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Iraq and Afghanistan Veterans report symptoms consistent with Chronic Multisymptom Illness
one year after deployment

Running Title: OEF/OIF Soldiers and Chronic Multisymptom Illness

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Conflict of Interest Statement
None to report.

Many Veterans returning from service in Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) experience chronic pain. What is not known is if for some OEF/OIF Veterans this pain is part of a larger condition of diffuse multi-system symptoms consistent with Chronic multisymptom illness (CMI). We use data from a prospective longitudinal study of OEF/OIF Veterans to determine the frequency of CMI. We found that one year after deployment 49.5% of OEF/OIF Veterans met criteria for mild to moderate CMI and 10.8% met criteria for severe CMI. Over 90% of Veterans with chronic pain met criteria for CMI. CMI was not completely accounted for either by PTSD or by pre-deployment levels of physical symptoms. Veterans with symptoms consistent with CMI reported significantly worse physical health function than Veterans who did not report symptoms consistent with CMI. This study suggests that the presence of CMI should be considered in the evaluation of OEF/OIF Veterans. Further, it suggests the pain management for these Veterans may need to be tailored to take CMI into consideration.

JRRD At a Glance: We use data from a prospective longitudinal study of OEF/OIF Veterans to determine the frequency of symptoms consistent with Chronic Multisymptom Illness (CMI). CMI is characterized by chronic multiple symptoms. We found that one year after deployment 49.5% of Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) Veterans met criteria for mild to moderate CMI and 10.8% met criteria for severe CMI. Veterans with symptoms consistent with CMI reported significantly worse physical health function than Veterans who did not report symptoms consistent with CMI. This study suggests that the presence of CMI should be considered in the evaluation of OEF/OIF Veterans.

Chronic pain is a significant and complex problem for Veterans who deployed to Iraq (Operation Iraqi Freedom; OIF) and Afghanistan (Operation Enduring Freedom; OEF). Forty three percent of OEF/OIF Veterans seeking treatment at a Veterans Affairs (VA) hospital reported pain, with 63% of those Veterans reporting clinically significant pain [1]. Further, OEF/OIF Veterans with chronic pain have worse physical health function than OEF/OIF Veterans without chronic pain [2]. Finally, OEF/OIF Veterans with chronic pain are more likely to present with another post-deployment health condition (i.e., posttraumatic stress disorder (PTSD), mild traumatic brain injury (mTBI) and/or polysubstance abuse) [3] than to present with only chronic pain. What is not known is how often chronic musculoskeletal pain presents with other chronic and comorbid symptoms, such as chronic fatigue, gastrointestinal distress or cognitive problems such as difficulty finding words. It is possible that for some OEF/OIF Veterans chronic pain may be only one symptom of a larger multi-symptom syndrome. Walker et al., suggested that the most common health concern of OEF/OIF Veterans are diffuse, wide-spread and overlapping physical, cognitive and emotional symptoms [4].

There is good reason to suspect that some OEF/OIF Veterans with chronic pain are also experiencing other chronic symptoms. Multi-system diffuse symptoms have been common in Veterans after every modern war [5, 6]. This was particularly clear after the Gulf War (Operation Desert Shield/Operation Desert Storm), when an estimated 30% of Veterans suffered from multiple chronic symptoms [7-10]. Termed chronic multisymptom illness (CMI) (or Gulf War Illness), the Centers for Disease Control (CDC) defines CMI as having 1 or more chronic symptoms (≥ 6 month duration) from 2 or more symptom categories: (1) fatigue, (2) mood and cognition (e.g., concentration problems, depression), or (3) musculoskeletal (e.g., joint pain) [11]. Evidence has found that CMI is distinct from PTSD or depression [12]. CMI causes disability that is as severe as found in other chronic illnesses and continues to impact Gulf War Veterans many years after their deployment [7, 13].

There is preliminary evidence to suggest that OEF/OIF Veterans may also be experiencing increases in widespread symptoms. Three cross-sectional studies found heightened physical symptom severity as measured with the Patient Health Questionnaire-15 (PHQ-15). Iverson et al. reported that 41% of women and 31% of men deployed to OEF/OIF reported medium or higher levels of physical symptom severity [14]. McAndrew et al. reported on the relationship between physical symptoms and environmental exposure concerns among OEF/OIF Veterans seeking care at a VA tertiary clinic [15]. They found, on average, medium levels of physical symptom severity and symptom severity was positively associated with environmental exposure concerns [15]. Similarly, Hoge et al. found, on average, medium levels of physical symptom severity among OEF/OIF Veterans and higher symptom severity among OEF/OIF Veterans with PTSD [16].

