Supporting Returning Combat Veterans: An OEM Model of Care

Stephen C Hunt MD MPH
National Director, Post-Deployment Integrated Care Initiative
Chief Consultant, Deployment Health Clinic
VA Puget Sound Health Care System

Research in Progress
Stanford October 12, 2010
During the 5600 years of recorded human history…

…there have been 14,600 wars reported…

2-3 wars/year.

- A Terrible Love of War by James Hillman
# Health Concerns of US Military Veterans
(190 years at war)

<table>
<thead>
<tr>
<th>War</th>
<th>Deaths</th>
<th>Wounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Revolution (1775-1783)</td>
<td>4,435</td>
<td>6,188</td>
</tr>
<tr>
<td>War of 1812 (1812-1815)</td>
<td>2,260</td>
<td>4,505</td>
</tr>
<tr>
<td>Indian Wars (approx. 1817-1898)</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Mexican War (1846-1848)</td>
<td>1,733</td>
<td>4152</td>
</tr>
<tr>
<td>Civil War (1861-1865)</td>
<td>298,621</td>
<td>400,000</td>
</tr>
<tr>
<td>Spanish-American War (1898-1902)</td>
<td>385</td>
<td>1662</td>
</tr>
<tr>
<td>World War I (1917-1918)</td>
<td>53,402</td>
<td>204,002</td>
</tr>
<tr>
<td>World War II (1941-1945)</td>
<td>291,557</td>
<td>671,846</td>
</tr>
<tr>
<td>Korean War (1950-1953)</td>
<td>33,741</td>
<td>103,284</td>
</tr>
<tr>
<td>Vietnam War (1964-1975)</td>
<td>47,424</td>
<td>53,303</td>
</tr>
<tr>
<td>Gulf War I (1990-1991)</td>
<td>147</td>
<td>467</td>
</tr>
<tr>
<td>Iraq/Afghanistan (2003-present)</td>
<td>5,637</td>
<td>30,182</td>
</tr>
<tr>
<td></td>
<td>740, 342</td>
<td></td>
</tr>
</tbody>
</table>
# Health Concerns of US Military Veterans

## America’s Wars Total (1775 -2010)

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Military Service during Wartime</td>
<td>41,891,368</td>
</tr>
<tr>
<td>Battle Deaths</td>
<td>656,465</td>
</tr>
<tr>
<td>Other Deaths (In Theater)</td>
<td>308,797</td>
</tr>
<tr>
<td>Other Deaths in Service (Non-Theater)</td>
<td>230,279</td>
</tr>
<tr>
<td>Non-mortal Woundings</td>
<td>1,431,290</td>
</tr>
<tr>
<td>Living War Veterans</td>
<td>17,484,000</td>
</tr>
<tr>
<td>Living Veterans (Periods of War &amp; Peace)</td>
<td>23,532,000</td>
</tr>
</tbody>
</table>

2793 deaths/year  
6090 wounded/year
Increasing rates of morbidity in military combat personnel:

% of Battle Wounded Who Die

Civil War: 50%
WWII: 30%
Vietnam: 24%
Iraq/Afghanistan: 10%

<table>
<thead>
<tr>
<th>Conflict</th>
<th>Wounded : Kill Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEF/OIF</td>
<td>16 : 1</td>
</tr>
<tr>
<td>DESERT STORM</td>
<td>1.2 : 1</td>
</tr>
<tr>
<td>VIETNAM</td>
<td>2.6 : 1</td>
</tr>
<tr>
<td>KOREAN</td>
<td>2.8 : 1</td>
</tr>
<tr>
<td>WWI / WWII</td>
<td>&lt; 2 : 1</td>
</tr>
<tr>
<td>CIVIL WAR, 1812,</td>
<td>&lt;0.7:1</td>
</tr>
<tr>
<td>REVOLUTION</td>
<td></td>
</tr>
</tbody>
</table>
### Most Common Service Connected Conditions in Veterans

**All Veterans**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scars</td>
<td>4.5%</td>
</tr>
<tr>
<td>2. Skeletal</td>
<td>4.1%</td>
</tr>
<tr>
<td>3. Knee</td>
<td>3.6%</td>
</tr>
<tr>
<td>4. Arthritis due to trauma</td>
<td>3.5%</td>
</tr>
<tr>
<td>5. Tinnitus</td>
<td>3.1%</td>
</tr>
<tr>
<td>6. Hearing loss</td>
<td>3.1%</td>
</tr>
<tr>
<td>7. LS strain</td>
<td>2.9%</td>
</tr>
<tr>
<td>8. PTSD</td>
<td>2.6%</td>
</tr>
<tr>
<td>9. Hypertension</td>
<td>2.5%</td>
</tr>
<tr>
<td>10. DDD</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
# Most Common Service Connected Conditions in Veterans

