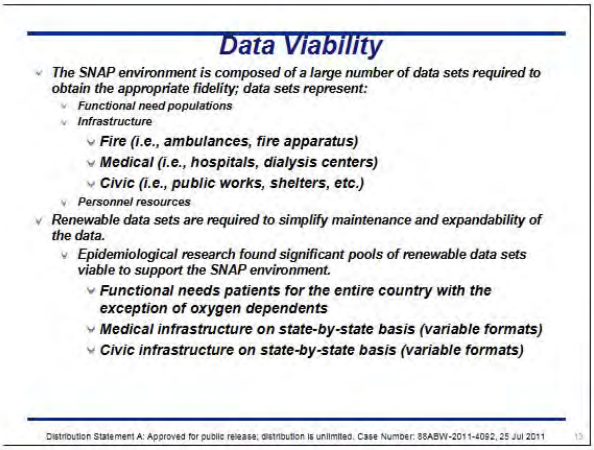
- Provides Emergency Operations Center managers with data-validated, modeled outcomes.
- Allows planners to tailor disaster planning needs to locally existing databases.
- Visualizes simulation results for easy recognition of significant findings.
  - Extremely valuable tool for mass gathering and large-scale public event planning
- Enables the identification of break points within the emergency response system.
  - Allows community planners to predict high-urgency resource requests within geographical context.

 11

Exercise Tool

- Extremely viable tool for use in exercise planning and training for disaster exercises and events
  - Generates injects for more realistic scenario exercises.
  - Generates holistic scenarios with integration between disparate entities.
  - Serves as command and control module for exercise to determine when activities should be concluded and kicked-off during exercise execution.
    - Allows for management of virtual and constructive resources within a live exercise.
  - Can recreate exact scenario to reinforce training activities.
  - Is capable of integration into live, virtual, and constructive training activities.

 12


Data Viability
The SNAP environment is composed of a large number of data sets required to obtain the appropriate fidelity; data sets represent:
Functional need populations
Infrastructure
Fire (i.e., ambulances, fire apparatus)
Medical (i.e., hospitals, dialysis centers)
Civic (i.e., public works, shelters, etc.)
Personnel resources
Renewable data sets are required to simplify maintenance and expandability of the data.
Epidemiological research found significant pools of renewable data sets viable to support the SNAP environment.
Functional needs patients for the entire country with the exception of oxygen dependents
Medical infrastructure on state-by-state basis (variable formats)
Civic infrastructure on state-by-state basis (variable formats)
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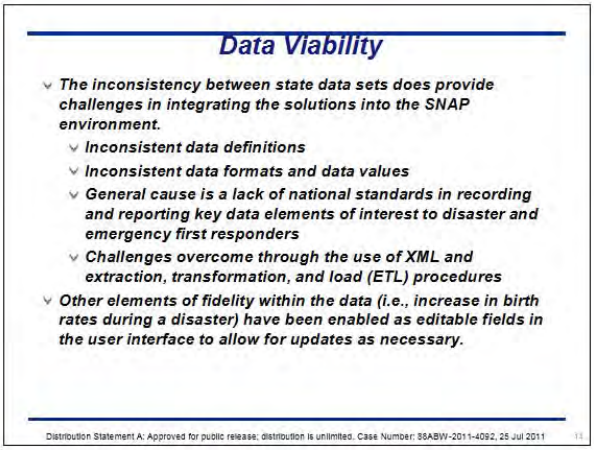
Data Viability
The inconsistency between state data sets does provide challenges in integrating the solutions into the SNAP environment.
Inconsistent data definitions
Inconsistent data formats and data values
General cause is a lack of national standards in recording and reporting key data elements of interest to disaster and emergency first responders
Challenges overcome through the use of XML and extraction, transformation, and load (ETL) procedures
Other elements of fidelity within the data (i.e., increase in birth rates during a disaster) have been enabled as editable fields in the user interface to allow for updates as necessary.
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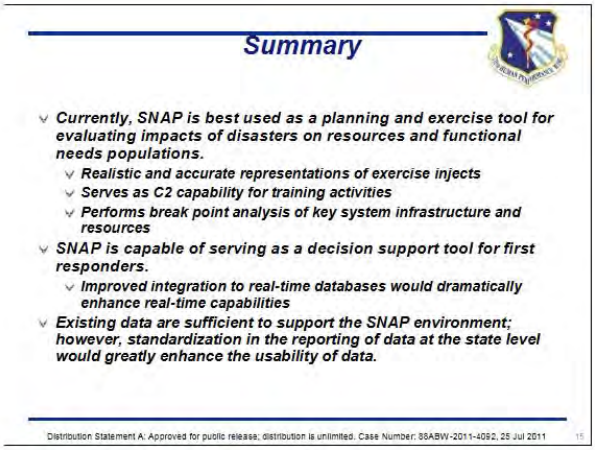
Summary
Currently, SNAP is best used as a planning and exercise tool for evaluating impacts of disasters on resources and functional needs populations.
Realistic and accurate representations of exercise injects
Serves as C2 capability for training activities
Performs break point analysis of key system infrastructure and resources
SNAP is capable of serving as a decision support tool for first responders.
Improved integration to real-time databases would dramatically enhance real-time capabilities
Existing data are sufficient to support the SNAP environment; however, standardization in the reporting of data at the state level would greatly enhance the usability of data.
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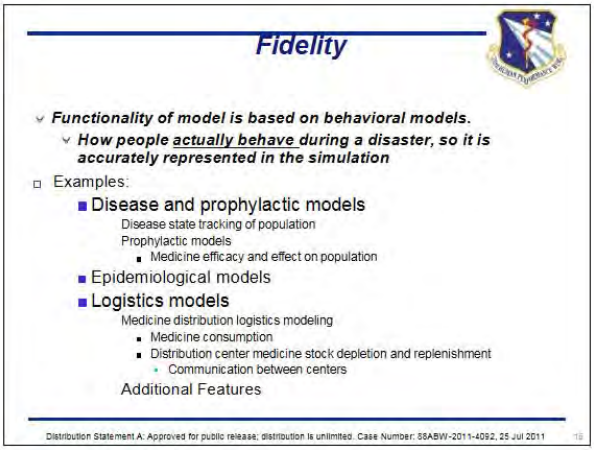
Fidelity
Functionality of model is based on behavioral models.
How people actually behave during a disaster, so it is accurately represented in the simulation
Examples:
Disease and prophylactic models
Disease state tracking of population
Prophylactic models
Medicine efficacy and effect on population
Epidemiological models
Logistics models
Medicine distribution logistics modeling
Medicine consumption
Distribution center medicine stock depletion and replenishment
Communication between centers
Additional Features
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Fidelity: An Example

