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Summary

Problem

The Medical Readiness and Strategic Plan 1998-2004 requires that the military services address the issue of patient stream specification in terms of Patient Condition (PC) codes. Determination of the likely distribution of injuries and illnesses during combat operations is essential to the assessment of the needed medical resources required at the various levels of medical care.

Objective

To provide the composition of the projected patient streams for various operational theaters in a format compatible with the requirements of military medical models.

Approach

Separate methodologies were employed to project PC code percentages for wounded in action (WIA), non-battle injury (NBI), and disease admissions. The WIA methodology is based on determination of the percentages of various injury types and the anatomical locations of those injuries during previous combat operations. The NBI methodology similarly projects PC code percentages based on observed injury types and anatomical locations, but it also makes adjustments for environmentally dependent injuries like heat or cold injuries that are included in the PC nomenclature. For the Disease methodology, diagnoses were mapped into PC clusters, and then the percentage for each PC code within a given cluster was estimated. Peacetime disease data were examined to make adjustments for both regional differences and changes in incidence distributions occurring since the combat operations that formed the baseline data.

Results

Projections of PC codes are provided for more than 300 patient conditions for three operational theaters: Europe, Northeast Asia, and Southwest Asia.

Conclusions

Empirical hospitalization data from previous combat operations, when supplemented by recent peacetime hospitalization data from various regions of the world, provide a mechanism for estimating the PC code distributions needed by military medical models.

Projection of Patient Condition Code Distributions During Ground Combat Operations

Forecasting of medical resource requirements during combat operations is contingent upon obtaining reliable estimates of the likely casualty occurrences. The estimates needed include 1) a determination of the overall wounded in action (WIA) and disease and non-battle injury (DNBI) incidence rates expected to be incurred by the deployed forces, and 2) an ascertainment of the distribution of the injuries and illnesses of which the patient streams are likely to be composed. This information on the magnitude and distribution of the various patient flows allows medical planners to determine the amount and composition of medical staff, equipment, and supplies that are required for an operation.

Previous work has led to the development of the FORECAS ground casualty forecasting system. The FORECAS system provides projections of the overall WIA and DNBI incidence presenting at combat zone treatment facilities.[1] However, the distribution of illnesses and injuries that comprise these patient streams also needs to be determined. The Medical Readiness Strategic Plan (MRSP) 1998-2004[2] specifically requires that the military services address the issue of patient stream specification. The objective of the present investigation, then, was to determine the composition of the projected patient streams in terms of specific Patient Condition (PC) codes for various theaters of operation. PC codes are the accepted diagnostic nomenclature for military medical models.

Determination of the likely distribution of injuries and illnesses requiring treatment is essential to the assessment of the resources required at the various medical facilities. These distributions are required input to the Deployable Medical Systems (DEPMEDS) project, which was initiated to provide a standard deployable hospital system for the services. This system consisted of deployable medical assets in the form of modular assemblages of standardized equipment and supplies.[3] The Time-Task-Treater database is a key component of this system and is specifically used to estimate requirements based on the resources needed to treat individual PC codes. Similarly other medical models, such as the Medical Analysis Tool (MAT),[4] which generates bed and staffing requirement estimates and medical supply shortfalls, utilize the same casualty rate and PC distribution information. For the medical resource needs estimates to be

accurate, it is essential that the set of PC codes be comprehensive and that the expected rate of occurrence of each condition be accurately derived.

Methodology

Empirical hospitalization data from US combat operations over the past half century provide a rich informational source to aid in estimating the types of diseases and injuries that would occur in a present-day combat scenario. A major drawback of the historical data, however, is that they were reported in different diagnostic formats than those required by the current medical resource models. As previously noted, the medical models require input in the form of PC codes, a system of more than 300 possible medical conditions to which treatment resources are tied. Data available from ground operations during World War II[5] and Korea,[6] for instance, were reported in broad diagnostic category format, while medical data from Vietnam[7] and the Gulf War[8] were reported in ICD (International Classification of Diseases) format.

A further complication associated with using empirical data from past operations is that much has changed on the battlefield over the decades that may affect the types of illnesses and injuries incurred. Weapons of potential adversaries have changed, prophylactic medicine has evolved, and a higher percentage of support troops are composed of women than in the past. Each one of these factors potentially has an impact on the distribution of admission types during ground operations and must be considered when using data from previous military engagements. Additionally, DNBI distributions may vary with geographical theater of operations, and this factor must also be considered when providing PC distribution input for use in medical models.

As part of the process to address the aforementioned considerations, separate methodologies were developed to estimate PC code distributions for WIA, NBI (Non-Battle Injury), Disease, and Battle Fatigue - all required inputs to medical models. Broadly speaking, the WIA PC code methodology is based on the injury types and anatomical location of injuries sustained in previous operations. The NBI methodology is similarly based on previously incurred injury types and anatomical regions, but it also includes adjustments for environmentally dependent injuries like heat and cold injuries that are required by the medical models. The Disease PC distribution methodology first maps empirical disease data into PC *clusters*, as defined by Joint Readiness Clinical Advisory Board (formerly the Defense Medical Standardization Board), and

then estimates the incidence percentage for each PC code within a cluster. The PC disease clusters are eleven broad categories of illness grouped largely along resource requirement lines. Individual PCs falling within a specific cluster, the dermatological cluster for instance, would be likely to use somewhat similar resources, even if those resources varied in amount. The specific methodologies used for estimating the PC code distributions of WIA, Battle Fatigue, NBI and Disease are discussed in greater detail in the sections that follow.