Especially compelling evidence comes from the Millennium Cohort Study. The Millennium Cohort Study is a prospective longitudinal study of 73,078 OEF/OIF soldiers [17], which used a close approximation of the CDC definition of CMI with some modifications (e.g., two instead of three pain symptoms; “unusual fatigue” instead of general fatigue). Comparing military personnel who deployed to those who did not deploy, they found that combat deployment resulted in a 1.7 increase in odds of meeting CMI criteria. Further, an estimated 26.5% of OEF/OIF Veterans who deployed met criteria for CMI after deployment. These data suggest that CMI is a problem among OEF/OIF Veterans, a view also suggested by the Institute of Medicine [18]. These existing studies are limited by having not used the specific CDC definition, thus we do not yet know if OEF/OIF Veterans meet that definition of CMI. Further, no existing study has used a pre-post deployment longitudinal design that provides the ability to assess whether symptoms increase after combat deployment or if OEF/OIF soldiers could have been experiencing heightened symptoms prior to combat deployment.

To optimally address pain among OEF/OIF Veterans it is critical that we understand whether CMI is a problem among these Veterans, and if so, its relationship to chronic pain. The presence of chronic pain in the context of CMI likely necessitates modification of pain management treatments. Focusing exclusively on chronic pain, without taking into account the patients' other symptoms, may lead to poor adherence to treatment recommendations and low satisfaction with care. Similarly, treatments for CMI need to be tailored when the predominant symptom is pain as compared to when the predominant symptoms are fatigue, or gastrointestinal distress.

The goal of the current study is to report the frequency of CMI in soldiers returning from war using data from a longitudinal, prospective study, the Healthy Resilience after Operational and Environmental Stressors (HEROES) Project. The HEROES Project improves upon limitations of past studies by using the CDC definition of CMI and using a pre-post deployment longitudinal design. The aims of the current study are to:

1. Estimate the frequency OEF/OIF Veterans who report symptom consistent with CMI at one year post-deployment.
2. Examine the relationship between CMI at one year post-deployment and chronic pain symptoms at one year post-deployment, PTSD symptoms at one year post-deployment and physical symptom severity at pre-deployment.
3. Determine the relationship of CMI assessed at one year post-deployment to physical and mental health function at one year post-deployment, controlling for physical symptom severity and health function at pre-deployment and PTSD symptoms at one year post-deployment.

METHODS

The HEROES Project is a prospective longitudinal observational cohort design with measures collected at 4 time points: pre-deployment, immediately post-deployment, 3 months post-deployment and 1 year post-deployment (for description see [19-21]).

Participants. Participants were Army National Guard and Army Reserve enlisted soldiers (including non-commissioned officers) deploying to either OEF or OIF who participated in the HEROES Project [19-21]. Exclusion criteria were current self-reported depression, medications with cardiovascular and/or autonomic effects (e.g., beta blockers or other anti-hypertensive medication), history of schizophrenia or bipolar disorder or current cancer, high blood pressure, or pregnancy. The larger study included a physiological assessment (not reported here) which necessitated excluding patients on medications with cardiovascular and/or autonomic effects and those with high blood pressure.

At the one year post-deployment assessment, 319 soldiers completed the questionnaire on CMI. This was from an initial study sample of 795 soldiers (at pre-deployment). Out of the initial sample, 32 did not mobilize, were officers, or were severely injured or killed in action. At one year post-deployment, 118 participants declined to participate (14.8%). The remainder of the participants whose data were missing at one year post-deployment were lost to follow up. Most of these were lost to follow up because we did not receive information on when they returned from deployment (n=289); for the others we do not have information on the reasons they were lost to follow up (n=37). Physical symptom severity at baseline was not related to the likelihood of being lost to follow-up at one year post-deployment ($\chi^2 = 0.80$, $p=0.85$).

