

Injuries and Illnesses of Vietnam War POWs Revisited: III. Marine Corps Risk Factors

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Operation Homecoming (O/H), the negotiated release of 566 US Servicemen held as prisoners of war (POWs) in Vietnam for as long as nine years, began in February 1973. During the months that followed, enemy forces released 138 Navy, 26 Marine Corps, 77 Army, and 325 Air Force Repatriated POWs (RPWs).

As a part of O/H, medical and psychological conditions of all repatriates were documented in the Initial Medical Evaluation Form (IMEF), a 400 page, 29 section, standard protocol. Berg and Richlin (1977) described the procedures and findings of the medical teams that examined and treated Marine Corps RPWs at Clark Air Force Base (Republic of the Philippines) and at 11 mainland Navy hospitals. Where appropriate, information was also presented concerning symptoms and conditions which occurred during captivity (as described in the history section of the IMEF).

Berg and Richlin emphasized documentation of the specific injury and illness diagnoses. The overwhelmingly most common diagnoses in the group were helminthiasis (96%), followed by refractive errors (58%), hearing impairment (46%), and peripheral nerve injury (31%). They noted that the consensus of physicians involved in O/H found that the Marine Corps RPWs were generally in good health, in fact, much better than the “worst case” actually planned. They also found limited evidence of either neuroses or “premature aging,” both of which have been noted among repatriates from previous wars.

We were interested in identifying risk factors that predisposed the RPW to various injuries and illnesses. In view of the small sample size of individual diagnoses, we evaluated the effects of captivity from the perspective of ICD9-CM diagnostic categories (i.e., systems level). From this perspective, the relationship between medical conditions observed at repatriation and various risk factors, also recorded in the IMEF, could be analyzed. These risk factors included age at time of captivity, length of captivity (months), length of solitary confinement (weeks), self-reported captivity medical problems, reported torture severity, and subjectively determined weight loss.

The purpose of this present study is to look at the relationship between the number of diagnosis at repatriation (i.e., IMEF) and various risk factors. We hypothesized that these risk factors would predict both the grand total of IMEF diagnoses across categories and the presence of any diagnoses within specific categories. This report, which addresses the Marine Corps RPWs, is the third in a series of four reports. The previous reports were devoted to Navy and Army RPWs and the final report will combine all three RPW groups for direct comparison.

Methods

Data from all 26 Marine Corps RPWs recorded in the IMEF were available for analysis. Prior to conducting our analyses, the completeness of the electronic database was verified by referring to individual microfiche copy of the original 400 page IMEF on each repatriate. All available information regarding diagnoses, age at time of captivity, length of captivity (months), length of solitary confinement (weeks), self-reported captivity medical problems, reported torture severity, and subjectively determined weight loss were verified. Next, each RPW ICDA-8 coded diagnosis was converted to an ICD9-CM category. We then tabulated the number of diagnoses per category, excluding diagnoses relating to Pregnancy and Certain Conditions Originating in the Perinatal Period (i.e., ICD9-CM codes 740-779), which were non-existent in our sample. All diagnoses were categorized and the sum across categories was equivalent to the number of diagnoses reported by Berg and Richlin (1977). The presence or absence of diagnoses within a category was also tabulated for each of the repatriates.

Statistical analyses were performed using SPSS version 19. Pearson correlations were obtained between the number of IMEF total diagnoses and the six risk factors, while Spearman correlations were

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14. ABSTRACT Operation Homecoming (O/H), the negotiated release of 566 US Servicemen held as prisoners of war (POWs) in Vietnam for as long as nine years, began in February 1973. During the months that followed, enemy forces released 138 Navy, 26 Marine Corps, 77 Army, and 325 Air Force POWs. The purpose of this present study is to look at the relationship between the number of diagnosis at repatriation (i.e., IMEF) and various risk factors. We hypothesized that these risk factors would predict both the grand total of IMEF diagnoses across categories and the presence of any diagnoses within specific categories.					
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obtained between risk factors and the non-normally distributed number of diagnoses within each category. The relative contribution of the six risk factors to the prediction of the total number of IMEF diagnoses was explored using linear regression (complete entry and statistically-based forward entry). Similar linear regressions were performed to predict self-reported captivity medical problems using the other five risk factors. After identifying those ICD9-CM diagnostic categories with a prevalence of 46 to 65 percent (conditions that were neither rare nor ubiquitous), logistic regression was performed to evaluate the effectiveness of the risk factors in predicting presence or absence of conditions within these categories.

Results

The descriptive statistics for the Marine Corps repatriates are presented in Table 1. These 15 Officers and 11 Enlisted men were, on average, nearly 26 years old at the time of capture and were held prisoner for approximately five and a half years, 51 weeks of which were spent in solitary confinement. During captivity, they were frequently tortured (mean = 32 on a 25-item IMEF scale with a maximum score of 75), lost an average of 26% of their pre-captivity body weight and reported having concerns about twelve medical problems during captivity (possible range 0 to 40).