During disasters, there is an increase in birth rate due to stress placed on mothers, creating a higher level of premature births.

SNAP Inputs

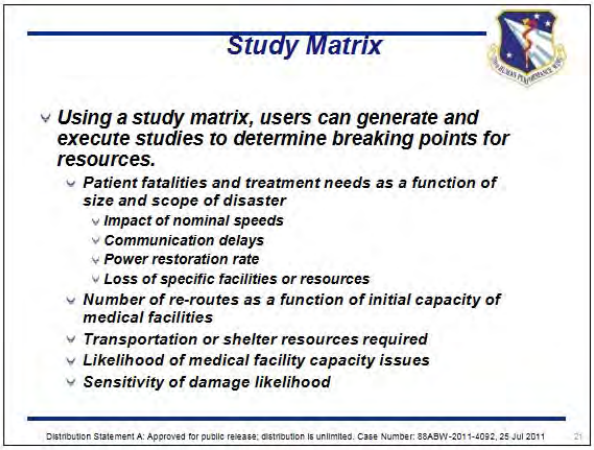
- *Two types of input:*
  - *Specific entity data*
    - *Population units (any geographic area were data are available)*
    - *Medical facilities (nursing, hospitals, dialysis centers)*
    - *Resources such as fire, rescue, public works, and buses*
  - *Run time user options*
    - *Disaster mechanism and damage likelihood control*
    - *Medical data*
      - Patient timelines
      - Initial conditions at medical facilities
    - *Parameters to control tactics, techniques, and procedures*

Control Your Simulation

- *User has substantial control to modify default values critical to simulation outcome.*
  - *Assets and timeline of "external" responders*
  - *Disaster damage likelihood*
  - *Medical need timeline for each patient type*
  - *Treatment times*
  - *Initial conditions (facility fullness, emergency rates)*
  - *Evacuation parameters (transportation needs)*
  - *Shift duration for fire/rescue resources*
  - *Power restoration timeline*
  - *Average transport speed*

Modeling Overview

- *Medical Facilities*
  - *Capacity to accept new patients*
  - *Treatment of current patients*
- *Fire/Ambulance Resources*
  - *Response to emergency calls*
  - *Transport patients, if applicable, to medical facility*
- *Patients*
  - *Many are self-moving and search out facilities to fill their specific medical needs*


Study Matrix
Using a study matrix, users can generate and execute studies to determine breaking points for resources.
Patient fatalities and treatment needs as a function of size and scope of disaster
Impact of nominal speeds
Communication delays
Power restoration rate
Loss of specific facilities or resources
Number of re-routes as a function of initial capacity of medical facilities
Transportation or shelter resources required
Likelihood of medical facility capacity issues
Sensitivity of damage likelihood
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You Won't Get There From Here Without Getting Them Here--AFMS Diabetes Care Quality Measurement

Ms Brooke Asbury, Office of the Chief Information Officer, Air Force Medical Support Agency

Initial work by the Air Force Medical Service (AFMS) Applied Clinical Epidemiology (ACE) team quantified the AFMS diabetic “enrolled but not seen” population to be 13% of the overall diabetic population. HEDIS® scores for the “not seen” population, defined here as diabetics having no MTF outpatient encounters in one year, are much lower than scores for those seeking MTF care. To further characterize diabetics “not seen,” ACE examined enrollment status, MTF characteristics, referral histories, and encounter/medication histories using AFMS clinical informatics data.

Seventy-five percent of diabetics “not seen” had TRICARE Plus or other health insurance vs. thirty-six percent of “seen” diabetics. Seventy percent of “not seen” diabetics had two or more billed network outpatient encounters for diabetes or had at least one diabetic network encounter plus medication(s). Similar proportions of those “seen” and “not seen” had emergency department visits, inpatient stays, and diabetes medication(s). Among those “not seen,” few referrals to the network (<2%) existed, and fewer MTF teleconsults were found vs. were found for diabetics “seen.”