Procedure. Study personnel approached soldiers who had just finished their medical processing or were waiting to complete their medical processing. We emphasized the voluntary nature of their participation, and that research staff were civilian VA personnel. We examined differences

between those who volunteered and those who declined to participate. There was no significant difference in the proportion of males and females in the participant and non-participant groups, ($X^2 = 2.30, p = .13$). However, using a dichotomized variable for general health (excellent/very good vs. good/fair/poor), there was a small but statistically significant difference between the participant sample and the non-participant sample. There were fewer individuals reporting excellent/very good health in the participant sample (72.1% of participant sample vs. 78.8 % of non-response sample; $X^2=8.25, p < .01$). We choose to ask about general health because it was only one item and has previously been shown to prospectively predict health.

Following recruitment, soldiers were given information about the study, screened for eligibility and those who were eligible and interested gave informed consent. Soldiers completed pre-deployment self-report questionnaires and physiological measures (not included here) while at the Army installation. At immediately post-deployment soldiers again completed self-report questionnaires at the Army installation. Soldiers who did not return to their installation were sent the immediate post-deployment questionnaires via mail. Data at 3 months and 1 year post-deployment were collected through mailed questionnaires. This report focuses on self-report of CMI measured at 1 year post-deployment controlling for pre-deployment factors. The protocol was approved by Institutional Review Boards of the Department of Veterans Affairs (VA New Jersey Healthcare System and the G.V (Sonny) Montgomery VA Medical Center) and by the Walter Reed Department of Clinical Investigation.

Measures

Chronic multisymptom illness [11]. Chronic multisymptom illness (CMI) was assessed at 1 year after deployment using the Centers for Disease Control (CDC) definition. The Institute of Medicine recently released a report that reviewed the evidence for a case definition of CMI. They recommended using either the CDC definition or the Kansas definition because both

encompassed most of the symptoms of CMI. We chose to use the CDC definition because it provided a broader definition of CMI and can be more easily assessed through self-report as the Kansas definition requires assessment of possible medical exclusions. To meet the CDC criteria for CMI, participants are asked about the severity (mild, moderate or severe) and duration (≥ 6 month duration) of ten common symptoms. CMI is defined as having one or more chronic symptom (\geq six months duration) from two or more symptom categories. The three symptom categories are (1) fatigue, (2) mood and cognition (symptoms of feeling depressed, difficulty remembering or concentration, feeling moody, feeling anxious, trouble finding words or difficulty sleeping) and (3) musculoskeletal (symptoms of joint pain, joint stiffness or muscle pain). We classified participants as having severe CMI if at least one symptom in two or more categories was rated as severe. We also asked about 25 additional symptoms that do not contribute to the definition of CMI. The prevalence of both CMI and these other symptoms is presented in Table 1.

Patient health questionnaire-15 (PHQ-15) [22]. Physical symptom severity was assessed at pre-deployment with the PHQ-15. Participants were asked to indicate “During the past 7 days, how much have you been bothered by any of the following problems”. Each item is scored from 0 (not bothered at all), 1 (bothered a little) or 2 (bothered a lot). Generally a cut off of 0-4 (minimal), 5 (low) 10 (medium) and 15 (high) are used to create physical symptoms severity categories [22]. Items include stomach pain, back pain, pain in your arms, legs, or joints, menstrual cramps or other problems with your periods, headaches, chest pain, dizziness, fainting spells, feeling your heart pound or race, shortness of breath, pain or problems during sexual intercourse, constipation, loose bowels or diarrhea, nausea, gas or indigestion, feeling tired or having low energy, and trouble sleeping.

Health Function - Veteran's Rand-36 (VR-36) [23-25]. The VR-36 is a measure of mental and physical health function and was assessed at pre-deployment and one year post-deployment with the VR-36. The VR-36 was developed from the Medical Outcomes Survey Short-Form-36 (SF-36). The VR-36 provides two composite scores, physical function (Physical Health Composite Score; PCS) and mental function (Mental Health Composite Score; MCS). These composite scores are comprised of 8 sub-scale scores: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. Composite and sub-scale scores are normed to a mean of 50 and a standard deviation of 10.

PTSD Checklist for DSM-IV (PCL) [26, 27]. PTSD symptoms were assessed at one year post-deployment with the PCL-civilian which assesses for 17 symptoms of PTSD. Participants were asked to indicate "in the past month how much were you bothered by" each of 17 symptoms. Items are scored on a scale of 1-5. A score of 50 or greater is commonly used to denote significant PTSD symptoms [28].