WIA Methodology

The first step was to examine the casualty data from previous operations[5-9] and compute the percentages of the overall WIA accounted for by various traumatisms. These percentages are displayed in Table 1. For each operation shown in the table, the casualties falling into the eight main traumatism groups were adjusted to total 100%, omitting the "Other" group. The Other category consisted of admissions due to poisonings, supplemental classifications, unknown injuries, and complications from surgery; this category was omitted because of a lack of PC code equivalency.

Reviewing the data in Table 1, one can see clear patterns in the traumatism distribution among the operations. For example, Wounds is the most frequently occurring category for all operations, and Fractures is the second most frequent. Because of this overall consistency across operations, it was determined that the distributions could be combined into an overall distribution useful for planning. However, statistically significant differences were observed when comparing the traumatism percentages of each operation (X^2=19935, df=35, $p<.001$). Further inspection of Table 1 reveals some of these differences. The percentage of Wounds varied from 55.1% in Panama to 81.0% in the Falklands. The occurrence of Fractures ranged from 7.7% (Falklands) to 26.5% (Panama). Because of these important differences in the frequency of occurrence among operations, it was decided to give more weight to some operations than to others.

Specifically, weights for operations were determined by combining ratings on three factors: operational relevance, data stability, and data recency. Each operation received a dichotomous score (0 or 1) on these three factors corresponding to its perceived value in projecting hospitalization distributions of future operations. First, World War II (WWII), Korea, Vietnam

and Desert Storm received a "1" for "operational relevance" because those distributions were obtained from larger-scale, conventional ground combat conflicts as opposed to smaller-scale, brief operations, or to conflicts that were not primarily ground operations. Second, dichotomous values reflecting the "data stability" of the distributions of each operation were assigned. WWII, Korea, and Vietnam were each assigned "1" for data stability because their corresponding distributions were based on very large numbers of admissions (all greater than 50,000); Falklands, Panama, and Desert Storm distributions were all based on fewer than 250 admissions each, and hence received the lower of the two dichotomous values. Third, dichotomous values were assigned corresponding to the "data recency" of each past operation. Falklands, Panama, and Desert Storm received the higher dichotomous rank for data recency because they were more recent operations; therefore, these distributions would be more representative of contemporary weapon effects than operations of the more distant past.

	Operational Relevance	Data Stability	Data Recency	Combined Score
WWII	1	1	0	2
Korea	1	1	0	2
Vietnam	1	1	0	2
Falklands	0	0	1	1
Panama	0	0	1	1
Desert Storm	1	0	1	2

The above combined scores were then summed and weights were derived according to each operation's percentage of that sum. Correspondingly, the derived weights were:

$$\textbf{\textit{Weighted Average}} = (20\% * WWII) + (20\% * Korea) + (20\% * Vietnam) + (20\% * Desert\ Storm) + (10\% * Falklands) + (10\% * Panama)$$

Assigning these weights to the traumatism category percentages observed in the empirical data yielded the weighted averages displayed in the far right column of Table 1.

The next step was to determine for each of the traumatism categories the distribution of the anatomical location of the injuries. Empirical data detailing anatomical location distributions of WIA admissions were available for Vietnam and WWII operations. These data were obtained from the ICD diagnoses recorded in the hospitalization records of Marines admitted during the Vietnam War[10] and from "Medical Statistics in WWII," by the Office of the Surgeon General, Department of the Army.[5]

Overall anatomical region percentages were computed by weighting the Vietnam data percentages twice that of the WWII anatomical percentages due to the greater recency of the Vietnam data. This weighting scheme was used for the categories of Amputations, Burns, Dislocations, Sprains/Strains, and Wounds (nonmultiple). Only WWII data were available for the anatomical locations of crush injuries and consequently were the sole basis of the anatomical location percentages within that category.

While data from both operations identified fractures by anatomical location, only the WWII data differentiated between open and closed fractures. Because the PC code nomenclature distinguishes between open and closed fractures, it was necessary to group the anatomical distribution of fractures by the open/closed classification. To estimate the open and closed fracture distributions by location for Vietnam, ratios were calculated for each anatomical region based on the WWII data. The open fracture ratio was calculated by dividing the number of open fractures by the number of overall fractures for each anatomical location. Similarly, the closed fracture ratio was set equal to the number of closed fractures for an anatomical location divided by the combined number of fractures for that location. These two ratios were then applied to the percentage of overall fractures for each anatomical location during Vietnam to obtain the estimated closed fracture and open fracture distributions for that conflict. Finally, the WWII anatomical region percentages for fractures and the derived percentages for Vietnam were weighted equally in obtaining projected anatomical locations for the Fracture traumatism category.

The final traumatism category for which anatomical regions needed to be determined was that of Multiple Injury Wounds (MIW). The first step in determining the percentages within this category was to examine the individual anatomical regions that make up the specific MIW PC codes. PC code 159, for instance, represents a combination of wounds to the thorax and the head (see Appendix A). Accordingly, the percentages for these two anatomical regions within the nonmultiple Wounds category were examined. As shown in Table 2, the percentages from the weighted WWII and Vietnam Wound category data were 6.3% (thorax) and 5.4% (head). These two percentages were summed and the MIW PC percentage was then computed by dividing this sum into the total of the anatomical region percentages summed over all of the MIW PC codes.