Diabetics “not seen” obviously have proportionally higher utilization of and access to non-MTF care compared to “seen” diabetics based on enrollment status, low volume of referrals to network, and the high percentage having network bills. Most are obtaining diabetes care, though the quality of care received in the network is unclear. Across MTFs, HEDIS® scores trend upward as percentages of “not seen” and TRICARE Plus diabetics trend downward. Systematic efforts targeted to diabetics "not seen" are necessary to positively impact AFMS HEDIS® scores.

Headquarters U.S. Air Force

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AFMS Diabetes Care Quality

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Brooke L. Asbury, MPH
AFMSA/SG6H
02 August 2011
Version 1

Acknowledgements

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  - Col James Neville, AFMOA
  - Ms. Susan Chao, AFMSA/SG6H
  - Dr. Celan Alo, AFMSA/SG6H
- Referral data pull: Mr. Tino Moreno, AFMSA/SG6H

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Why we measure quality

- It is required by law
  - Section 723(e) of the National Defense Authorization Act for Fiscal Year 2000, Public Law 106-65
- From the Department of Defense Health Care Quality Report to Congress, 2010:
  - *"The MHS is committed to being patient centered and providing quality health care." (p. 4)*
  - *"On and off the battlefield, in times of peace and war, the MHS's goal is to ensure that the highest standard of care is delivered." (p. 1)*
  - *"…to enhance the quality of care provided at MTFs…payments for quality of clinical care are based on performance on HEDIS© and ORYX© measures." (p. xi)*

*HEDIS©: Healthcare Effectiveness Data and Information Set©

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How we measure and report quality

- Air Force Medical Support Agency (AFMSA/SG6H) produces selected clinical quality measures for DoD
- Measures are refreshed monthly on MHS Population Health Portal (MHSPHP)
- Action lists are provided for population health management
- Measures and lists are produced using HEDIS© methodologies
  - Include TRICARE Prime and Plus enrollees to Military Treatment Facilities (MTFs)
  - Use Administrative Specification only
  - Include several diabetes care measures
- DoD uses the National Committee for Quality Assurance's (NCQA) Commercial HMO benchmarks for comparison

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Diabetes care quality measures

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- Diabetics are identified through encounters and medications
- Lists are further refined using HEDIS© exclusion criteria
- Percentages of diabetics screened and "in control" are presented
  - Four measures for Hemoglobin A1C (HbA1c) screening/control
    - HbA1c screening in past year
    - HbA1c <= 9%, HbA1c <8%, HbA1c <7% (diabetics without selected comorbidities)
  - Two measures for Low Density Lipoprotein (LDL) screening/control
    - LDL screening in past year
    - LDL control (<100 mg/dL)

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Current performance— HbA1c Screening (Direct Care)

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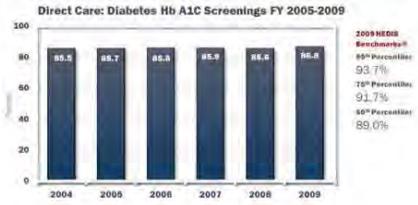

Source: DoD Health Care Quality Report to Congress, 2010

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Current performance— HbA1c Screening (USAF)

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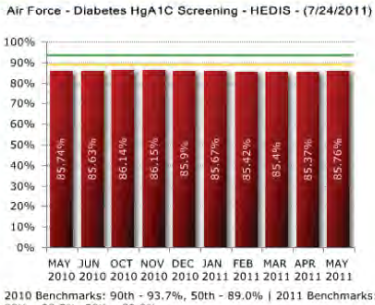

Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 93.7%, 50th - 89.0% | 2011 Benchmarks: 90th - 93.7%, 50th - 89.0%

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Current performance— HbA1c <= 9% (USAF)

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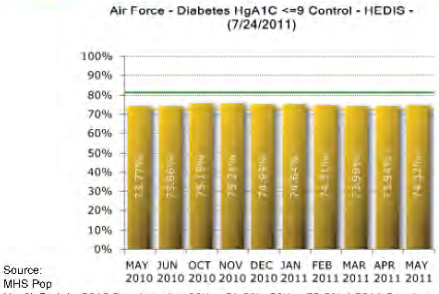

Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 81.3%, 50th - 72.2% | 2011 Benchmarks: 90th - 81.3%, 50th - 72.2%

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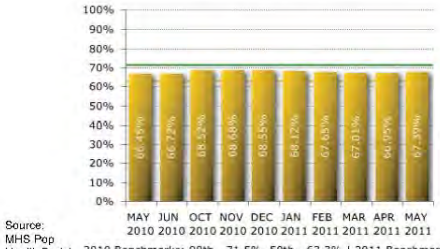
Current performance— HbA1c < 8% (USAF)

Air Force - Diabetes HgA1C <8 Good Control - HEDIS - (7/24/2011)



Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 71.5%, 50th - 63.3% | 2011 Benchmarks: 90th - 71.5%, 50th - 63.3%

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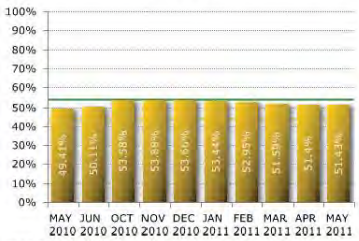
Current performance— HbA1c < 7% (USAF)