Analysis

We first provide the frequency of CMI and specific physical symptoms at one year post-deployment. A Pearson's correlation was used to examine the relationship between CMI and age. Chi-square analyses were used to examine the relationship of CMI to gender and whether or not a participant had previously deployed, which prior research found to be related to increases in physical symptoms [29].

We next report the percentage of Veterans with musculoskeletal chronic pain who met criteria for CMI. To measure chronic pain we used the musculoskeletal category of the CMI measure (1

or more symptoms of joint pain, joint stiffness and muscle pain). We considered not including joint stiffness, but only 8 Veterans reported joint stiffness without joint or muscle pain. Chi-square analyses were conducted to understand the relationship of chronic pain to CMI. Chi-square analyses were also used to examine the relationship of CMI to PTSD symptoms at one year post-deployment and CMI to pre-deployment physical symptoms.

Finally, we were interested in the relationship of CMI to health function. We first graphically depicted health function scores for each subscale of the VR-36 at three levels of CMI (did not screen positive for CMI, mild to moderate CMI and severe CMI). We then used two analyses of covariance (ANCOVAs) to examine the relationship of CMI (no CMI, mild to moderate CMI and severe CMI) to a composite score of mental health function (Mental Health Component score or MCS) and a composite score of physical health function (Physical Health Component Score or PCS). Generally, a 2-3 point difference on these scores is considered clinically significant. In both models, we respectively controlled for the composite mental or physical health function score at pre-deployment and the physical symptom severity from the PHQ-15 at pre-deployment. Examining post-deployment health function while controlling for pre-deployment levels of health function, allows us to understand the relationship of CMI to post-deployment health function independent of pre-deployment levels. Similarly, controlling for pre-deployment physical symptoms allows us to understand the impact of symptoms that emerge after deployment (controlling for preexisting symptom severity) on health function. We also controlled for PTSD symptoms at one year post-deployment, age and gender, as these also are related to health function.

RESULTS

Prevalence of CMI. At one year after return from deployment, physical symptoms were assessed using the CDC measure of CMI; 46.7% reported physical symptoms consistent with

CMI and 10.8% reported symptoms consistent with severe CMI. Reporting physical symptoms consistent with CMI at one year after return from deployment was not related to gender ($\chi^2 = 1.49, p=0.47$) or to having deployed previously ($\chi^2 = 2.89, p=0.24$). Meeting CMI criteria was related to greater age ($r=.19, p<.01$).

Physical Symptoms in those with CMI. The prevalence of the ten chronic (duration ≥ 6 months) physical symptoms that define CMI at one year post-deployment are listed in Table 1 (in bold). The severity and duration of an additional 25 physical symptoms are listed in Table 1. The most common symptoms were difficulty sleeping (51%), being moody or irritable (50%), joint pain (46%), fatigue (40%), difficulty remembering or concentrating (40%), headaches (36.1%), sinus congestion (30%), hay fever or allergies (19.7%) and numbness or tingling (19.1%).

Relationship of CMI to Pain Symptoms. We compared the number of Veterans who reported chronic musculoskeletal pain symptoms (defined as reporting either joint pain, joint stiffness or muscle pain lasting 6 months or longer) to the number of Veterans who reported symptoms consistent with CMI. We found a total of 166 (52%) Veterans reported chronic musculoskeletal pain, and 150 of these Veterans or 90% of those with musculoskeletal pain also met criteria for CMI. Thus the vast majority of those reporting chronic musculoskeletal pain met criteria for CMI. Further, 82% of those who met criteria for CMI reported chronic pain ($\chi^2 = 291.83, p<.01$).

Relationship of CMI to PTSD. At one year post-deployment, almost all Veterans who reported symptoms consistent with PTSD also reported symptoms consistent with CMI or severe CMI ($\chi^2 = 47.27, p<.01$). Only seven (2.2%) Veterans reported symptoms consistent with PTSD but did not meet criteria for CMI. However, 140 (43.9%) Veterans met criteria for CMI (4.8% severe CMI) but not did not report symptoms consistent with PTSD (Figure 1).

Relationship to pre-deployment symptoms. Of the Veterans who provided responses at one year post-deployment, at pre-deployment, 162 (50.9%) reported minimal physical symptom severity, 112 (35%) reported low physical symptom severity, 38 (11%) reported medium physical symptom severity, and 6 (1%) reported high physical symptom severity.