## Peacetime Era Veterans

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knee</td>
<td>5.4%</td>
</tr>
<tr>
<td>2. Skeletal</td>
<td>5.2%</td>
</tr>
<tr>
<td>3. Arthritis due to trauma</td>
<td>3.9%</td>
</tr>
<tr>
<td>4. Scars</td>
<td>3.8%</td>
</tr>
<tr>
<td>5. LS strain</td>
<td>3.6%</td>
</tr>
<tr>
<td>6. Hypertension</td>
<td>3.3%</td>
</tr>
<tr>
<td>7. Hearing loss</td>
<td>3.2%</td>
</tr>
<tr>
<td>8. DDD</td>
<td>2.9%</td>
</tr>
<tr>
<td>9. Tinnitus</td>
<td>2.8%</td>
</tr>
<tr>
<td>10. Hemorrhoids</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
## Most Common Service Connected Conditions in Veterans

### World War II Era Veterans

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anxiety Disorder</td>
<td>5.3%</td>
</tr>
<tr>
<td>2. Scars</td>
<td>4.7%</td>
</tr>
<tr>
<td>3. Cold injury residuals</td>
<td>4.0%</td>
</tr>
<tr>
<td>4. Arthritis due to trauma</td>
<td>3.4%</td>
</tr>
<tr>
<td>5. PTSD</td>
<td>2.5%</td>
</tr>
<tr>
<td>6. Pes planus</td>
<td>2.4%</td>
</tr>
<tr>
<td>7. Hearing loss</td>
<td>2.9%</td>
</tr>
<tr>
<td>8. Tinnitus</td>
<td>2.3%</td>
</tr>
<tr>
<td>9. Scars</td>
<td>2.2%</td>
</tr>
<tr>
<td>10. Head/neck scars</td>
<td>2.3%</td>
</tr>
</tbody>
</table>
Most Common Service Connected Conditions in Veterans

**Korean War Era Veterans**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scars</td>
<td>5.0%</td>
</tr>
<tr>
<td>2. Cold injury residuals</td>
<td>3.9%</td>
</tr>
<tr>
<td>3. Hearing loss</td>
<td>3.0%</td>
</tr>
<tr>
<td>4. Tinnitus</td>
<td>3.0%</td>
</tr>
<tr>
<td>5. Arthritis due to trauma</td>
<td>2.8%</td>
</tr>
<tr>
<td>6. Ulcer, duodenal</td>
<td>2.3%</td>
</tr>
<tr>
<td>7. PTSD</td>
<td>2.2%</td>
</tr>
<tr>
<td>8. Scars</td>
<td>2.0%</td>
</tr>
<tr>
<td>9. Anxiety disorder</td>
<td>1.9%</td>
</tr>
<tr>
<td>10. Skeletal</td>
<td>1.8%</td>
</tr>
</tbody>
</table>
# Most Common Service Connected Conditions in Veterans

## Vietnam War Era Veterans

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scars</td>
<td>5.6%</td>
</tr>
<tr>
<td>2. PTSD</td>
<td>5.4%</td>
</tr>
<tr>
<td>3. Diabetes</td>
<td>3.9%</td>
</tr>
<tr>
<td>4. Skeletal</td>
<td>3.6%</td>
</tr>
<tr>
<td>5. Hearing Loss</td>
<td>3.4%</td>
</tr>
<tr>
<td>6. Tinnitus</td>
<td>3.1%</td>
</tr>
<tr>
<td>7. Knee</td>
<td>2.9%</td>
</tr>
<tr>
<td>8. Hypertension</td>
<td>2.7%</td>
</tr>
<tr>
<td>9. Arthritis due to trauma</td>
<td>2.6%</td>
</tr>
<tr>
<td>10. LS strain</td>
<td>2.3%</td>
</tr>
</tbody>
</table>
Most Common Service Connected Conditions in Veterans

**Gulf War Era Veterans**

1. Skeletal 6.4%
2. Knee 4.8%
3. Arthritis due to trauma 4.5%
4. LS strain 4.3%
5. Tinnitus 4.0%
6. Scars 3.4%
7. DDD 3.2%
8. Hypertension 3.0%
9. Hearing Loss 2.9%
10. Ankle 2.3%
Post-war syndromes in the past century

1870: Civil War veterans present with “irritable heart”
1920: WWI veterans present with “shell shock” or “effort syndrome”
1950: WWII veterans present with “combat fatigue”
1975: Vietnam veterans present with Agent Orange exposure, “post traumatic stress disorder”
1995: Gulf War veterans present with Gulf War Syndrome (“medically unexplained symptoms”)
Rate the degree to which you believe “Persian Gulf Illness” is:

- Mostly a Physical Disorder
- Mostly a Mental Disorder

<table>
<thead>
<tr>
<th></th>
<th>Internal Medicine (n = 77)</th>
<th>Mental Health (n = 176)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly a Physical Disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mostly a Mental Disorder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rate the degree to which you believe “Persian Gulf Illness,” in general, is most effectively treated by:

- Internal Medicine (n = 77)
- Mental Health (n = 176)

How Does Combat Effect Health?