Air Force - Diabetes HgA1C <7 Good Ctrl no Comorb - HEDIS - (7/24/2011)



Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 54.3%, 50th - 43.7% | 2011 Benchmarks: 90th - 54.3%, 50th - 43.7%

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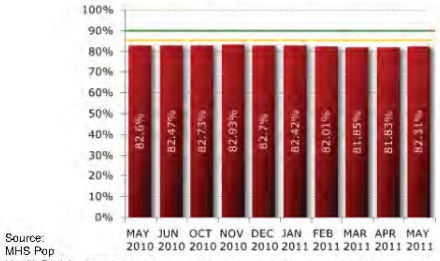
Current performance— LDL Screening (USAF)

Air Force - Diabetes LDL Screening - HEDIS - (7/24/2011)



Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 89.8%, 50th - 85.1% | 2011 Benchmarks: 90th - 89.8%, 50th - 85.1%

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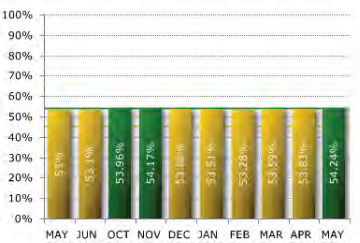
Current performance— LDL < 100 mg/dL (USAF)

Air Force - Diabetes LDL Control - HEDIS - (7/24/2011)



Source: MHS Pop Health Portal

2010 Benchmarks: 90th - 53.9%, 50th - 45.3% | 2011 Benchmarks: 90th - 53.9%, 50th - 45.3%

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Why are we not meeting targets?

- USAF is not reaching 50th percentile for screening measures
- Performing somewhat better on control measures
- Possible reasons for less than optimal performance
  - Appropriate care is not being delivered at recommended intervals by MTF providers
  - Diabetics are not compliant with diabetes care plan
  - DoD does not use Hybrid Specification for HEDIS® measures (i.e., no medical record review)
  - Administrative healthcare data for selected diabetics is not making it into DoD repositories

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Taking a closer look

- Air Force Medical Operations Agency (AFMOA) Applied Clinical Epidemiology (ACE)* team was created in 2010
  - Has medical oversight and direction of AFMOA
  - Has analytical expertise and informatics resources of AFMSA
- Issue of diabetes care quality met ACE investigative criteria
  - Important to leaders
  - Measurable
  - Data regarding diabetes care are obtainable
  - Presumably can be impacted by patient and provider actions
- Initial analysis stratified HbA1c and LDL outcomes for March 2010 AF MTF-enrolled diabetics by past year's visit histories

*In summer 2011, ACE was renamed "AF Clinical Decision Support" (AF CDS)

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Encounter histories shed some light…

	Overall AFMS	No DC encounter	DC but no PCM encounter	Any PCM encounter
Number of Adult diabetics	47,321	5,972 (12.6%)	7,090 (15.0%)	34,259 (72.4%)
Any A1c result	39,560 (83.6%)	1,782 (29.8%)	5,546 (78.2%)	32,232 (94.1%)
A1c <=9	33,277 (70.3%)	437 (7.3%)	4,459 (62.9%)	28,341 (82.8%)
A1c <7	22,247 (47.0%)	300 (5.0%)	2,952 (41.6%)	18,995 (55.4%)
LDL <100	24,759 (52.3%)	358 (6.0%)	3,294 (46.5%)	21,207 (61.6%)

-HEDIS definition diabetics as of 31 Mar 2010 (minus continuous enrollment criterion; >18 yrs of age)
-Outpatient encounters from Apr 09 – Mar 10 (12 months)
-HbA1c/LDL result on record (CHCS) OR Purchased Care "service date"; no data puts patient in "not controlled" category by rule
-"HEDIS-like" because the upper age limit of 75 and continuous enrollment criterion were not applied
-Source: AFMSA/SG6H Sept 2010

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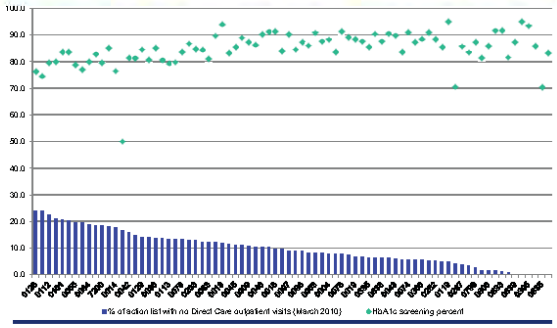
Does "enrolled but not seen" population vary across USAF?



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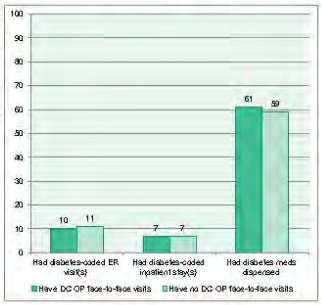
Are they sicker?