Chi-Square analyses showed that soldiers who reported greater symptom severity at pre-deployment were more likely to report physical symptoms consistent with CMI one year post-deployment ($\chi^2=17.84$, $p=.01$; see Table 2). All of the soldiers who reported high symptom severity at baseline also met criteria for CMI at one year post-deployment. However, 150 (47%) of soldiers who reported minimal symptom severity (i.e., the lowest category) at baseline also reported physical symptoms consistent with CMI at one year post-deployment.

Relationship of CMI to Physical and Mental Health Function. Figure 2 depicts mental and physical health function at one year post-deployment for Veterans who did not screen positive for CMI, Veterans who screened positive for mild to moderate CMI and Veterans who screened positive for severe CMI. For reference, a 2 to 3 point difference on one of the subscales of the VR-36 is generally considered clinically significant. For each subscale, Veterans who screened positive for severe CMI reported functioning that was 10 points or more lower than that in soldiers who did not screen positive for CMI.

Two ANCOVAs were used to determine the relationship of CMI (no CMI, mild to moderate CMI, and severe CMI) to composite scores of mental (Table 3) and physical health function (Table 4). CMI was strongly related to physical health function one year after deployment after controlling for pre-deployment levels of physical health function and physical symptoms, and for PTSD symptoms at one year after deployment. CMI and mental health function were not significantly

associated after controlling for pre-deployment levels of mental health function and physical symptoms, and PTSD symptoms at one year post-deployment.

Discussion

Chronic pain is a significant problem for OEF/OIF Veterans. For some OEF/OIF Veterans, this chronic pain may be part of a larger multi-system syndrome, termed chronic multisystem illness (CMI). Using a prospective longitudinal study of OEF/OIF soldiers, we found that 49.5% of OEF/OIF Veterans met criteria for mild to moderate CMI at one year after deployment, and 10.8% met criteria for severe CMI. Almost all Veterans with chronic musculoskeletal pain also met criteria for CMI (90%). In this study, neither mild to moderate nor severe CMI were completely accounted for by PTSD or by pre-deployment levels of physical symptom severity. Further, Veterans who met criteria for either mild to moderate or severe CMI also reported clinically and statistically significantly worse physical health function than soldiers without CMI, even after controlling for pre-deployment physical health function and physical symptoms and PTSD symptoms at one year post-deployment. To put this in perspective, on average, soldiers with severe CMI had physical health function almost as low as civilians with chronic illness [30].

Our results suggest that for some, if not many, OEF/OIF Veterans with chronic musculoskeletal pain, their chronic pain may be part of a larger CMI. This has implications for pain management or treatment. Providers should consider asking about and addressing the other chronic symptoms of OEF/OIF Veterans. Prior research has found that when providers and patients' views on illnesses are non-concordant the patient is less adherent to treatment recommendations and less satisfied with their care [31]. For Veterans with chronic pain, treatments focused on chronic pain that ignore the Veterans fatigue or cognitive dysfunction may lead to poorer adherence and satisfaction. Management for Veterans with CMI may require going beyond traditional pain management approaches. For example, Cognitive Behavioral

Therapy is a recommended treatment for chronic pain. However, there likely needs to be greater tailoring of Cognitive Behavioral Therapy to the specific needs of Veterans with CMI [32]. This may include treatment to improve sleep, scheduling of pleasant activities around episodes of fatigue and cognitive remediation treatment.

After the Gulf War, there was a prominent focus on CMI (called Gulf War Illness) the associated poor functioning [7] and on the possible overlap of this syndrome with PTSD symptoms [16]. In contrast, the clinical focus for OEF/OIF Veterans has been on multiple diagnoses each of which can be associated with significant physical symptoms including: chronic pain, PTSD, mild traumatic brain injury, depression and poly-substance abuse ([16, 33-35]). Our study was limited in that we only assessed PTSD and pain symptoms and did not have measures of these other common post-deployment health conditions. However, it seems unlikely that unmeasured depression, mild traumatic brain injury and substance abuse can fully account for the physical symptoms observed here. First, depression and substance abuse frequently co-occur with CMI, but in prior studies, have not been demonstrated to account for the symptoms of CMI (for a review see [36]). Second, another possible candidate for the CMI, mild traumatic brain injury (TBI) also appears unlikely to fully explain the extent of CMI. Mild TBI is thought to impact approximately 15% of OEF/OIF Veterans and commonly co-occurs with PTSD, yet we found that 43% of OEF/OIF Veterans met criteria for CMI and did not meet criteria for PTSD. Thus, even if mild TBI had no overlap with PTSD there would still be an estimated 28% of our sample that met criteria for CMI but not for either PTSD or mTBI (i.e., 43% minus 15%). Future studies should measure the full range of possible comorbidities to better understand the relationship of CMI to each of these other post-deployment conditions.