Table 2 presents the projected percentages of anatomical regions within each WIA traumatism category. As described in the preceding methodology, all of the percentages are based on actual percentages observed in previous combat operations. These percentages were derived from weighted averages found in Table 1, adjusted for the fact that MIWs comprised an average of 27% of overall wounds for both Vietnam and Desert Storm.[7,8]

The final step in the WIA projection methodology was to derive the individual PC code distributions from the traumatism/anatomical region data. As can be seen from the descriptions in Appendix A, the PCs most typically describe a specific injury and the region of the body to which the insult occurred. For example, the specific PC codes associated with various amputations, and their respective percentages of that trauma category are shown below:

Hand	28.1%	⇒	PC 69
Above knee	26.0%	⇒	PC 147
Below knee	20.2%	⇒	PC 145
Foot	17.8%	⇒	PC 144
Forearm	6.4%	⇒	PC 70
Full arm	1.4%	⇒	PC 71
Hip disarticulation	0.0%	⇒	PC 146
	100.0%		

Table 2 also shows in parentheses the weighted percentages for each traumatism category relative to overall admissions. For example, the percentage of the total admissions represented by the amputation category is projected at 2.21%. Each individual PC code percentage is computed as the product of the "traumatism type" percentage times the "anatomical region" percentage.

*Probability (amputation PC code) = P (amputation category) * P (anatomical location of amputation)*

P (PC 69)	*= 2.21% **	*28.1%*	=	*0.62%*
P (PC 147)	*= 2.21% **	*26.0%*	=	*0.57%*
P (PC 145)	*= 2.21% **	*20.2%*	=	*0.45%*
P (PC 144)	*= 2.21% **	17.8%	=	0.39%
P (PC 70)	*= 2.21% **	*6.5%*	=	*0.14%*
P (PC 71)	*= 2.21% **	*1.4%*	=	*0.03%*
				2.21%

In the preceding example, there was a straightforward correspondence between the PC codes and the 'traumatism by anatomical location' combinations available from the empirical data. However, for many other PC codes there is not a one-to-one correspondence with categories from the empirical data; often, there are multiple PCs that correspond to a single "traumatism by location" combination. By way of example, within the burns category (1.76% of total admissions) seen in Table 2, one of the anatomical locations is "head," and this subcategory represents 34.4% of the overall category. However, as seen in Appendix A, within the PC code schemata there are six individual PCs which correspond to this "traumatism by anatomy" (burns-head) combination: PC 35 through PC 40. So, the strategy was to allocate the percentage for this burn-head subcategory among these six PC codes. The expected ratios of these burns to one another were determined by using the ratios derived by the Defense Medical Standardization Board Subject Matter Expert panel.[4] These percentages were then applied to the overall 0.60% of total admissions (34.4% of 1.76% = .60%) represented by "burns to the head" to determine the individual percentages for PC codes 35 through 40. This same strategy was employed wherever there were multiple PCs emanating from a single "traumatism by anatomical location" combination.

Table 3 displays the PC codes associated with the various traumatism subcategories and how the PCs are distributed within those subcategories. For instance, it can be seen that, of the projected incidence of amputations above the knee, 100% are funneled into Patient Condition code 147 – there are no other relevant PCs for this type of traumatism. However, among the projected frequency of 'burns-head," there are multiple PCs into which the overall incidence of this traumatism will funnel. Of the projected incidence for this traumatism, 2% will be mapped into PC 35, 33% into PC 36, 11% into PC 37, 31% into PC 38, 6% into PC 39, and 17% into PC 40.

Battle Fatigue Methodology

The second category for which PC codes needed to be distributed was Battle Fatigue. The medical models require that battle fatigue incidence rates be distributed across eight PC codes within the Battle Fatigue category. Because limited empirical data were available, the percentages assigned to each of these eight codes were based on the percentages developed by

the Defense Medical Standardization Board Subject Matter Expert panel,[11] shown in Appendix B.

NBI Methodology

The third category of medical conditions for which it was necessary to distribute PC codes was Non-Battle Injuries (NBI). The method utilized for estimating the distribution of PC codes within NBI traumatism categories was similar to that used within the WIA categories. Non-battle injury data from previous operations were first examined, then the casualties that occurred within each of eight traumatisms categories were determined and weighted averages were computed.

Military medical models also require projections for two categories of NBI beyond the conventional traumatism classifications. These categories "environmentally dependent injuries" and "miscellaneous injuries," include heat-related injuries; cold-related injuries; and bites, stings, and blisters. Following the determination of the NBI percentage that corresponded to each traumatism group, the traumatism category percentages were apportioned according to the distribution of non-battle injuries by each anatomical location. From there, the individual PC codes that corresponded to each "traumatism by anatomical location" grouping were determined.

The first step was to estimate the NBI distribution for all of the conventional injury type classifications. Non-battle injury data from previous combat operations were compiled for the same eight traumatism groups used in the WIA methodology. Comparison of Table 1 with Table 4 shows a somewhat different pattern for NBI casualties compared with WIA -- most notably, Sprains/Strains account for a higher percentage of NBI casualties than WIA, and the percentage corresponding to Wounds is significantly lower.