"Seen" vs. "Not Seen"

- Similar proportions had diabetes-related ER visits in past year
- Similar proportions had diabetes-related inpatient stays in past year
- Similar proportions were on diabetes medication



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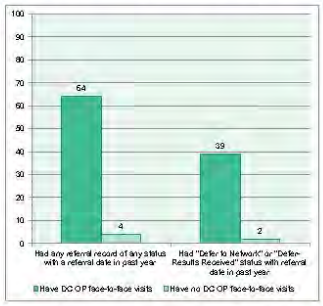
Are they being referred out for specialty care?

"Seen" vs. "Not Seen"

- "Seen" diabetics were much more likely to have referral records in the Referral Management System



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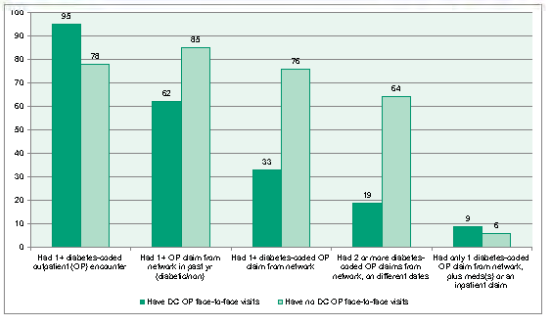
Are they obtaining care elsewhere?



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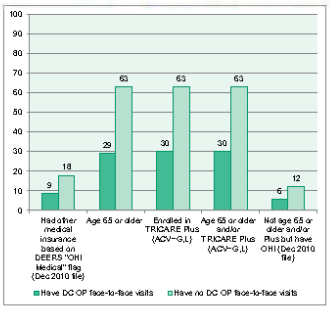
Are they different demographically?

"Seen" vs. "Not Seen"

"Not seen" twice as likely to:

- Have other medical insurance (OHI)
- Have TRICARE Plus and/or be age >= 65



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What's different about Plus?

- TRICARE Plus vs. TRICARE Prime
  - TRICARE Plus
    - Not a health plan
    - An "enrollment option" for Standard enrollees in order to receive same access standards as TRICARE Prime
    - Plus enrollees are assigned a Primary Care Manager (PCM)
    - Mainly beneficiaries age 65 and over
    - Access to MTF specialty care is not guaranteed
    - MTF not required to offer Plus

From TRICARE.mil website:
http://www.tricare.mil/mybenefit/home/overview/SpecialPrograms/Plus

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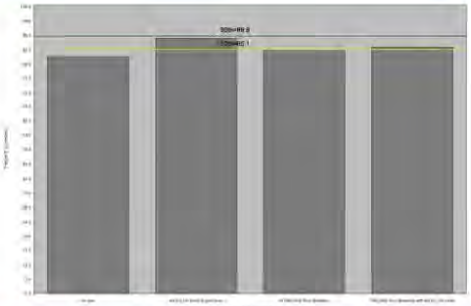
Impact—LDL screening



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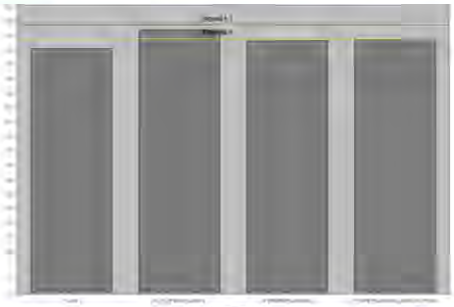
Impact—HbA1c screening



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What can be done?

- Acknowledge the impact of the "not seen" group on quality measures
  - Continue to provide care as usual
  - Enter outside data into medical record when available
- Bring all diabetics in for a visit with PCM each year and draw labs
- Monitor proportion "not seen" and their outcomes at Patient-Centered Medical Home MTFs to see if PCMH makes a difference
- Internally adjust by MTF proportion of "enrolled but not seen"
- Calculate lower "achievable" benchmarks
- Remove TRICARE Plus/OHI from denominators/numerators
- Politely ask the "not seen" to disenroll from MTF (?) if they are not seeking direct care

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Remaining challenges

- Complex policy issue for both DoD and MTF leadership
  - Difficult to determine how closely measures reflect actual clinical quality and how much importance to place on them
  - MTFs are resourced based on enrollment
- AFMSA/SG6H undergoing first HEDIS® compliance audit
- Still no requirement for network lab results to enter DoD repositories
- Difficult to make blanket decisions about "enrolled but not seen" population, as it is a somewhat heterogeneous group of enrollees

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Conclusion

- "Enrolled but not seen" diabetics will continue to prevent AFMS from reaching targets for diabetes care quality measures unless changes are made at multiple levels
  - Programs that use quality measures downstream of MHSPHP, like pay-for-performance initiatives, are also impacted
  - Policy changes most effective if enacted at DoD level
- Even after "not seen" were removed from March 2010 diabetes care HEDIS® measures, HbA1c screening remained under 90th percentile compared to Commercial HMOs
  - Still work to do among enrollees that visit direct care
  - USAF rates have been flat for years
- In the meantime, MTFs can use MHSPHP to assist with patient identification, disease management and quality assessment

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Contact Info

BROOKE L ASBURY, MPH
AFMS Office of the CIO (AFMSA/SG6H)
Sr Informaticist
3515 S General McMullen Suite 200
San Antonio, Texas 78226
COMM 210.395.9782
DSN 969.9782
Brooke.asbury.ctr@us.af.mil

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A Simulation-Based Program to Improve Non-technical Skills during Cardiopulmonary Resuscitation

CPT Albert Bonafacio, USAR, Patient Safety Center of Inquiry, Durham (NC) VAMC

Introduction: Sudden cardiac arrest is the leading cause of death in the United States. Code response training has traditionally focused on improving individual responders' technical skills and knowledge base. However, the impact of code response team performance, blending interpersonal and cognitive skills ("non-technical skills"), is increasingly recognized as critical for success in these scenarios. Since these skills are rarely evaluated, we developed a program for training and evaluating non-technical skills in code scenarios.