There are several limitations of this study. Although the CDC definition for CMI is recommended by the Institute of Medicine, it is not without limitations. Most critically, there are no exclusion

criteria for the CDC definition, and thus conditions such as HIV, multiple sclerosis and rheumatoid arthritis may explain these symptoms for some of our participants. The relatively short timeframe between deployment and demonstration of CMI in this sample, however, suggests that the overlap with chronic conditions like these should not yet be very high. Second, this definition was developed based on symptom presentations in Gulf War Veterans. The symptoms we found to be most common were not necessarily those most commonly reported after the Gulf War suggesting that there may be a unique case definition of CMI for OEF/OIF Veterans that takes into account deployment-related factors that differ for these deployments. Other limitations include that we did not have a complete assessment of CMI symptoms pre-deployment, and thus had to rely on the PHQ-15-based measure of physical symptom severity at pre-deployment. We also did not have a validated measure of chronic musculoskeletal pain. Finally, by using a self-report measure of CMI we are capturing the number of soldiers in our sample who have symptoms consistent with CMI. An interview with a provider is necessary to determine the best diagnosis.

To our knowledge, this is one of the first studies of CMI in OEF/OIF soldiers. Our data suggest that many OEF/OIF Veterans are experiencing multiple chronic symptoms that meet criteria for CMI. Further, meeting CMI criteria is associated with lower physical health function to an extent that is likely clinically significant. Finally, the prevalence of CMI in this sample is not fully accounted for by either pre-deployment physical symptoms or PTSD. Because we did not use a diagnostic interview with a clinician, we don't know the best diagnosis for participants in this sample. However, our results suggest that clinicians should consider CMI when assessing OEF/OIF Veterans with post-deployment health concerns. This includes considering broader treatment strategies that encompass both pain management as well as attention to other bothersome symptoms such as fatigue, trouble sleeping or cognitive symptoms.

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Table 1: Percentage of OEF/OIF soldiers reporting symptoms with duration of greater than 6 months at one year after return from deployment. Bolded items are symptoms of Chronic Multisymptom Illness (CMI) from the CDC definition.