Further inspection of Table 4 reveals a number of similarities in NBI incidence across the operations. For all six operations, Fractures, Sprains/Strains, and Wounds account for 75% of NBI casualties; among four of the operations, Fractures represented the lowest percent of incidence of these three traumatisms.

However, as found for the WIA distributions, statistically significant differences existed between the NBI distributions of the various operations ($X^2 = 84635$, $df = 35$, $p<.001$). For

example, the percent of Sprains/Strains ranged from 7.5% in Zagreb to 37.8% in the Falklands, while the occurrence of Fractures varied from 21.6% in WWII to 45.8% in Zagreb. So again, different weights were applied to the various operations to most accurately reflect the expected NBI distributions of future operations. Three factors were selected for this purpose: data stability, data recency, and data descriptiveness. The data stability and data recency factors were scored as previously described for the WIA distribution. For data descriptiveness, only the hospitalization data from the Vietnam War contained detailed diagnoses and a secondary indicator (cause code) by which to verify that this was indeed an NBI. Data from the other operations were merely categorized as battle wounds or NBIs, and there were no associated "cause codes" with which to verify the source of the injury.

	Data Stability	Data Recency	Data Descriptiveness	Combined Score
WWII	1	0	0	1
Korea	1	0	0	1
Vietnam	1	0	1	2
Desert Storm	0	1	0	1
Falklands	0	1	0	1
Zagreb	0	1	0	1

The above combined scores were then summed, and weights were derived according to each operation's relative percentage of that sum. Correspondingly, the derived weights were:

Weighted Average = *(25% * Vietnam) + (15% * Desert Storm) + (15% * WWII) + (15% * Korea) + (15% * Falklands) + (15% * Zagreb)*

Table 4 indicates the distribution of NBI types for previous combat operations and displays the weighted average for each category.[5,6,9-10,12]

Projected traumatism group percentages for the various operational theaters were based on the assumption that NBI group percentages reflect minimal regional variation. However, because the overall NBI category is also composed of environmentally related conditions (heat, cold injuries) and miscellaneous conditions (stings, bites) that do show regional variation, there are some differences in regional percentages corresponding to the eight major NBI traumatism categories. The percentages of heat-related injuries for Europe are based on empirical data from the European theater during WWII. Northeast Asia was assigned a similar percentage of these types

of injuries as Europe (no empirical data existed for heat-related injuries in the Korean War), and the percentage observed during the Vietnam conflict was assigned to the Southwest Asia region. For cold-related injury estimates, the percentages observed during WWII European operations, Korean War operations, and the Vietnam War operations were used as estimates for the Europe, Northeast Asia, and Southwest Asia regions, respectively. For the "bites and stings" grouping within the miscellaneous category, empirical data from WWII were used for the European theater, and this percentage was adjusted slightly upward for Northeast Asia and again for Southwest Asia.

The "Other" category of miscellaneous injuries represented by the PC codes included blisters, toxic inhalation and white phosphorus burns. Limited empirical data were available detailing these injuries during past operations, and therefore, the projections were set as a constant across geographical regions. The percentage for toxic effects was estimated at 1.19%, which was based on the admissions observed during the Vietnam War. The expected percentage for blisters was set at 1.03%, 75% of the proportion observed during World War II. Both the environmentally related and miscellaneous category percentages are seen in Table 5. Table 6 shows the major NBI traumatism category percentages, adjusted for the expected environmental and miscellaneous NBI occurrences, for the three operational theaters.

The next step in the NBI methodology was to project the injury distribution by the anatomical region for the eight main traumatism groups. Again, the method used was very similar to that employed to distribute the battle injuries across anatomical regions. However, the NBI empirical data by anatomical region was available only for Vietnam War operations. However, the Vietnam War data did not distribute crush injuries by anatomical location, so this traumatism category was distributed across anatomical regions in accordance with percentages developed by the Defense Medical Standardization Board Subject Matter Expert panel.[4]

The only other deviation from the empirical anatomical region data was for the category of Fractures. While the Vietnam War data did include anatomical region percentages for fractures, it did not make any distinction between open and closed fractures. Conversely, while the WWII and Korean War data did not indicate the injury proportions by anatomical region, those two data sets did distinguish between the percentage of fractures that were open and those that were closed. Based on an average of WWII and Korean Operations, 30.0% of all NBI fractures were

estimated to be open fractures. [5,6] Then, applying this percentage to the Vietnam War data, estimates were made by anatomical location for both open and closed fractures.

Table 7 displays the estimated distribution of anatomical locations for each of the eight NBI categories. It can be seen from this table that Wounds is the most prevalent anticipated traumatism category, and that the most prevalent anatomical region within that category is "leg". Table 8 indicates how the percentages are distributed across the PC codes for the NBIs. Where there is more than one PC code corresponding to an "injury by anatomical location" grouping, the same methodology was used as with distributing across the WIA PC codes.

Disease Methodology

The last category of medical admissions for which percentage distributions are required is that of Disease. As with the WIA and NBI estimates, the Disease methodology used a weighted average across historical operations to obtain an estimate of the percentage distribution for the various disease categories. However, because disease percentages vary by geographical region, a somewhat different approach was taken for the disease distribution estimates than was used in projecting combat wound and NBI distributions.