Methods: A high-fidelity, simulation-based program to improve non-technical skills among in-hospital code responders was implemented at a tertiary VA Medical Center. The Cardiopulmonary Resuscitation Team (CRT) program, comprised of three components (education, program evaluation, and quality improvement), was introduced to rotating departmental house staff over one year. Participants were oriented to code roles and responsibilities. Six times/month, 8-minute simulated arrest scenarios were conducted, followed by debriefing emphasizing communication/teamwork. Simulated code scenarios were videotaped and reviewed to evaluate CRT performance with respect to non-technical skills.

Results: Simulated code exercises were significantly improved with regard to task performance, communication, and organization, which has translated to more efficient "real-world" codes. Numerous parallel processes relevant to CRT performance (code cart organization, modified acquisition/delivery of laboratory samples, code documentation) have been improved and applied to actual clinical events.

Conclusions: Non-technical skills are essential to successful resuscitation efforts. The CRT program used high-fidelity simulation to enhance and maintain non-technical skills among in-hospital cardiac arrest responders. Comparison of pre- and post-implementation in-hospital cardiac arrest mortality data will be evaluated to further assess program effectiveness

[No Presentation Slides Follow}

Utilization of a Prescreening Instrument for the Selection of Special Duty Personnel

Dr. Joe Wood, III, 711 HPW/USAFSAM-FEC WPAFB OH

Selecting the highest caliber personnel for Air Force special duty assignment is crucial for reducing training attrition, increasing retention, and improving operations critical to national security mission readiness and completion. The procedures for assessment and selection of special duty personnel can be a time-consuming and expensive process. However, utilizing an empirically validated prescreening instrument can be one of the more cost-effective methods of refining the applicant pool prior to an in-person assessment and selection (A&S), thus avoiding the costs associated with travel, lodging, and lost time on the job for the applicant in addition to reducing the resources needed by staff at the A&S.

This study evaluated the usefulness of an empirically validated "select out" web-based prescreening instrument assessing medical, psychological, and interpersonal aspects of functioning. Out of the 1100+ potential applicants who completed the prescreen survey between 2005 and 2009, approximately 52% were identified as having concerning information affecting their fitness and suitability for a high-demand, high-risk special duty career field. In total, 78% of those flagged were eliminated from consideration after additional review by unit leadership. These eliminations are estimated to have provided savings of more than $200,000 per year. Additionally, the use of the instrument has significantly improved (a) the quality of the pool of applicants invited to attend A&S and (b) our understanding of the prerequisites needed to successfully adapt to the training and operational rigors of a special duty assignment.

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Utilization of a Prescreening Instrument for the Selection of Special Duty Personnel

Joe Wood III, PsyD
Eagle Applied Sciences
Aeromedical Consultation Service
USAF School of Aerospace Medicine

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Overview

- History of assessment & selection (A&S)
- Description of special duty program
- Characteristics of screening instrument
- Benefits/cost-savings of prescreen

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History of A&S

- World War I
  - Army Alpha & Beta tests
    - Screened 1-2 million soldiers
    - Aptitude test for job placement
    - Army Alpha & Beta tests
- The most prominent industry of Minneapolis is:
  - A. Flour
  - B. Packing
  - C. Automobiles
  - D. Brewing
- It is better to fight than run because:
  - A. Cowards are shot
  - B. It is more honorable
  - C. If you run you may get shot in the back

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History of A&S

- Office of Strategic Services (OSS)
  - Precursor to the CIA
  - Screened for intelligence and training
  - No testing for emotional/social attributes
  - Problems with field agents having nervous breakdowns

History of A&S

- **Office of Strategic Services (OSS)**
  - 1st formal attempt at A&S for special duty personnel
  - Selection run by clinical psychologists & psychiatrists
  - Evaluated 5,391 recruits from 1943-1947
  - 1st attempt at comprehensive A&S
    - Intelligence testing
    - Psychological testing
    - Field testing
    - Motivation

Moe Berg
.243 lifetime avg.
Catcher for Red Sox

Also, OSS superspy who spoke 10 languages

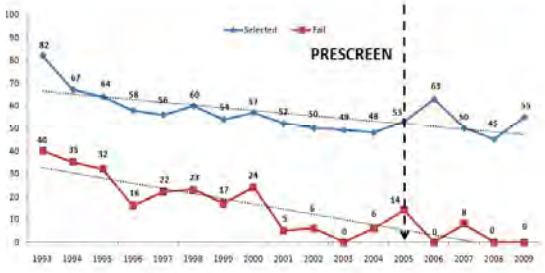
History of A&S

- **NASA select-in criteria**
  - Ability
    - Intelligence
    - Leadership
    - Stress tolerance
    - Flexibility
  - Stability
    - Hardiness
    - Ability to form stable relationships
    - Expressivity
    - Assertiveness
    - Sense of humor/cultural sensitivity
  - Motivation
    - Mastery
    - Work orientation
    - Competitiveness
    - Extrinsic motivation

Special Duty Program

- Structured A&S began in 1993
  - Prior: Informal interviews; by-name recommendation
- First research funds in 2001 (5 phases through 2010)
- GOALS:
  - Validate (fairness/accuracy)–Does it work? How do you know?
  - Determine psychological mission requirements that predict success (and failure) and use to screen and select.
  - Metrics-based selection decisions allow flexibility for changing mission conditions.