All wars have the same *post-combat health problems*:

- physical injuries with residual pain
- diagnosable mental health conditions
- unexplained symptoms with general health decline
- hearing problems
- dental problems
- psychosocial distress: marriage/work/social disruption
- post-war death/injury from “incidental trauma”
What are the stressors of war?

Physical

- injury
- temperature
- diet
- toxic agents
- multiple immunizations
- noise
- sleep deprivation
- austere conditions
- infectious agents
- blast wave/head injury
What are the stressors of war?

Psychological

- anticipation of combat
- combat trauma
- non-combat trauma
- separation from family/home
- deprivation
What are the stressors of war?

Psychosocial

Marital/parenting issues
Social functioning
Occupational/financial concerns
Risk of re-deployment
Spiritual / existential
Demographics: OEF/OIF Veterans Using VA Health Care

- Approximately 2.04 million individuals have been deployed since 2002
- 1,094,502 OEF and OIF veterans who have left active duty and become eligible for VA health care FY 2002 through end FY 2009
  - 52% (573,404) Former Active Duty troops
  - 48% (521,098) Reserve and National Guard
What are the health concerns of OEF/OIF veterans seen in the VA?

1,168,953 of the 2.1 million deployed, are separated and eligible for VA
48% (565,024) have been seen in VA between FY02 and 3/31/10

- Musculoskeletal 53.2%
- Mental disorders 49.0%
- Symptoms/signs 47.4%
- Nervous system (hearing) 41.0%
- GI (dental) 34.6%
- Endocrine/Nutrition 27.9%
- Injury/Poisoning 26.4%
- Respiratory 24.0%

VHA Office of Public Health and Environmental Hazards  August 2010
# Mental Health Concerns of Iraq/Afghanistan Combat Veterans

<table>
<thead>
<tr>
<th>Disease Category</th>
<th>Total Number of OEF/OIF Veterans²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>129,654</td>
</tr>
<tr>
<td>Depressive Disorders</td>
<td>90,936</td>
</tr>
<tr>
<td>Neurotic Disorders</td>
<td>74,559</td>
</tr>
<tr>
<td>Affective Psychoses</td>
<td>52,982</td>
</tr>
<tr>
<td>Nondependent Abuse of Drugs</td>
<td>41,980</td>
</tr>
<tr>
<td>Alcohol Dependence Syndrome</td>
<td>24,454</td>
</tr>
<tr>
<td>Specific Non-psychotic Mental Disorder due to Organic Brain Damage</td>
<td>15,040</td>
</tr>
<tr>
<td>Special Symptoms, Not Elsewhere Classified</td>
<td>14,531</td>
</tr>
<tr>
<td>Sexual Deviations and Disorders</td>
<td>12,382</td>
</tr>
<tr>
<td>Persistent Mental Disorders due to Conditions Classified Elsewhere</td>
<td>12,029</td>
</tr>
</tbody>
</table>

Cumulative through 4th Quarter FY2009
Environmental Exposures and Medically Unexplained Symptoms (MUS)

Over 20% of Gulf War veterans report MUS contributing to functional impairments
How do war and combat effect the lives of those people touched by them?

PTSD
Depression
Musculoskeletal Pain
Blast Exposure TBI
Medical Diagnosis

Financial Stress
Marital Stress
Vocational Challenges
Deficits in Social Role Functioning
Impairment in Function and Social Reintegration
What do these veterans say they need?

- Medical Care 49
- Assistance with C&P claim 21
- Financial 19
- Employment 19
- Dental 16
- Someone who understands OEF/OIF Combat Veterans separating from service at Ft Lewis
- Sleep 13
- Education 13
- Mental Health 13
- Counseling 12
- Marital 9
- Help with family/friends 8
- Housing 6
- Sexual functioning 6
- Legal 4
- ETOH treatment 2
Health and Exposure Concerns of Veterans Deployed to Iraq and Afghanistan

“Veterans of military operations in Southwest Asia have deployment-related health and exposure concerns that will need to be addressed by their ambulatory care physicians.”

Musculoskeletal injury/chronic pain

The most common health concern following combat is physical injury with associated pain and functional impairments; the cost of care, rehabilitation and disability compensation has been growing steadily.