Marine Corps repatriates received between 5 and 24 diagnoses at the time of repatriation (Table 2). The three ICD9-CM categories with the highest mean number of diagnoses within the Marine Corps cohort were Infectious, Nervous and Special Senses, and Respiratory (in descending order). The prevalence of any diagnosis in each of these categories ranged from 100% to 54% (Table 4). No Marine Corps repatriate had more than one diagnosis in four of the categories, but as many as two diagnoses were observed in the Mental category (overall prevalence of any Mental diagnosis was 39%).

As shown in Table 3, the total number of diagnoses at the time of repatriation was significantly correlated with only one of the six risk factors, with torture severity explaining the 24% of the variance (17%). Length of solitary confinement was significantly correlated with the number of ill-defined illnesses ($r = 0.464$, $r^2 = 0.215$). Age at the time of capture was significantly correlated with the number of diagnoses within both the Infectious category and the Injury/Poisoning category. The number of self-reported captivity medical problems correlated significantly only with number of actual IMEF diagnoses in the Infectious category. Length of Captivity and estimated percent Weight Loss were not significantly correlated with any diagnostic category, while length of solitary confinement correlated with only one category (Ill Defined). No risk factor accounted for more than 24% of the variance within any disease category.

Complete linear regression analysis predicting the number of IMEF diagnoses using all six risk factors (Table 5a) resulting in a nonsignificant equation that accounted for 32.2% of the variance. Statistical linear regression allowing the forward addition of predictors (Table 6a) accounted for 24.3% of the variance using only one of the risk variables (Torture Severity). In each of these two regression equations, the relative contribution of Torture Severity was equivalent as demonstrated by the partial correlations.

A similar approach was utilized to predict the number of self-reported captivity medical problems using the remaining five risk factors. For this prediction, complete linear regression analysis resulted in a nonsignificant equation that accounted for 27.3% of the variance (Table 5b). Follow-up statistical linear regression allowing the forward addition of predictors (Table 6b) did not produce a reliable equation.

The ability of the risk factors to predict the presence or absence of diagnoses in those five ICD categories with midrange condition prevalence: musculoskeletal (MUS: 65%), ill-defined (ILL: 58%), respiratory (RES: 54%), skin (SKN: 50%), and circulatory (CIR: 46%), was evaluated using logistic regression analysis (Table 7). No significant model was obtained for any category. The logistic regression model for ILL approached statistical significance, accounting for approximately 46.5% of the variance and accurately categorizing 69.2% of the Marine Corps repatriates (base rate accuracy = 57.7%). For ILL, only estimated Weight Loss approached statistical significance as an individual predictor ($p = 0.142$; $\text{Exp}(B) = 1.111$, with a 95% confidence interval from 0.965 to 1.280).

Discussion

To our knowledge, this study represents the first attempt to utilize captivity-related risk factors to predict repatriated POWs injury and illnesses, as measured by the number of diagnoses and the existence of categorical diagnoses. The strength of this study is a direct result of our access to the all of the original data obtained in 1973 (i.e., the IMEF). Early published reports described the observed illnesses and injuries in great detail, but did not attempt to exploit concurrently obtained risk factors to illness and injury.

The Marine Corps RPWs were, indeed, healthier than expected despite their lengthy and torturous captivity. After 55 months of captivity, an average of 12 captivity-related medical problems were subjectively reported by these men, while 12 diagnoses were made as a result of an extensive examination upon their repatriation. Berg and Richlin reported the most common diagnoses. When we categorized the 320 different diagnoses, the 4 most common ICD9-CM categories were consistent with Berg and Richlin's top diagnoses. The order of frequency, however, was slightly different.

As a result the small sample size, only torture severity correlated significantly with the total number of objective diagnoses at the time of repatriation. The total number of captivity-related medical problems subjectively reported by the Marine Corps RPWs did not predict the number of physician-made diagnoses. Despite our unique approach, there appear to be several limitations to this study including the small sample size, the restricted range of pathology, and the lack of comparison to repatriates from other services. We will attempt to address these issues in future studies.