The first step taken was to determine the percentage distribution of disease category admissions that occurred during operations in four separate geographical regions: the Korean War, the Vietnam War, the Gulf War, and the UN peacekeeping operation in Zagreb, Croatia. Table 9 displays the ICD category percentages of admissions for troops deployed during these four operations.[6,8,12,13] As can be seen, the categories of Infective/Parasitic, Respiratory, Digestive, Skin/Subcutaneous Tissue, and Symptoms and Ill-Defined Conditions each constituted a substantial proportion of the overall admissions for each of these military operations.

Because the combat operation disease distributions are based on conflicts with relatively small numbers of admissions (Gulf War, UN operation in Zagreb) or are based on data that may be somewhat outdated due to changes in medical technology since the conflicts (Korea, Vietnam), this disease data was supplemented by recent peacetime disease distributions. Table 10 is a presentation of the disease category distributions among US troops stationed in three geographical regions: Europe, South Korea, and Turkey. These regions were selected to

correspond to distributions needed for Europe, Northeast Asia and Southwest Asia theaters. The data in Table 10 represent admissions of active-duty male personnel deployed to these regions between 1991 and 1995[14]; hospitalization distributions of female personnel are addressed later.

To obtain the projected disease distribution during combat for each of the three theaters, an average of the distributions observed during the aforementioned combat deployments was derived, with additional weight given to the distribution occurring in the theater of interest. The disease category percentages observed during the combat operations were first adjusted to reflect regional variations in disease distributions observed during recent peacetime deployments. Specifically, the disease distributions for each theater were determined as follows:

A = operational theater of interest (theater being projected for)
B = second operational theater
C = third operational theater

Projected distribution for A = (1/5) * [2*Adj(WA) + Adj(WB) + Adj(WC) + (VN)]

where,

WA = wartime distribution observed during conflict in theater A
WB = wartime distribution observed during conflict in theater B
WC = wartime distribution observed during conflict in theater C
VN = wartime distribution observed during the Vietnam War

and,

$Adj(WA) = WA + M*(PA-PD)$
$Adj(WB) = WB + M*(PA-PB)$
$Adj(WC) = WC + M*(PA-PC)$

where,

PA = peacetime distribution for region associated with theater A, the theater of interest
PB = peacetime distribution for region associated with theater B
PC = peacetime distribution for region associated with theater C
PD = average of PB and PC = (PB+PC)/2
M = multiplier for each theater

*For Adj(WA): M = sqrt [WA * ((1-PA-PD) /(PA+PD))]*
*For Adj(WB): M = sqrt [WB * ((1-PA-PB) /(PA+PB))]*
*For Adj(WC): M = sqrt [WC * ((1-PA-PC) /(PA+PC))]*

These computations allow the greatest weight in the projected disease distribution to be placed on the empirical combat data, while at the same time permitting adjustments to reflect differences in regional disease incidence distributions. Taking square roots is a well-known

technique to stabilize the variance,[15] allowing for dampening of possible large differences between a distribution obtained from the empirical wartime data and one of the distributions observed during the peacetime deployments.

A modification to this methodology was made for the mental disorders category. Because the incidence of psychiatric problems during combat was surmised to have limited correlation with the actual incidence of mental disorders during peacetime, a percentage for mental disorders was calculated equal to the average proportions of mental disorders observed during the Korean, Vietnam, Zagreb, and Desert Shield operations. This obtained average value, 6.06%, was applied to all the geographic regions.

Table 11 shows the estimated ICD category percentages for combat troops in Europe, Southwest Asia, and Northeast Asia. These estimations are based on the exclusion of NBIs, pregnancies, perinatal, congenital disorders, and supplementary classifications.

Once these ICD category percentages were determined, the next step was to map them into PC cluster percentages. The disease PC clusters include the following categories: Infectious/Parasitic, Gastrointestinal, Dermatological, Respiratory, Neuropsychiatric, Sexually Transmitted Disease, Eye/Ear, Genitourinary, Surgical, Cardiovascular, and Miscellaneous.

The hospitalization diagnoses recorded for all combat zone disease admissions of Marines in Vietnam were reviewed and summarized, and the PC cluster to which each ICD diagnosis best mapped was determined. Table 12 shows the mapping from ICD categories to PC clusters. While there are considerable parallels between the two diagnoses formats (PC and ICD), it is noted that there is not a one-to-one correspondence between the hospital record categories and the PC clusters. As can be seen in Table 12, the diagnoses that fell within the ICD category of Infectious/Parasitic diseases mapped to five separate PC clusters: Infectious/Parasitic, Gastrointestinal, Dermatological, Respiratory, and Sexually Transmitted Disease. This table indicates that 73% of the diagnoses recorded within the ICD category of Infectious mapped to the Infectious/Parasitic PC cluster, while 19% mapped to the Gastrointestinal PC cluster, 4% to the Dermatological cluster, and 2% each to the Respiratory and Sexually Transmitted Disease clusters. The Infectious/Parasitic PC cluster was decreased because of advances in medicine since the time of the Vietnam hospitalizations and because the three regions for which our

projections apply would be expected to have a lower percentage of infective disorders than that observed in the Vietnam theater of operations from which the baseline was derived. Thus, this PC cluster was adjusted downward and the other major PC clusters increased proportionally.