Musculoskeletal injury/chronic pain

Neck Pain in Military Helicopter Pilots: Prevalence and Associated Factors

“…neck pain in military helicopter pilots is a significant occupational problem and may be a consequence of longer exposure to flying.”

Musculoskeletal injury/chronic pain


“...a substantial increase in the incidence of back, neck and UE pain during deployment, and approximately twice as many Soldiers attributed their musculoskeletal pain to wearing body armor than to job tasks and PT.”

Konitzer LN, Fargo MV, Brininger TL, Lim, Reed M. J Hand Ther. 2008; Apr-Jun; 21(2):143-8.
Musculoskeletal injury/chronic pain

Incidence of Carpal Tunnel Syndrome in the US Military Population

“…occupational requirements have an effect on CTS within the military.”

Wolf JM, Mountcastle S, Owens BD. Hand (NY); 2009; Sep 4 (3):289-93.
Environmental Agent Exposure Concerns

Screening Health Risk Assessment
Burn Pit Exposures, Balad Air Base, Iraq

“...measured exposure levels from burn pit operations are not routinely above deployment military exposure guidelines (MEGs) for exposures up to 1 year, levels which are not likely to cause short-term onset health affects. A human HRA was performed under guidance outlined by the US EPA. These results indicate an “acceptable” health risk for both concern and non-cancer long-term health effects.”

Environmental Agent Exposure Concerns

Newly Reported Respiratory Symptoms and Conditions Among Military Personnel Deployed to Iraq and Afghanistan: A Prospective Population-Based Study.

“…respiratory symptoms were associated with deployment… suggests that specific exposures rather than deployment in general are determinants of post-deployment respiratory illness.”

Environmental Agent Exposure Concerns

Occupational Exposure to Blood and other Bodily Fluids at a Military Hospital in Iraq

“...a substantial number of blood and other bodily fluid exposures occurred in a combat zone military healthcare facility.”

Tobacco Use

Increased prevalence of smoking among those reporting acute and chronic stress; greater among those with multiple deployments and experiencing combat; predominantly recidivism among former smokers who had previously quit.

Alcohol Use

Individuals with combat exposure are at increased risk for heavy weekly drinking, binge drinking and alcohol-related problems.

More of a problem with National Guard/Reservists compared to active duty personnel.

Eating disorders/weight changes

Women veterans with combat exposure are more likely to develop disordered eating following deployments.

Individuals with combat exposure are at no higher risk of weight gain following deployment.

New onset depression

Deployed veterans with combat exposure are at risk for new onset depression

 Deployed veterans without combat exposure are at lower risk for new onset depression compared with non-deployed veterans

New onset PTSD

There is a 3-fold increase in new onset PTSD among deployed veterans with combat exposure.

There is a 2-fold increase in new onset PTSD among both male and female combat deployers reporting an assault prior to deployment.

Hypertension

Newly Reported Hypertension After Military Combat Deployment in a Large Population-Based Study

“Although military deployers, in general, had a lower incidence of hypertension than nondeployers, deployment with multiple stressful combat exposures appeared to be a unique risk factor for newly reported hypertension.”

Traumatic Brain Injury

A higher proportion of service members deployed to Iraq/Afghanistan sustain traumatic brain injuries (TBI) than in prior military conflicts.

Death by External Causes

Returning combat veterans from the current conflict as well as past wars have higher rates of death by external causes (motor vehicle crashes, other accidents).


Family Impacts

55% of active military members are married
43% have children (40% of whom are < 5 years old)

Office of the Deputy Under Secretary of Defense 2005

34% of service personnel deployed have been deployed more than once


Over 700,000 children have had a parent deployed to a combat zone since 9-11-01.

Family Impacts

Spouses of deployed servicemen had significantly higher perceived stress scores than those of non-deployed service members; somatization scores were higher in spouses of deployed servicemen as compared to non-deployed individuals.

Family Impacts

Military families face stressors along a continuum from normative to toxic.

Family Impacts: children

Children aged 3-5 who have a deployed parent had significantly higher rates of behavioral symptoms than those with non-deployed parents.

Family Impacts: adolescents

Adolescents who have a deployed parent had significantly higher heart rates, systolic blood pressures and perceived stress scores than those with non-deployed parents.

Family Impacts: parenting

During deployment, there are increased rates of child maltreatment by caregivers.

Family Impacts

The prevalence of domestic violence in a pregnant military population was 14.5% (the upper range of the prevalence reported in the general population).

What are the health concerns of returning combat veterans?