	Mild	Moderate	Severe	Total
1. Sinus Congestion	43 (13.5%)	38 (12%)	15 (4.7%)	96 (30%)
2. Headache	46 (14.4%)	35 (11%)	34 (10.7%)	115 (36.1%)
3. Fatigue	55 (17.2%)	50 (15.7%)	21 (6.6%)	126 (39.5%)
4. Joint Pain	51 (16%)	69 (22%)	28 (8.8%)	148 (46%)
5. Difficulty remembering or concentrating	60 (18.8%)	42 (13.2%)	25 (7.8%)	127 (39.8%)
6. Joint stiffness	40 (12.5%)	50 (15.7%)	18 (5.6%)	108 (33.9%)
7. Difficulty Sleeping	44 (13.8%)	68 (21.3%)	52 (16.3%)	164 (51.4%)
8. Gas, bloating, cramps or abdominal pain	20 (6.3%)	25 (7.8%)	10 (3.1%)	55 (17.2%)
9. Trouble finding words	34 (10.7%)	24 (7.5%)	15 (4.7%)	73 (22.9%)
10. Moody or irritable	65 (20.4%)	61 (19.1%)	36 (11.3%)	162 (50.8%)
11. Rash or sores	11 (3.4%)	11 (3.4%)	5 (1.6%)	27 (8.5%)
12. Numbness or tingling	31 (9.7%)	24 (7.5%)	6 (1.9%)	61 (19.1%)
13. Muscle Pain	31 (9.7%)	33 (10.3%)	7 (2.2%)	71 (22.2%)
14. Hay fever or allergies	27 (8.5%)	21 (6.6%)	15 (4.7%)	63 (19.7%)
15. Feeling depressed	48 (15.0%)	27 (8.5%)	16 (5.0%)	91 (28.5%)
16. Diarrhea (> 3 loose stool samples per 24 hours)	15 (4.7%)	14 (4.4%)	6 (1.9%)	35 (11%)
17. Sore throat	9 (2.8%)	3 (0.9%)	0 (0%)	12 (3.8%)
18. Cough	25 (7.8%)	8 (2.5%)	4 (1.3%)	37 (11.6%)
19. Feeling anxious	44 (13.8%)	43 (13.5%)	19 (6.0%)	106 (33.2%)
20. Unintentional Weight Gain greater than or equal to 10 lbs	24 (7.5%)	36 (11.3%)	15 (4.7%)	75 (23.5%)
21. Shortness of Breath	22 (6.9%)	17 (5.3%)	6 (1.9%)	45 (14.1%)
22. Chest Pain	15 (4.7%)	9 (2.8%)	3 (0.9%)	27 (8.5%)
23. Decreased interest in Sex	21 (6.6%)	15 (4.7%)	14 (4.3%)	50 (15.7%)
24. Dizziness or trouble maintaining balance	21 (6.6%)	9 (2.8%)	4 (1.3%)	34 (10.7%)
25. Night Sweats that soak the bed sheets	13 (4.1%)	14 (4.4%)	10 (3.1%)	37 (11.6%)
26. Fatigue lasting 24 hours after exertion	18 (5.6%)	11 (3.4%)	9 (2.8%)	38 (11.9%)
27. Nasal sores	4 (1.3%)	5 (1.6%)	0 (0%)	9 (2.8%)
28. Swollen lymph nodes	4 (1.3%)	2 (0.6%)	3 (0.9%)	9 (2.8%)
29. Milk intolerance	7 (2.2%)	8 (2.5%)	7 (2.2%)	22 (6.9%)
30. Episodes of disorientation	14 (4.4%)	5 (1.6%)	2 (0.6%)	21 (6.6%)
31. Nausea and Vomiting	8 (2.5%)	5 (1.6%)	3 (0.9%)	16 (5.0%)
32. Wheezing	6 (1.9%)	9 (2.8%)	1 (0.3%)	16 (5.0%)
33. Chemical Sensitivity	5 (1.6%)	6 (1.9%)	3 (0.9%)	14 (4.4%)
34. Fever	5 (1.6%)	3 (0.9%)	1 (0.3%)	9 (2.8%)
35. Unintentional weight loss >10 lbs	5 (1.6%)	1 (0.3%)	3 (0.9%)	9 (2.8%)

Table 2: Pre-deployment physical symptom severity (rows) and CMI status (columns) one year after deployment.

Baseline symptom severity	No CMI*	Mild to Moderate CMI*	Severe CMI*
Minimal physical symptom severity	85 (52.5%)	64 (39.5%)	13 (8.0%)
Low physical symptoms severity	40 (35.4%)	59 (52.2%)	13 (12.4%)
Medium physical symptom severity	11 (28.9%)	22 (57.9%)	5 (13.2%)
High physical symptom severity	0 (0%)	4 (66.7%)	2 (33.3%)

*n (percentage of individuals within each row at each level of CMI at one year after deployment)

Table 3: ANCOVA predicting physical health function one year after deployment (Adjusted $R^2=.25$)

	Mean Square	F	Sig.
Gender	.44	.01	.93
Age	431.50	7.55	.01
Pre-deployment physical functioning	1113.12	19.47	.00
Pre-deployment physical symptoms	.57	.01	.92
PTSD symptoms one year after deployment	654.40	11.45	.00
CMI one year after deployment	587.65	10.28	.00

Table 4: ANCOVA predicting mental health function one year after deployment (Adjusted $R^2=.48$)

	Mean Square	F	Sig.
Gender	170.41	2.14	.14
Age	114.73	1.44	.23
Mental health functioning pre-deployment	1392.74	17.50	.00
Physical symptoms pre-deployment	129.89	1.63	.20
PTSD symptoms one year after deployment	13464.31	169.16	.00
CMI one year after deployment	155.75	1.96	.14

Figure 1: Frequency of CMI, PTSD among OEF/OIF Soldiers one year after deployment

Figure 2: Physical and Mental Health Function subscales of the VR-36 at One Year Post-Deployment for Soldiers with no CMI, mild to moderate CMI, and severe CMI. Higher scores (y axis) indicate better functioning.