Additionally, some ICD categories, such as Endocrine and Blood Diseases, did not translate well to PC clusters; these admissions were omitted from the distribution projections. Table 12 also indicates that 80% of the diagnoses within the ICD category of Symptoms/Ill-Defined Conditions provided scant information upon which to base the mapping to PC clusters. Therefore, the diagnoses within this category were distributed across the Respiratory, Gastrointestinal, Dermatological, and Infective/Parasitic PC clusters in proportion to the percentages that these major categories represented relative to each other. Applying the mapping of ICD categories to PC clusters shown in Table 12 to the regional disease category distributions seen in Table 11 yielded the PC cluster projections presented in Table 13.

The percentages projected thus far are based on empirical data of male combat troops; thus, these category percentages need to be adjusted, if warranted, for differences between combat and support troops, and for differences between male and female personnel. Empirical data contrasting the disease distributions of combat and support troops during the same military operation were limited. However, data from the Korean War[6] did include disease incidence distributions by ICD category for both combat and support troops. These data suggested that differences in disease category distributions between combat and support troops were minor and did not warrant further adjustment.

Because of the relative lack of data for female troops in previous combat operations, peacetime deployment data from 1991 to 1995 were analyzed to assess any differences in illness distributions between male and female personnel. Differences were found to exist, and the distribution of disease categories for female troops is shown in Table 14. Accordingly, the estimated disease distributions for female troops were calculated using the combat troop data, adjusted by the differences between the male and female peacetime data. The percentages were derived as follows:

A = operational theater of interest (theater being projected for)

Projected distribution for female support troops in theater A = CMA + M(PFA – PMA)*

where,

CMA = projected disease distribution for male combat troops in theater A
PFA= peacetime disease distribution for females in theater A
PMA = peacetime disease distribution for combat troops (males) in theater A
M = multiplier for each theater

The multiplier is similar to the one previously introduced to estimate the combat troop distribution. For theater A:

*M = sqrt [CMA * ((1-PFA-PMA) /(PFA+PMA))]*

As with the male troops, the estimate for the mental disorder category proportion among female support troop casualties was set as a constant value equal to the average projected percentage across all three regions. Table 15 shows the percentage distribution by ICD category for diseases among female support troops. Applying the ICD categories to PC clusters mapping shown in Table 12, estimates were then derived for the PC cluster percentage distribution among the female support troops. These estimates are shown in Table 16.

Individual Patient Condition Codes

The last step in the disease methodology was to distribute the incidence percentage for each PC code within the various PC clusters. Having already determined which individual ICD codes mapped to each PC cluster, a determination was then made of which PC code(s) in that cluster best matched each of the ICD diagnosis codes that had gone into that cluster. For example, the ICD diagnosis of influenza was funneled to the Respiratory PC cluster, and then mapped into PC code 240, "acute respiratory disease, moderate." If there was not a direct one-to-one match between the ICD code and a specific PC code in the cluster, the particular ICD code was mapped across several PC codes. Where the PC codes called for distributing an ICD diagnoses into two PC codes that differed only by a severity rating, the Defense Medical Standardization Board Subject Matter Expert panel data was used to determine the relative percentages for those diagnoses.[4] Percentages corresponding to ICD diagnoses where there was no PC equivalent were distributed proportionally across the existing PC codes in that major disease category under the assumption that the required medical resources would likely be similar.

A list of the estimated PC code incidence percentages within each disease PC cluster can be found in Appendix D. Individual PC code percentages were estimated by multiplying the estimated PC cluster percentage by the percentage for individual PC codes within that cluster. For example, it is estimated that 15.7% of the disease admissions incurred by female support troops in Southwest Asia will be respiratory diseases, and that 19.0% of these diseases will approximate PC Code 234 (bronchitis). Therefore, it is estimated that 3.0% (15.7% * 19.0%) of female support troop disease admissions will be for bronchitis. Distributions of PC codes within PC clusters were also adjusted to reflect regional variations. Appendix E contains a final list showing the distribution for all of the disease-related PC codes.

Conclusion

Estimates of the likely distribution of medical admissions by PC code are a key component in ensuring adequate programming of resources to meet the medical needs of combat operations. Use of empirical data from previous operations provides a baseline for projecting casualty incidence for future scenarios. The approach taken in the present study was to first examine the admissions incurred during previous operations within the broad categories of Battle Injuries, Battle Fatigue, Non-Battle Injuries and Diseases. Within the injury categories, the observed incidence was then analyzed by traumatism type and anatomical region, with the percentages corresponding to these subcategories then mapped directly to the most appropriate PC codes. Mapping of the empirical disease data was accomplished by first mapping hospitalizations to the appropriate PC cluster, and then by distributing that percentage across the individual PC code components within that cluster.