Family Impacts: interventions

www.operationmilitarykids.org
www.afterdeployment.org
www.guardfamily.org
http://www.militaryonesource.com
www.nationalresourcedirectory.gov
Marital Impacts

There is robust evidence that mental health co-morbidity is associated with marital distress


Veterans with PTSD have lower marital satisfaction, more likely to divorce, experience domestic violence and have difficulty parenting

Social Impacts

Greater social support is correlated with lower rates of PTSD; risk of PTSD increases with negative social interactions, negative life events and divorce and other psychosocial stressors.


PTSD symptoms predict deteriorating social support over time.

Expectations of OEF/OIF Combat Veterans

Results of multiple focus groups

- Compassionate, empathic staff beginning with the receptionist and extending to all members of the team.
- Comprehensive intake and assessment by staff with experience in post-combat health care and knowledgeable in military medicine and the OEF-OIF conflict.
- Appointments timely minimizing needless waiting.
- Appointments scheduled during same day to minimize multiple visits.
- Co-localization of services preferable.
- Excellent telephone and clinic visit access to providers and staff. Same day access is extremely important if at all possible.
- Comfortable, relatively quiet waiting area that is sensitive to the needs of returning combat veterans, including wireless internet access.
- Extended hours should be available, including at least one evening and one weekend day.
Post-Combat Health Concerns

- Combat injury
- Non-combat injury
- Environmental exposure illness
- Non-combat illness
- TBI
- Marital/family financial difficulties
- Post-combat symptoms
- Spiritual / existential struggles
- Mental health
- Hearing loss / tinnitus
- Needs C&P
Integrated Post-Combat Care
Veteran centered, team based, coordinated care

- Combat injury
- Non-combat injury
- Marital/family financial difficulties
- TBI
- Non-combat illness
- Environmental exposure illness
- Spiritual / existential struggles
- Hearing loss tinnitus
- Mental health
- Needs C&P
- Post-combat symptoms
Integrated Post-Combat Care

- Non-combat injury
- Environmental exposure illness
- Hearing loss tinnitus
- Mental health
- Non-combat illness
- Combat injury
- TBI
- Marital/family financial difficulties
- Post-combat symptoms
- Spiritual / existential struggles
- Needs C&P
What were your combat theater health risks?

Risk Matrix of Combat

Physical Risk

Psychological Risk

Psycho-social risk
Integrated Post-Combat Care

PCP  MH  SW

Veteran
Puget Sound OEM Grand Rounds
Thursday February 4, 2010

The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD
Professor, General Internal Medicine
Stanford School of Medicine
Puget Sound OEM Grand Rounds
Thursday February 4, 2010
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:
Puget Sound OEM Grand Rounds
Thursday February 4, 2010
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:
- Physical Demand
Multivariate logistic regression for OSHA-recordable injuries only among hourly manufacturing workers (N=9,101)

<table>
<thead>
<tr>
<th>Physical Demand</th>
<th>Multivariate Odds Ratios</th>
<th>95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very heavy</td>
<td>4.14</td>
<td>2.13 – 8.06</td>
</tr>
<tr>
<td>Heavy</td>
<td>3.69</td>
<td>2.09 – 6.51</td>
</tr>
<tr>
<td>Medium</td>
<td>2.23</td>
<td>1.28 – 3.86</td>
</tr>
<tr>
<td>Light</td>
<td>1.58</td>
<td>0.91 – 2.76</td>
</tr>
<tr>
<td>Sedentary</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>
“It’s the hardest thing I’ve ever done…day after day after day…”

Predictors of Work Related Injury:

- Physical Demand
Puget Sound OEM Grand Rounds
Thursday February 4, 2010
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:
• Physical Demand
• Time on job (experience)
Rates of first injury, by sex for six smelters, 1996-2000

![Graph showing injury rates over months on job by gender.](image-url)
“I don’t care how many times you’ve done it in training, the first time it happens in combat it’s a whole new ball game…as time goes by, you start making little mistakes…you get worn out…”

Predictors of Work Related Injury:

• Physical Demand
• Time on job (experience)
The Myth of the Great Divide: All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
Psychological Job Factors: Job Demand Survey

• Job demand (psychological)
As one has to work without mistakes, more often the probability of recordable injury increases (Odds Ratio 1.04 p=0.0017)

<table>
<thead>
<tr>
<th>Often</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often is it extremely important to do the work without mistakes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Job control
As one has less control over when work is done, the probability of recordable injury increases (Odds Ratio 1.10 p=0.03)

How often does the job permit complete discretion and independence in determining when the work is done?

