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Measuring and Optimizing Medical Force Readiness (Conference Presentation)

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Executive Summary

This briefing summarizes IDA's work on medical force readiness. IDA used theater diagnosis and procedure data to identify essential medical capabilities, and military treatment facility (MTF) data to develop workload benchmarks. Based on these benchmarks, IDA found that MTFs generate a limited readiness-relevant workload for the medical force. The Department of Defense can boost medical force readiness by increasing its role in the civilian trauma system and by expanding the reserve component (RC). Opportunities with the civilian trauma system vary by MTF and must be navigated on a case-by-case basis. Expanding the RC is a way to circumvent workload limitations, but yields diminishing returns to force readiness on a large scale. Addressing limitations to medical force readiness will require a combination of solutions.

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Measuring and Optimizing Medical Force Readiness

James Bishop

15 Aug 2019

We have addressed three research questions:

How should DoD measure medical force readiness?

What is the current state of medical force readiness?

How can DoD improve medical force readiness?

We have publicly available answers to each question:

How should DoD measure medical force readiness?

By volume of procedures related to severe, complex diagnoses common in theater

What is the current state of medical force readiness?

Heavily limited by military treatment facility (MTF) workload and case mix

How can DoD improve medical force readiness?

Treat civilian patients inside or outside MTFs

Expand the reserve component (RC)

Essential medical capabilities measure readiness

The Military Compensation and Retirement Modernization Commission (MCRMC) made 15 recommendations.

Recommendation 5: "Ensure Service members receive the best possible combat casualty care by creating… **new standards for essential medical capabilities.**" (EMCs)

The MCRMC defined EMCs as "a limited number of critical medical capabilities that must be retained within the military for national security purposes."

The MCRMR asked IDA to develop EMCs.

We used theater data to develop EMCs

The DoD Trauma Registry and Theater Medical Data Store allowed us to answer:

What are the most common diagnoses/conditions requiring life-saving care?

What skills/procedures are used to treat these conditions?

Theater and direct care case mixes are very different

Top 10 Inpatient Diagnosis Group Ranks and Frequencies in Iraq vs. Military Hospitals

CCS Diagnosis Group	In-Theater Rank (Frequency)	Direct Care Rank (Frequency)
Open wounds of head, neck, and trunk	1 (3,488)	143 (1,225)
Open wounds of extremities	2 (2,650)	146 (1,196)
Other injuries and conditions due to external causes	3 (2,274)	67 (4,190)
Fracture of lower limb	4 (992)	116 (1,969)
Nonspecific chest pain	5 (986)	**40 (8,139)**
Abdominal pain	6 (683)	75 (3,544)
Crushing injury or internal injury	7 (589)	139 (1,273)
Fracture of upper limb	8 (563)	125 (1,702)
Skin and subcutaneous tissue infections	9 (543)	59 (4,932)
Burns	10 (528)	101 (2,299)

Sources: Theater Medical Data Store (in-theater) and M2 (direct care). Iraq data are from 2007 and direct care data are from 2015.

MTFs provide insufficient inpatient workload for medical personnel to maintain critical life-saving skills

Theater data connected major diagnoses to procedures

Restricted to procedures performed at least 10 times in Iraq in 2007

Top 10 Candidate Trauma Procedures by Volume

Procedure	Frequency
Other diagnostic procedures on brain and cerebral meninges	115
Other craniectomy	88
Excisional debridement of wound, infection, or burn	77
Elevation of skull fracture fragments	76
Exploratory laparotomy	75
Fasciotomy	63
Delayed closure of granulating abdominal wound	49
Suture of laceration of diaphragm	47
Closure of laceration of liver	47
Exploratory thoracotomy	44
Other repair of cerebral meninges	44

Source: DoD Trauma Registry

Readiness means practicing these

...

We developed workload benchmarks

We established (sub)specialty-level workload volume benchmarks (not standards)

Benchmarks were median procedures performed among providers at San Antonio Military Medical Center (SAMMC)

We then compared the benchmarks to the mean workload per provider across the Military Health System (MHS)

The workload gap is large

We estimated that the current MHS workload supports **less than 30 percent** of surgical specialists.