Prescreen Implemented 2005



Prescreen "Select Out" Variables

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- Substance Abuse Issues (self or family)
- Previous Suicide Attempts
- Poor Marriage Quality
- Nightmares
- Concerns about Past Performance Ratings
- Family Member with Needs/Problems
- Anger Issues
- Takes Tranquilizers or Anti-Depressants
- Sleep Problems
- Dependent with Medical Issues
- Financial Difficulties
- Problems with the Law
- Mental Health Issues (self or family)
- Failed to Complete a Military Course
- Letter of Counseling/Reprimand, Article 15, or Court Martial

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Prescreen Cost Savings 2005-Present

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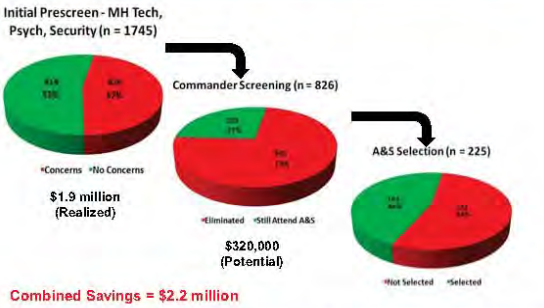

Combined Savings = $2.2 million

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Summary

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- *Prescreen Benefits*
  - *Empirically validated*
  - *Consistent with research*
  - *Improved selection of special duty personnel*
  - *Cost savings*
- *Applications*
  - *Use in other A&S programs*
  - *Use in selection of high-risk operational personnel (i.e., remotely piloted aircraft operators)*

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Questions?

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Newly dedicated USAFSAM facility

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Benefits of Operational Testing and Why it's Important

Maj Charles Morris & Maj James Weinstein, AF Medical Evaluation Support Activity

Educate AFMS personnel on the importance of Operational Testing of medical equipment and systems (i.e. UTCs).

The Air Force Medical Evaluation Support Activity is charged with conducting Operational Test and Evaluation (OT&E) of medical and IM/IT equipment, and systems by the Air Force Surgeon General. AFMESA is the AF's premier medical operational test activity. AFMESA testing expertise has drawn the attention of other DoD components, and government agencies. This briefing will explain how AFMESA conducts OT&E, why it is necessary, how it differs from developmental testing and current trends in DoD acquisition that are driving changes to test processes. The presentation will conclude with a review of recent test programs highlighting the breadth of testing environments, scope of testing, and our numerous test customers.

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Operational Testing in Medical Acquisition

Maj Charles Morris
AFMSA / SG5T

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Agenda

- Definition of Test / What is Test
- Where Test fits into Acquisitions
- Difference between Developmental Testing and Operational Testing
- AFMESA:
  - Mission/Org
  - AFMESA Advantage
  - Authority
  - Current AFMESA Customers
- AFMESA Operational Testing Support
- Upcoming / Current Activities
- Bottom Line

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Testing Defined

- **Definition of Testing**
  - Testing is the process of examining and operating a system or systems with the intent of finding problems
- **DOD and Service Instructions state that operational testing will test a product for effectiveness, suitability, and survivability**
  - The actual system elements of what fits into each of these metrics are application and system dependent
  - The test methods used to test each of these metrics are also application and system dependent

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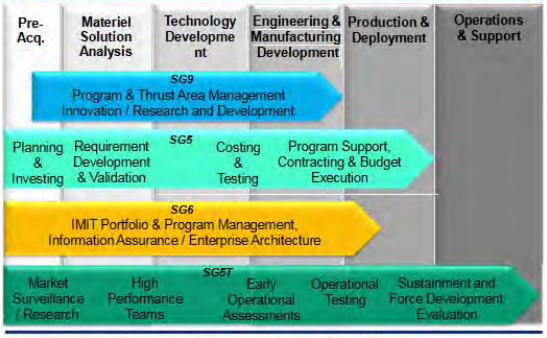
Testing – Where We Fit in the Acquisitions Framework for Modernization



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DT (PMO) vs. OT (AFMESA)

Developmental Testing	Operational Testing
Controlled by Program Manager	Controlled by Independent Tester
One – One Test	One, Two, or Many Tests
Controlled Environment	Realistic Operational Scenario
Trained, Experienced Operators	Users Recently Trained on Equipment
Precise Performance Objectives and Threshold Measurement	Performance Measurement of Operational Effectiveness and Suitability
Test to Specification	Test to Requirements
Development Test Article	Production Ready Product

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What is Tested

- On a broad scale, operational testing focuses on testing and measuring a product's:
  - Availability
  - Compatibility
  - Learnability
  - Portability
  - Reliability
  - Supportability
  - Suitability
  - Capability
  - Interoperability
  - Maintainability
  - Recoverability
  - Usability
  - Survivability