<table>
<thead>
<tr>
<th>Often</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often does the job permit complete discretion and independence in determining when the work is done?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
“It’s a place where little mistakes have big consequences…and no matter what you do or how you do it, you don’t know how it’s going to turn out…”

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
Case-crossover comparison of hours worked in injury vs. control week for all cases using conditional logistic regression modeling

<table>
<thead>
<tr>
<th>Day</th>
<th>0 Hrs</th>
<th>GT 0 to 8</th>
<th>GT 8 to 12</th>
<th>Over 12</th>
<th>p for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>451</td>
<td>1687</td>
<td>464</td>
<td>308</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>474</td>
<td>1714</td>
<td>441</td>
<td>281</td>
<td></td>
</tr>
<tr>
<td>Hazard Ratio</td>
<td>.81 (.61-1.07)</td>
<td>Reference</td>
<td>1.18 (.79-1.84)</td>
<td>1.13 (.91-1.42)</td>
<td>0.09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>0 Hrs</th>
<th>GT 0 to 16</th>
<th>16-20</th>
<th>20-24</th>
<th>over 24</th>
<th>p for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>371</td>
<td>1761</td>
<td>196</td>
<td>415</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>396</td>
<td>1802</td>
<td>194</td>
<td>372</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>Hazard Ratio</td>
<td>.81 (62-1.07)</td>
<td>Reference</td>
<td>1.16 (0.81-1.64)</td>
<td>1.24 (0.99-1.54)</td>
<td>1.43 (0.97-2.10)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>0 Hrs</th>
<th>GT 0 to 24</th>
<th>24-32</th>
<th>Over 32</th>
<th>p for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>120</td>
<td>2054</td>
<td>460</td>
<td>276</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>135</td>
<td>2095</td>
<td>438</td>
<td>242</td>
<td></td>
</tr>
<tr>
<td>Hazard Ratio</td>
<td>.83 (.54-1.27)</td>
<td>Reference</td>
<td>1.17 (.97-1.40)</td>
<td>1.20 (.88-1.64)</td>
<td>0.08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>0 Hrs</th>
<th>GT 0 to 40</th>
<th>40-48</th>
<th>48-56</th>
<th>56-64</th>
<th>Over 64</th>
<th>p for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>15</td>
<td>1097</td>
<td>687</td>
<td>488</td>
<td>290</td>
<td>333</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>19</td>
<td>1195</td>
<td>667</td>
<td>478</td>
<td>267</td>
<td>284</td>
<td></td>
</tr>
<tr>
<td>Hazard Ratio</td>
<td>1.00 (.35-2.85)</td>
<td>Reference</td>
<td>1.26 (1.03-1.54)</td>
<td>1.19 (.92-1.52)</td>
<td>1.21 (.84-1.75)</td>
<td>1.88 (1.16-3.05)</td>
<td>0.04</td>
</tr>
</tbody>
</table>
“We would go for 12 hours, 18 hours, 24 hours…we would just keep going…”

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
Puget Sound OEM Grand Rounds
Thursday February 4, 2010
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
5 soldiers killed in accident

The Associated Press and Reuters

TIKRIT, Iraq – Five U.S. soldiers died last night when a Bradley Fighting Vehicle rolled into a canal during a combat patrol north of Baghdad near the town of Khan Bani Saad, the military said today.

The soldiers from the Army’s 1st Infantry Division were dead on arrival at a military clinic. Two other soldiers were injured.

Also last night, a roadside bomb blast killed a U.S. soldier in Baghdad, the U.S. military said.

The Army also announced that a soldier has died during training at Camp Arifjan in the Kuwait desert. The soldier “collapsed while running outdoors,” the Army said.
Risk Factors for Injury: Temperature

- Steep increase in injury rates at colder temperatures
- 2-Fold increase in injury rates at the highest temperatures

Study conducted by T. Bernard
“It would be over 100 degrees during the days and then be down to freezing at night...no matter what gear you brought, it was never quite what you needed…”

Predictors of Work Related Injury:
• Physical Demand
• Time on job (experience)
• Psychosocial job demand
• Overtime
• Temperature
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Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
Risk Factors for Injury: Gender
Injury Rates for Males and Females by Standardized Job Title
“There were only five of us women in our unit of over 100 men...we had to do everything that they did...we had to prove it to them...we had to prove it to ourselves...”