- EMC benchmark: 14 percent
- Major Trauma benchmark: 28 percent

MHS-Wide Major Trauma Workload Gaps

Provider Specialty	Provider Subspecialty	Provider Full-time Equivalents (FTEs)	Supported Providers	Gap
Anesthesiology	Anesthesiology	104.8	11.1	**93.7**
Anesthesiology	Critical Care Medicine	7.2	4.5	**2.7**
Dentist	Oral and Maxillofacial Surgery	48.2	29.3	**18.9**
Neurological Surgery	Neurological Surgery	30.2	17.0	**13.2**
Ophthalmology	Ophthalmology	50.3	43.0	**7.3**
Orthopedic Surgery	Orthopedic Surgery	192.7	46.8	**145.9**

We identified three options for closing the gap:

1. Upgrade some DoD hospitals to trauma centers
2. Form joint military-civilian (JMC) trauma centers
3. Place military providers in civilian-run trauma centers

All strategies involve **increasing DoD's role in the civilian trauma system**

Optimal solution likely would employ a **mixture** of these strategies across different market areas

Option 1: Stand-alone DoD trauma centers

Benefits

- Deployment Speed and Flexibility
- Research and Training
- Military Culture

Challenges

- Patient Regulation
- Billing
- Deployment Risk
- Security

Option 2: JMC trauma centers

Benefits

- For Military: Clinical skill maintenance, access to case mix in markets with robust civilian infrastructure, lower costs, recruitment/retention
- For Civilian Partners: Financial benefits, staffing key specialist vacancies
- For Local Trauma Patients: Improved access to care
- Additional Shared Benefits: Sharing of knowledge, access to state and local funding

Challenges

- Reimbursement and Billing
- Licensing
- Credentialing/Privileging
- Malpractice
- Personnel Matters
- Deployment Risk

Option 3: Military personnel in civilian facilities

Benefits

- For Military: Clinical skill maintenance, flexibility, recruitment/retention, cost savings
- For Civilian Partners: Reduced personnel costs, staffing hard-to-fill vacancies, learning

Challenges

- Same challenges as JMC trauma centers
- Loss of military culture
- Difference in enlisted military and civilian occupations

We chose criteria for evaluating options:

Facility size and volume

- Computed facility size (beds) distribution for Level I and II trauma centers in the U.S.
- Minimum facility size is about 100 beds

Local demand for trauma care

- Area population data
- Local injury data

Local supply of trauma care

- Current civilian infrastructure
- American College of Surgeons (ACS) guideline: 1-2 high-level trauma centers for every 1M residents

12 MTFs were large enough for option 1 or 2

Only 12 MTFs pass initial size filter

Facility	Bed Count	ADPL
San Antonio MMC (LI)	425	254
NMC San Diego	285	162
NMC Portsmouth	274	148
Walter Reed National MMC (LII)	247	168
Madigan AMC (LII)	227	130
William Beaumont AMC (LIII)	209	71
Tripler AMC	194	134
Womack AMC	156	79
NH Camp Lejeune	117	47
David Grant USAF Medical Center	116	63
Carl R. Darnall AMC (LIII)	109	62
Dwight D. Eisenhower AMC	107	63

ADPL=Average Daily Patient Load

Facilities that don't pass the filter are all candidates for option 3

Fayetteville, NC presents an exemplary opportunity

Womack Army Medical Center, Fayetteville, NC

156 beds

ADPL 79 (51% occupancy)

5% of workload classified as trauma

30 civilian emergency cases in FY 2015 (<1% of inpatient)

Surgical staff includes most specialties

Runs multiple graduate medical education (GME) programs (including Oral and Maxillofacial Surgery (OMFS))

10 miles from Level III trauma center – Cape Fear Valley Medical Center (CFVMS)

- > 1,500 trauma admissions in 2016 (Level I requirement = 1,200)
- Could be Level II but lacks required specialists, including OMFS
- Head of Womack's orthopedic department works at CFVMC one day a week

Upgrading MTFs can help close the workload gap

What if each partnership or stand-alone facility could support their providers at the same level as SAMMC?