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Table 1
USMC Demographics
(n = 26)

Variable	Min	Max	Mean	StdDev
Age_TOC	19	36	25.77	5.92
LOCm	4	87	54.92	22.97
LOSw	0	285	51.15	66.46
IMEF_tort	2	61	32.00	15.99
Weight Loss %	3.3	50.0	26.06	11.86
CapMedProbs	4	28	12.08	6.38
Percent Officer			57.70	

Table 2
USMC IMEF ICD Descriptives
(n = 26)

Variable	Min	Max	Mean	StdDev
Total # Diagnoses	5	24	12.31	4.17
Infectious	1	5	2.69	1.23
Neoplasms	0	1	0.15	0.37
Endocrine	0	1	0.19	0.40
Blood	0	1	0.04	0.20
Mental	0	2	0.42	0.58
Nervous & Senses	0	4	1.50	0.99
Circulatory	0	3	0.65	0.85
Respiratory	0	3	0.88	0.99
Digestive	0	3	0.15	0.61
Genitourinary	0	2	0.23	0.51
Skin	0	3	0.73	0.92
Musculoskeletal	0	3	1.00	0.89
Congenital	0	1	0.15	0.37
Ill Defined	0	3	0.85	0.88
Injury Poisoning	0	7	3.00	0.28

Table 3
USMC Correlations
(n = 26)

Variable	Age_TOC	LOCm	LOSw	IMEF_tort	Weight Loss %	CapMedProbs
Total # Diagnoses	0.242	0.119	0.073	0.493	0.131	0.137
Infectious	-0.453	-0.117	-0.264	-0.088	-0.184	0.394
Neoplasms	0.308	0.356	0.172	0.021	0.213	0.179
Endocrine	0.066	0.130	0.039	0.065	0.228	0.039
Blood	0.081	-0.334	-0.268	-0.174	0.280	0.054
Mental	-0.061	0.257	-0.126	-0.016	-0.280	-0.115
Nervous & Senses	-0.155	-0.091	0.003	-0.019	-0.093	-0.021
Circulatory	0.047	-0.248	0.298	0.143	0.299	0.079
Respiratory	-0.300	-0.214	-0.006	0.037	-0.053	0.169
Digestive	0.118	-0.131	-0.005	0.101	-0.214	-0.096
Genitourinary	-0.043	0.166	-0.105	-0.009	-0.115	-0.228
Skin	-0.126	0.072	-0.115	0.227	-0.357	-0.301
Musculoskeletal	0.301	-0.179	-0.126	0.020	-0.065	-0.227
Congenital	-0.021	0.150	0.021	0.192	0.092	0.136
Ill Defined	0.009	0.326	0.464	0.221	0.187	0.140
Injury Poisoning	0.488	0.039	0.345	0.448	0.312	0.146

BOLD = Significant

Table 4
USMC IMEF Any Categorical Diagnosis
(n = 26)

Variable	Presence (%)
Infectious	100.0
Neoplasms	15.4
Endocrine	19.2
Blood	3.8
Mental	38.5
Nervous & Senses	88.5
Circulatory	46.2
Respiratory	53.8
Digestive	7.7
Genitourinary	19.2
Skin	50.0
Musculoskeletal	65.4
Congenital	15.4
Ill Defined	57.7
Injury Poisoning	88.5

Table 5
USMC Complete Regressions
(n = 26)

a. IMEF $R^2 = 0.322$ $SEE = 3.94$ $p = 0.230$

	B	Std Error	Beta	p	part
(Constant)	6.356	4.088	n/a	0.136	n/a
Age_TOC	0.166	0.165	0.235	0.327	0.190
LOCm	-0.010	0.041	-0.056	0.807	-0.047
LOSw	-0.033	0.015	-0.052	0.835	-0.040
IMEF_tort	0.168	0.065	0.643	0.019	0.485
Weight Loss %	-0.123	0.099	-0.349	0.229	-0.235
CapMedProbs	0.020	0.145	0.031	0.890	0.027

b. CapMedProbs $R^2 = 0.273$ $SEE = 6.08$ $p = 0.234$

	B	Std Error	Beta	p	part
(Constant)	7.167	6.101	n/a	0.254	n/a
Age_TOC	-0.215	0.250	-0.199	0.400	-0.164
LOCm	0.073	0.062	0.262	0.252	0.225
LOSw	-0.040	0.022	-0.419	0.081	-0.350
IMEF_tort	0.088	0.099	0.221	0.384	0.170
Weight Loss %	0.218	0.145	0.405	0.148	0.287

Table 6
USMC Forward Regressions
(n = 26)

a. IMEF $R^2 = 0.243$ $SEE = 3.71$ $p = 0.010$

	B	Std Error	Beta	p	part
(Constant)	8.187	1.652	n/a	<0.001	n/a
Torture	0.129	0.046	0.493	0.010	0.493

b. CapMedProbs No Variables Entetred Into The Equation

Table 7
USMC Logistic Regression

	MUS	ILL	RES	SKN	CIR
Baseline % Correct	0.654	0.577	0.538	0.500	0.538
Equation % Correct	0.615	0.692	0.654	0.615	0.692
% Difference	-0.039	0.115	0.116	0.115	0.154
False Positives	6	4	5	5	3
False Negatives	4	4	4	5	5
PPV	0.68	0.73	0.67	0.62	0.70
NPV	0.43	0.64	0.64	0.62	0.69
Model Significance (p)	0.477	0.087	0.831	0.166	0.353
Nagelkerke R-Square	0.265	0.465	0.137	0.395	0.302