Combining the expected PC code distributions with the projected overall WIA and DNBI incidence rates will allow planners to more accurately project medical resource requirements. Further, incorporation of this PC forecasting capability into a software environment will allow for the derivation of corollary projections of the staffing demands, requisite equipment, and needed medical supplies.[16]

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Table 1. Percentage Distributions of WIA Admissions by Traumatism and Combat Operation

Traumatism	WWII	Korea	Vietnam	Falklands	Panama	Desert Storm	Weighted Average
Amputations	1.8%	1.4%	1.9%	7.7%	0.4%	1.5%	2.2%
Burns	1.0%	1.0%	1.4%	0.0%	2.6%	3.7%	1.8%
Concussions	1.4%	2.3%	1.3%	1.0%	0.4%	1.5%	1.5%
Crushing	0.0%	0.0%	0.0%	N/A	N/A	3.0%	0.8%
Dislocations	0.1%	0.1%	0.5%	0.1%	1.4%	0.0%	0.3%
Fractures	21.8%	23.0%	16.3%	7.7%	26.5%	17.8%	20.0%
Sprains/Strains	3.1%	2.8%	1.4%	0.9%	12.7%	6.7%	4.4%
Wounds	63.7%	67.9%	76.5%	81.0%	55.1%	56.3%	69.0%
Other	7.1%	1.5%	0.7%	1.5%	0.9%	9.6%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
No. of Admissions	599,716	77,788	51,956	195	234	120	

N/A = data unavailable

Table 2. Percentage Distributions of Anatomical Locations by Traumatism for WIA Admissions

Anatomical Location	*% of Traumatism*
Amputations (2.2%)	
above knee	26.0%
forearm	6.5%
full arm	1.4%
below knee	20.2%
foot	17.8%
hand	28.1%
	100.0%
Burns (1.8%)	
head	34.4%
lower extremities	13.8%
thorax	9.9%
upper extremities	42.0%
	100.0%
Concussions (1.5%)	
head moderate	72.0%
head severe	18.0%
head (hematoma)	10.0%
	100.0%
Crush injuries (0.8%)	
arm	9.3%
leg	44.0%
thorax	46.7%
	100.0%
Dislocations (0.3%)	
shoulder	80.0%
elbow	1.0%
wrist	3.8%
fingers	15.2%
	100.0%
Closed fractures (2.6%)	
face	3.4%
femur	6.0%
foot/toe	13.6%
hand/finger	10.5%
humerus	4.4%
knee	1.5%
jaw	3.3%
pelvis	2.7%
radius/ulna	9.2%
ribs	4.6%
skull/closed	4.3%
shoulder	3.6%
spine	10.3%
tibia/fibula	22.7%
	100.0%
Open fractures (17.4%)	
face	3.9%
femur	13.0%
foot/toe	11.3%
hand/finger	13.0%
humerus	11.6%
knee	1.1%
jaw	2.4%
pelvis	1.9%
radius/ulna	12.0%
ribs	1.7%
skull/open	2.9%
shoulder	3.9%
spine	2.3%
tibia/fibula	19.0%
	100.0%

Anatomical Location	*% of Traumatism*
Sprains/Strains (4.4%)	
back	21.5%
wrist	7.8%
fingers	1.0%
knee	28.6%
ankle	41.1%
	100.0%
Wounds (50.4%)	
abdomen	2.4%
arm	19.7%
body	5.0%
buttock	3.8%
ear	1.6%
eye	2.1%
eye/laser	1.2%
face/neck	11.5%
foot/ankle/toe	5.2%
genitals	0.5%
hand/finger	5.2%
head	5.4%
intestine	0.6%
kidney	0.2%
leg	28.9%
liver	0.3%
spleen	0.1%
thorax	6.3%
	100.0%
Multiple injury wounds (18.6%)	
head/thorax	2.2%
head/abdomen/colon	1.6%
head/abdomen/kidney	1.5%
head/abdomen/bladder	1.5%
head/abdomen/spleen	1.5%
head/abdomen/liver	1.5%
head/lower extremities	7.4%
thorax/abdomen/colon	1.7%
thorax/abdomen/kidney	1.7%
thorax/abdomen/bladder	1.7%
thorax/abdomen/spleen	1.7%
thorax/abdomen/liver	1.7%
thorax/extremities	12.2%
abdomen/colon/bladder	0.6%
abdomen/colon/spleen	0.6%
abdomen/colon/liver	0.6%
abdomen/colon/lower extremities	6.9%
abdomen/pelvis/liver/kidney	0.5%
abdomen/pelvis/spleen/bladder	0.5%
abdomen/pelvis/extremities	11.5%
abdomen/pelvis/lower extremities	6.8%
abdomen/lower extremities	6.8%
abdomen/extremities	11.5%
thorax/upper extremities	5.8%
thorax/upper extremities/abdomen	6.3%
thorax/abdomen/colon/bladder	1.8%
abdomen/thorax/organs	1.9%
	100.0%

Table 3. Percentage Distributions of WIA PC Codes by Traumatism and Anatomical Location