Moves MHS from being able to support 21 orthopedic surgeons to 46 with major trauma workload

Example: Orthopedic Surgery (Major Trauma Benchmark)

Facility	FTE	Supported	Percent Supported	Supported (at SAMMC level)
SAMMC	**26.5**	**14.7**	**55%**	N/A
TRAVIS	2.0	0.4	18%	1.1
NMC SAN DIEGO	19.3	4.6	24%	10.7
EISENHOWER AMC	7.2	4.3	59%	4.0
TRIPLER AMC	2.4	0.7	29%	1.3
WALTER REED NMC	18.6	5.9	32%	10.3
WOMACK AMC	4.0	0.4	10%	2.2
NH CAMP LEJEUNE	6.0	0.4	6%	3.3
WILLIAM BEAUMONT	6.6	1.0	15%	3.6
DARNALL AMC	4.0	0.4	10%	2.2
NMC PORTSMOUTH	8.0	1.4	18%	4.4
MADIGAN AMC	4.8	1.6	33%	2.6
Total	82.8	21.0		45.8

Upgrading MTFs cannot close the workload gap alone

Assume DoD invests in all 11 facilities (Tier I, II, & III) **and** that the investment in each facility allows it to support 5, 10, or 15% more providers than they currently have at SAMMC level

Workload Gap Improvement by Provider Increase

Provider Increase	Current Gap	New Gap	Gain in Supported Providers	% of MHS Providers Supported
EMC-Based Benchmark				
5%	557.6	470.6	**87.0**	27.5%
10%	557.6	464.6	**93.0**	28.4%
15%	557.6	458.7	**98.9**	29.4%
Major Trauma-Based Benchmark				
5%	605.3	459.8	**145.5**	45.5%
10%	605.3	448.2	**157.1**	46.9%
15%	605.3	436.6	**168.7**	48.2%