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

• Physical Demand
• Time on job (experience)
• Psychosocial job demand
• Overtime
• Temperature
• Gender
• Age
## Injury Severity Rates by Age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Person-years</th>
<th>FA</th>
<th>MT</th>
<th>RW</th>
<th>LW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 35</td>
<td>5494</td>
<td>9.88</td>
<td>3.50</td>
<td>2.24</td>
<td>0.62</td>
</tr>
<tr>
<td>35-49</td>
<td>19350</td>
<td>8.17</td>
<td>3.44</td>
<td>1.59</td>
<td>0.61</td>
</tr>
<tr>
<td>50 and over</td>
<td>14976</td>
<td>8.27</td>
<td>2.70</td>
<td>0.89</td>
<td>0.60</td>
</tr>
<tr>
<td>Total</td>
<td>39820</td>
<td>8.44</td>
<td>3.17</td>
<td>1.42</td>
<td>0.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age in Decades</th>
<th>Person-years</th>
<th>FA</th>
<th>MT</th>
<th>RW</th>
<th>LW</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>56</td>
<td>12.5</td>
<td>7.14</td>
<td>0</td>
<td>3.57</td>
</tr>
<tr>
<td>20-29</td>
<td>2444</td>
<td>11.37</td>
<td>3.27</td>
<td>2.37</td>
<td>0.74</td>
</tr>
<tr>
<td>30-39</td>
<td>7732</td>
<td>8.42</td>
<td>3.60</td>
<td>1.88</td>
<td>0.59</td>
</tr>
<tr>
<td>40-49</td>
<td>14612</td>
<td>8.12</td>
<td>3.40</td>
<td>1.56</td>
<td>0.60</td>
</tr>
<tr>
<td>50-59</td>
<td>13042</td>
<td>8.61</td>
<td>2.84</td>
<td>0.93</td>
<td>0.61</td>
</tr>
<tr>
<td>60-69</td>
<td>1912</td>
<td>5.91</td>
<td>1.78</td>
<td>0.68</td>
<td>0.52</td>
</tr>
<tr>
<td>70+</td>
<td>22</td>
<td>9.09</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>39820</td>
<td>8.44</td>
<td>3.17</td>
<td>1.42</td>
<td>0.61</td>
</tr>
</tbody>
</table>
The average age of active duty personnel is 23...the average age of Guard and Reservists is 33...

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
Puget Sound OEM Grand Rounds
Thursday February 4, 2010
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:
- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
Hazard ratios for average risk of any first injury among 7,690 hourly manufacturing employees by body mass index, 2002-2004*

Hazard Ratios (95% Confidence Intervals)

<table>
<thead>
<tr>
<th></th>
<th>Normal (18.5-24.9 kg/m³)</th>
<th>Overweight (25.0-29.9 kg/m³)</th>
<th>Obesity I &amp; II (30.0-39.9 kg/m³)</th>
<th>Obesity III (&gt;40 kg/m³)</th>
<th>P value (trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Univariate</strong></td>
<td>1</td>
<td>1.05 (.927-1.19)</td>
<td>1.13 (1.00-1.28)</td>
<td>1.31 (1.05-1.64)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Multivariate Model</strong></td>
<td>1</td>
<td>1.11 (0.98-1.26)</td>
<td>1.21 (1.06-1.38)</td>
<td>1.38 (1.11-1.72)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Multivariate model stratified by type of traumatic injury

<table>
<thead>
<tr>
<th></th>
<th>Sprains and strains</th>
<th>Sprains, strains, contusions and abrasions</th>
<th>All injuries except for sprains and strains</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Univariate</strong></td>
<td>1.26 (0.99-1.59)</td>
<td>1.48 (1.17-1.88)</td>
<td>1.62 (1.08-2.44)</td>
</tr>
<tr>
<td><strong>Multivariate Model</strong></td>
<td>1.14 (0.97-1.35)</td>
<td>1.37 (1.16-1.62)</td>
<td>1.58 (1.19-2.11)</td>
</tr>
</tbody>
</table>

*Note: The table includes hazard ratios for different body mass index categories and their corresponding 95% confidence intervals. The P values indicate the significance of the trend across body mass index categories. The table also shows multivariate models stratified by type of traumatic injury, including sprains and strains, sprains, strains, contusions, and abrasions, and all injuries except for sprains and strains.
Maintaining physical readiness/weight standards is more important and in some ways more difficult than ever given the demands of the combat environment...

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- Chronic disease status
Relative risk of injury associated with chronic disease (15 locations, 1996-1997)

<table>
<thead>
<tr>
<th>Chronic disease</th>
<th>OR (CI)</th>
<th>LW / RWT OR (CI)</th>
<th>Multiple injuries OR(CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>1.45 (1.20-1.75)</td>
<td>1.52 (1.17-1.98)</td>
<td>1.79 (1.45-2.20)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.20 (1.04-1.39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>1.38 (1.13-1.68)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart disease</td>
<td>1.02 (0.87-1.19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>0.91 (0.72-1.16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.08 (0.99-1.20)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
With recurrent deployments and higher numbers of NG and reservists deployed, we see higher rates of depression, PTSD, hypertension, respiratory illnesses and other chronic diseases.