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Report of the Defense Science Board Task Force on DT&E

- Findings
  - IOT&E failure rate (50%) suggest deficiencies in DT&E processes
  - Suitability failures are increasing
- Recommendations
  - Integrate RAM in system development, as a contractual requirement
  - Improve gov't involvement & oversight in DT – access to test data
  - Address RAM at OTRR
  - Integrated DT/OT to share resources and data
  - Perform detailed risk assessment with COTS products
- Recent DOT&E memorandum on RAM stresses similar issues
  - Improved RAM decreases Life Cycle Costs and reduces demand on logistics systems

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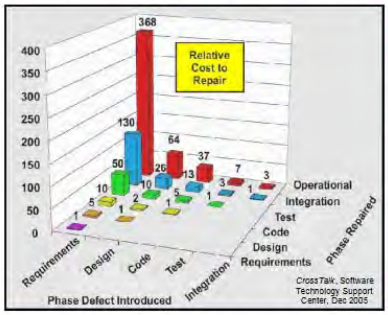
Relative Cost of Software Fault Propagation



Finding and fixing software defects early is absolutely imperative!

- As shown an error introduced in the Requirements phase but not found until Deployment can cost 368X the cost to fix had it had been found in the Requirements phase
- If found in the Test phase, the same error only costs 50X the cost to repair

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AFMSA/SG5T Mission
To Advance Air Force Healthcare Through Rapid Independent Operational Testing of Medical Technologies and Information Systems
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Site Overview
Only Dedicated Medical Operational Testing (OT) Organization in the AFMS
Stood up 2001 per AF/SG
Fully functional EMEDS +10
31 Personnel
Key Staff
Chief – Maj James Weinstein
DO – Mr. Jim Sylvester
Superintendent – SMSgt Jason Read
GSU Operation
Fort Detrick, MD: Medical Systems, Equipment, UTCs
Port San Antonio, TX: IM/IT Systems
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AFMESA / AFMISTB
Two DoD-Unique Sites
Ft Detrick Test Site
Established in 2002
14 Acres, 44,000 ft² Test Pad
EMEDS +10 / Patient Staging UTC
Biomedical Equipment Testing Facility
Unique Personnel Mix
Medical Information Systems Test Bed, Port San Antonio
Established in 2005
DIACAP Certificate in Late June
OT w/o Borders, Secured Dedicated VPN
TATRC CDE Capability in 2012
Able to Test Systems Before Going Live
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AFMESA Advantage
Aeromedical Evacuation
Nursing
Combat Casualty Care / Expeditionary Medicine
Medical CBRN
Flight Medicine
Family Practice
Occupational Health
Nutritional Medicine
CLINICAL
ENGINEERING
Biomedical Equipment Tech
Electrical Engineers
Mechanical Engineers
IM/IT
LOGISTICS/ OPERATIONS
Medical IM/IT Healthcare Informatics
Communications and Telemedicine
Distance Learning / CBT
Education and Training
Medical Logistics
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Current AFMESA Customers

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AFMESA Tests Throughout the AF and DoD Acquisition Process

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Market Research-- Early OT Involvement

- Collect and Analyze Information about Capabilities within the Market to Satisfy Customer Requirements and Needs
- Two Main Activities
  - Market Surveillance (Practices, Trends, Technology Development)
    - Quick Look, Strategic View
  - Market Investigation (In-Depth Research, Requires a Team Approach)
    - In-depth Look, Tactical View

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Operational Testing: AFSOC Support

Joint Medical Distant Support and Evacuation (JMDSE) JCTD Support

- Airdrop of critical combat casualty care support packages
- In line with AFs Joint Precision Airdrop System (JPADS) program
- New Development and Concept
  - Micro Package – 500 lbs
  - Ultra Package – 250 lbs
  - 72 hours Life Sustaining
  - Different Configurations
  - Within 50 Meters

EXPEDITIONARY MEDICINE

Multi-Lingual Interface Device

- Language and Dialect
- Do's / Don'ts for patient culture
- Patient inputs symptoms / history

EXPEDITIONARY MEDICINE

CASEVAC Electrical Power Demand

- Man-portable alternate power sources
- To support forward combat to hospital/transport

EXPEDITIONARY MEDICINE

Taking Medical Innovations From Concept To Field

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Bottom Line

- Unique Personnel Mix and Medical Experiences
  - Easier to Make Testers Than Clinicians
- Independent and Rapid
- Test Early and Often
- Focus on Reliability, Availability, Maintainability, Sustainability, and Life Cycle Management
  - Supporting sustainability and maintainability (better products at lower cost)---the Return on Investment (ROI) for engaging test
- The Key for a Successful Transition from Testing to Field is Training and Technology Adoption

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Message From the Boss

AFMESA provides the Air Force Medical Service, DoD, and our Joint partners with world class operational testing and evaluation capabilities. This critical asset is a force enabler and a powerful risk management tool. Test is the conscience of acquisition – the final arbiter of truth – did we build the right thing for our warfighters?

-Brig Gen James Carroll, AFMSA/CC

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Operational Testing – "The Right Stuff"

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Questions

AFMESA Contact Information
http://afmesa.ft-detrick.af.mil
DSN 343-8600

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