The workload gap impacts force readiness

Force readiness is the ability to meet demands for ready providers over time

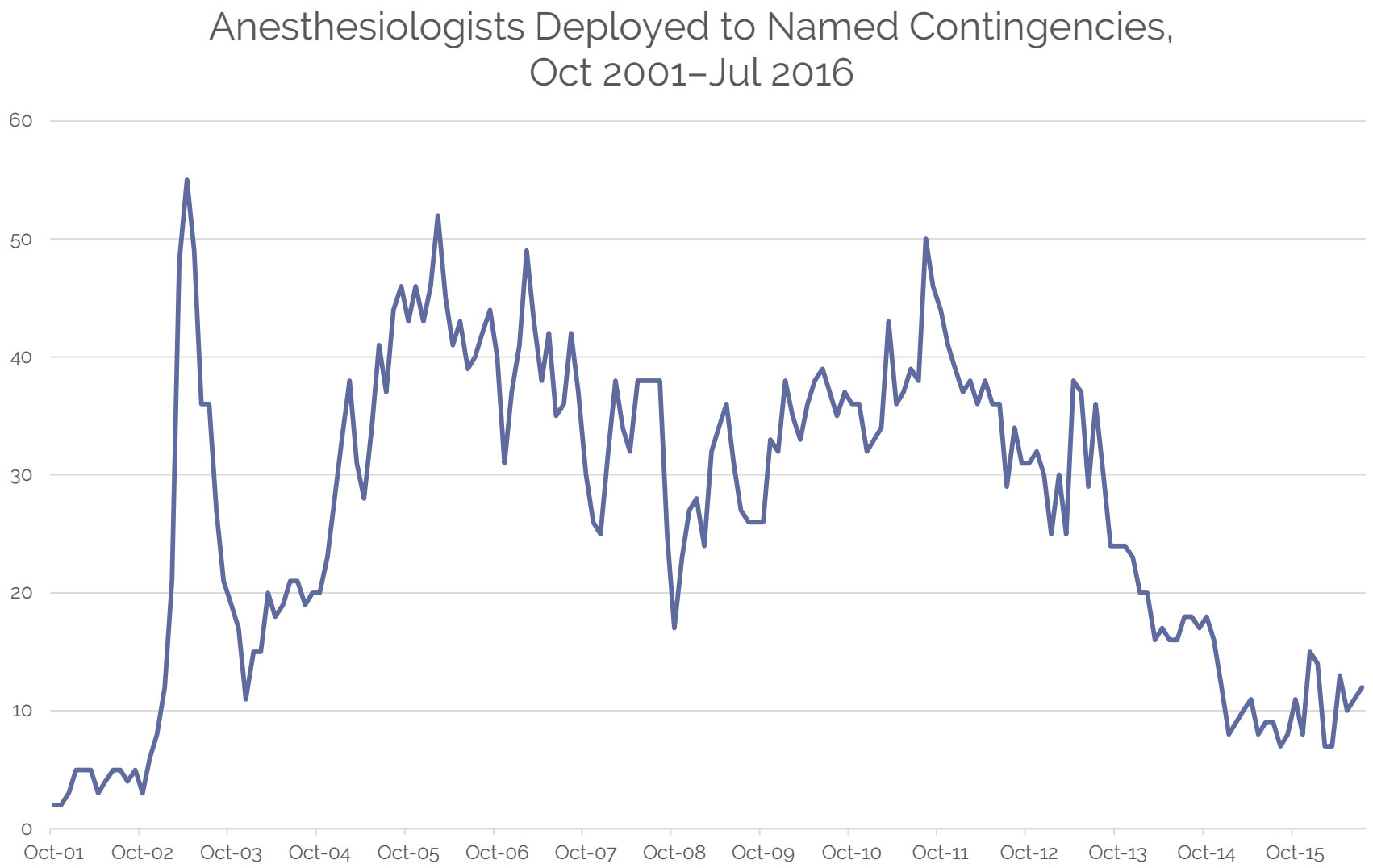
- Depends on current policies for rotation, timing, etc.

What demands? We used Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) deployment data:

- Metric is “how many OIF/OEF war fights could be supported”

MHS workload caps the number of active component (AC) providers that can be kept ready; reservists are not capped

We used deployment time series as demand cases



The force readiness gap is large but addressable

The current force could meet 2.22 times the deployment demands of OIF/OEF *if MTFs could keep all AC personnel ready*

After accounting for limited MTF workload, this “force readiness factor” is 0.71

Expanding the RC would increase the force readiness factor but also increase cost