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- Chronic disease status
The Myth of the Great Divide:
All Health is Occupational Health

Mark Cullen MD

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- Chronic disease status
- Work organization
Working Condition Items (2006)

Answer Questions using the following scale:
Always (1)  Often (2)  Sometimes (3)  Rarely (4)  Never (5)

• I find my work stressful.
• I find that I am worn out at the end of the day
• I find that my work demands often interfere with my family life
• I find that work issues remain on my mind after hours.
Table 5. Effect estimates: Univariable and multivariable results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Incidence Rate Ratio</th>
<th>95% Confidence Intervals</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multivariable model</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.44</td>
<td>1.23, 1.67</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>Male</td>
<td>1.0</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1.07</td>
<td>0.91, 1.27</td>
<td>p=0.397</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.30</td>
<td>1.08, 1.57</td>
<td>p=0.007</td>
</tr>
<tr>
<td>Asian</td>
<td>0.85</td>
<td>0.57, 1.28</td>
<td>p=0.429</td>
</tr>
<tr>
<td>White</td>
<td>1.0</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Time since hire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than one yr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 yrs</td>
<td>2.44</td>
<td>2.00, 2.97</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>3-5 yrs</td>
<td>2.08</td>
<td>1.57, 2.75</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>6-10 yrs</td>
<td>1.64</td>
<td>1.31, 2.06</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>11-20 yrs</td>
<td>1.65</td>
<td>1.38, 1.98</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>Over 20 yrs</td>
<td>1.29</td>
<td>1.08, 1.54</td>
<td>p=0.005</td>
</tr>
<tr>
<td>Work Organization Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction scale (tertiles)</td>
<td>0.94</td>
<td>0.46, 1.95</td>
<td>p=0.876</td>
</tr>
<tr>
<td>Work environment scale (tertiles)</td>
<td>0.49</td>
<td>0.22, 1.22</td>
<td>p=0.090</td>
</tr>
<tr>
<td>Supervisor scale (tertiles)</td>
<td>0.70</td>
<td>0.25, 2.02</td>
<td>p=0.516</td>
</tr>
<tr>
<td>Stress scale (tertiles)</td>
<td>0.50</td>
<td>0.28, 0.90</td>
<td>p=0.021</td>
</tr>
</tbody>
</table>
“It’s intense, relentless, exhausting and no matter how hard you try, bad things happen…leadership means everything…”

Predictors of Work Related Injury:

- Physical Demand
- Time on job (experience)
- Psychosocial job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- Chronic disease status
- Work Organization
Integrated Post-Combat Care: OEM Model

Rehabilitative in orientation
Health recovery in approach
Transitional in duration
Based in primary care health delivery
Structured to provide de-stigmatized mental health and psychosocial support
Designed to mitigate long term health impacts of combat related risk exposure
Integrated Post-Combat Care: OEM Model

Assessment of risk across the matrix:
  physical, psychological, psychosocial
Clinical assessment and intervention
Risk communication
Mitigation of impact
Population management
Remediation
Prevention
Integrated Post Combat Care for OEF/OIF Veterans

Essential Elements

• Comprehensive psychosocial and medical intake performed on all veterans: Medical, Mental Health and Social worker all see every new patient during first visit.
• Primary Care Provider(s) trained and designated to function in this role.
• Close links to allied clinics and programs
• Active participation by existing OEF/OIF program staff (OEF/OIF Program Manager and team, OEF/OIF Mental Health teams etc) featuring full integration of all post deployment services
• Meetings (usually weekly-provider attendance essential) of the entire integrated team to discuss:
  – Patient care issues
  – Systems issues
**Integrated Post Combat Care for OEF/OIF Veterans**

**Recommended Elements**

- Co-localization whenever possible for Polytrauma, Mental Health, Pain, and Physical Therapy clinics.
- Same day access encouraged even when co-localization not possible; linked appointments to avoid unnecessarily frequent visits to the medical center.
- Extended hours availability
- Seamless telephone access; provisions for e-mail and text messaging alternatives encouraged.
- When feasible identified space
All DoD and VA Medicine is Occupational and Environmental Medicine

Integrated Post-Combat Care is a way of creating a home for returning combat veterans, a home where healing and recovery can occur, a home that says:

Welcome.  
*We appreciate what you have done.*  
*We are here for you.*
All DoD and VA Medicine is Occupational and Environmental Medicine

Using an OEM Model of Care is a way of saying:

*Where you went and what you did was difficult.*

*Where you went and what you did put you and your health at risk.*

*We acknowledge this service and these sacrifices.*

*We will do all we can to support you as you get back on your feet, so that you and your family can have the most satisfying, productive and healthy lives possible.*
Military Service as an Occupation
Combat as an Environment
An OEM Model of Care
For Returning Combat Veterans

Stephen C Hunt MD MPH
National Director, Post-Deployment Integrated Care Initiative
Chief Consultant, Deployment Health Clinic
VA Puget Sound Health Care System