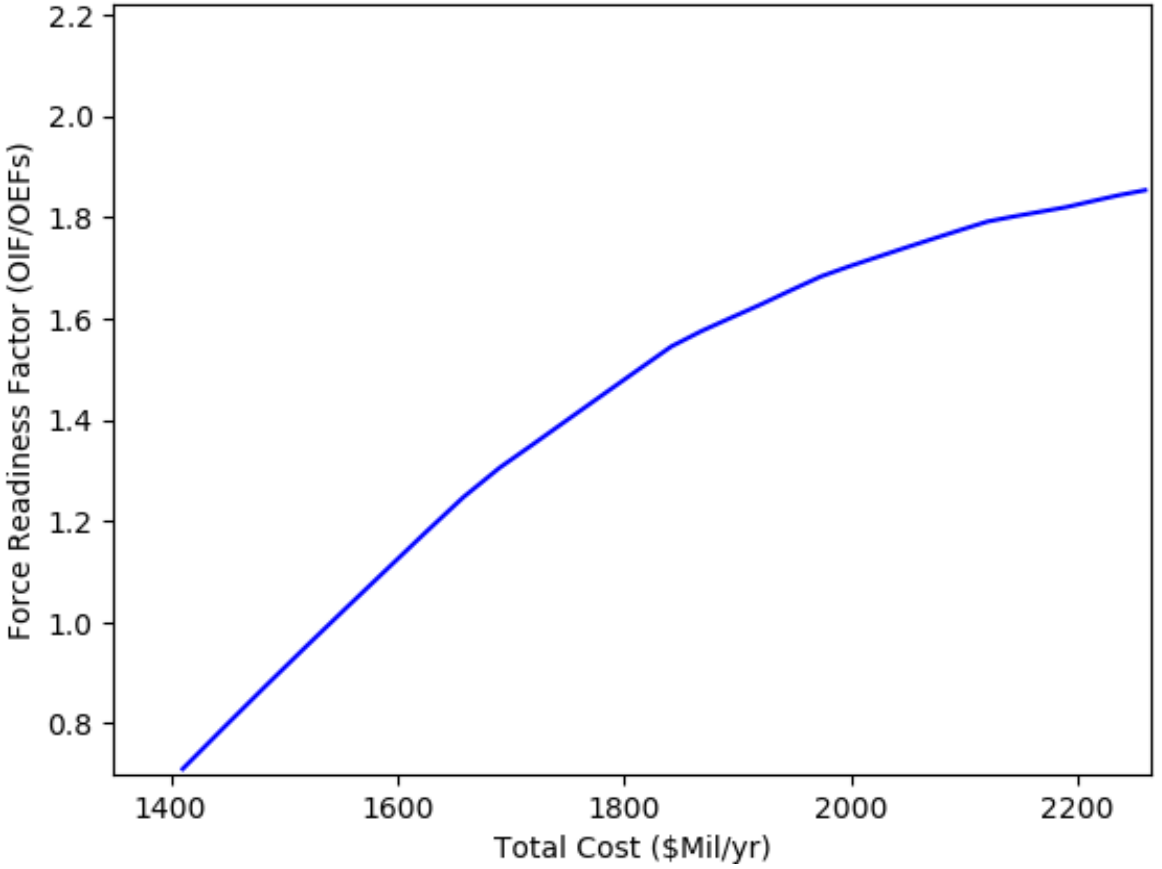
Introducing alternative force mix options reduces the cost of meeting a given force readiness factor

RC expansion increases force readiness and cost

Expanding RC (by up to 600%) increases force readiness and cost

Diminishing returns to readiness as RC expands

Reaching >2 OIF/OEFs with current force options is impractical



We designed and evaluated alternative force mixes

Current options for sourcing a medical force requirement:

- AC in MTF (with current workload availability)
- RC under current contract conditions

Alternative set of force mix options for sourcing a requirement:

- AC in MTFs that received investments to establish trauma centers
- AC in civilian trauma centers
- RC with traditional drill/deployment requirements plus readiness evaluation/requirements
- Strategic RC – minimal drilling, only mobilized in extreme cases

What is the least expensive combination of these options that can meet 2.22 OIF/OEFs?

The RC is a large share of the cost-optimal ready force

Occupation	AC in MTF	AC in Civilian Center	Operational RC	Strategic RC	Total Cost ($Mil/yr)
Anesthesiology	41	165	588	77	360.2
Cardiac/Thoracic Surgery	10	6	37	17	28.5
Emergency Medicine	167	157	973	235	511.9
General Surgery	119	126	923	102	503.2
Neurological Surgery	35	8	63	17	51.9
Oral Maxillofacial Surgery	59	34	262	71	172
Orthopedic Surgery	145	69	609	102	448.3
Peripheral Vascular Surgery	13	1	50	19	37.2
Total	589	566	3506	640	2113.2

Our work is in three publicly available IDA papers:

Essential Medical Capabilities and Medical Readiness (2016)

Medical Readiness within Inpatient Platforms (2017)

Medical Total Force Management: Assessing Readiness and Cost (2018)

Each can be found through the “Research and Publications” tab at www.ida.org

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14. ABSTRACT

The Institute for Defense Analyses has answered three questions in the domain of medical force readiness: (1) how should the Department of Defense (DoD) measure force readiness?; (2) what is the current state of medical force readiness?; and (3) how can DoD improve medical force readiness? DoD should measure medical force readiness by volume of procedures related to severe, complex diagnoses common in theater. Medical force readiness is heavily limited by military treatment facility workload, and can be improved by treating more civilian patients and expanding the reserve component.

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