Anatomical Locations	*PC Codes and (Proportions)*
Amputations (2.2%)	
above knee	**147** (100%)
below knee	**145** (100%)
foot	**144** (100%)
forearm	**70** (100%)
full arm	**71** (100%)
hand	**69** (100%)
pelvis	**146** (100%)
Burns (1.8%)	
head	**35** (2%), **37** (11%), **39** (6%), **36** (33%), **38** (31%), **40** (17%)
lower extremities	**150** (6%), **151** (23%), **152** (10%), **153** (25%), **154** (18%), **155** (18%)
thorax	**90** (16%), **91** (23%), **92** (10%), **93** (16%), **94** (21%), **95** (14%)
upper extremities	**75** (11%), **76** (11%), **77** (30%), **78** (20%), **79** (20%), **80** (8%)
Concussions (1.5%)	
head moderate	**2** (100%)
head severe	**1** (100%)
head (hematoma)	**5** (50%), **7** (50%)
Crush injuries (0.8%)	
arm	**61** (50%), **62** (50%)
leg	**138** (50%), **139** (50%)
thorax	**83** (20%), **84** (80%)
Dislocations (0.3%)	
elbow	**65** (100%)
wrist	**67** (100%)
shoulder	**64** (100%)
fingers	**68** (100%)
Closed fractures (2.6%)	
face	**15** (57%), **16** (43%)
femur	**120** (100%)
foot/toe	**132** (85%), **133** (15%)
hand/finger	**55** (80%), **56** (20%)
humerus	**44** (100%)
knee	**N/A**
jaw	**323** (100%)
pelvis	**112** (35%), **113** (65%)
radius/ulna	**49** (70%), **50** (30%)
ribs	**81** (30%), **82** (70%)
skull/closed	**3** (10%), **4** (42%), **6** (24%), **8** (24%)
shoulder	**41** (100%)
spine	**25** (16%), **26** (37%), **27** (14%), **28** (33%)
tibia/fibula	**127** (100%)
Open fractures (17.4%)	
face	**17** (55%), **18** (45%)
femur	**123** (20%), **124** (80%)
foot/toe	**136** (20%), **137** (80%)
hand/finger	**59** (25%), **60** (15%), **319** (60%)
humerus	**47** (15%), **48** (85%)
knee	**125** (83%), **126** (17%)
jaw	**322** (100%)
pelvis	**114** (50%), **115** (50%)
radius/ulna	**53** (15%), **54** (85%)
ribs	**87** (50%), **88** (50%)
skull/open	**9** (50%), **10** (50%)
shoulder	**42** (80%), **43** (20%)
spine	**29** (30%), **30** (70%)
tibia/fibula	**130** (20%), **131** (80%)

Table 3. (Cont.) Percentage Distribution of WIA PC Codes by Anatomical Location and Traumatism

Anatomical Locations	*PC Codes and (Proportions)*
Sprains/Strains (4.35%)	
ankle	**148** (10%), **149** (90%)
back	**33** (10%), **34** (90%)
fingers	**73** (30%), **74** (70%)
knee	**141** (15%), **142** (85%)
wrist	**72** (100%)
Wounds (50.39%)	
abdomen	**96** (47%), **97** (42%), **108** (2%), **109** (9%)
arm	**45** (11%), **46** (29%), **51** (11%), **52** (49%)
body	**186** (100%)
buttock	**110** (24%), **111** (76%)
ear	**23** (20%), **24** (80%)
eye	**21** (50%), **22** (20%), **311** (30%)
eye/laser	**346-350** (20% for all 5 codes)
face/neck	**19** (12%), **20** (88%)
foot/ankle/toe	**134** (5%), **135** (95%)
genitals	**116** (88%), **117** (12%)
hand/finger	**57** (30%), **58** (70%)
head	**13** (45%), **14** (55%)
intestine	**101** (75%), **102** (25%)
kidney	**106** (20%), **107** (40%), **313** (40%)
leg	**121** (11%), **122** (24%), **128** (12%), **129** (53%)
liver	**98** (5%), **99** (19%), **103** (38%), **104** (38%)
spleen	**100** (40%), **105** (60%)
thorax	**85** (5%), **86** (95%)
MIW (18.64%)	
head/thorax	**159** (100%)
head/abdomen/colon	**160** (100%)
head/abdomen/kidney	**161** (100%)
head/abdomen/bladder	**162** (100%)
head/abdomen/spleen	**163** (100%)
head/abdomen/liver	**164** (100%)
head/lower extremities	**165** (100%)
thorax/abdomen/colon	**166** (100%)
thorax/abdomen/kidney	**167** (100%)
thorax/abdomen/bladder	**168** (100%)
thorax/abdomen/spleen	**169** (100%)
thorax/abdomen/liver	**170** (100%)
thorax/extremities	**171** (100%)
abdomen/colon/bladder	**172** (100%)
abdomen/colon/spleen	**173** (100%)
abdomen/colon/liver	**174** (100%)
abdomen/colon/lower extremities	**175** (100%)
abdomen/pelvis/liver/kidney	**176** (100%)
abdomen/pelvis/spleen/bladder	**177** (100%)
abdomen/pelvis/extremities	**178** (100%)
abdomen/pelvis/lower extremities	**179** (100%)
abdomen/lower extremities	**180** (100%)
abdomen/extremities	**181** (100%)
thorax/upper extremities	**182** (100%)
thorax/upper/abdomen	**183** (100%)
thorax/pelvis/abdomen/colon/bladder	**184** (100%)
abdomen/thorax/organs	**185** (100%)

Table 4. Percentage Distributions of NBI Admissions by Traumatism and Combat Operation

Traumatism*	WWII	Korea	Vietnam	Falklands	Desert Storm	Zagreb	Weighted Average
Amputations	0.8%	1.1%	1.5%	1.1%	0.0%	4.8%	1.6%
Burns	7.1%	9.4%	6.6%	0.0%	5.2%	2.7%	5.2%
Concussions	2.4%	1.5%	2.8%	3.4%	0.6%	4.2%	2.5%
Crush injuries	0.5%	N/A	0.0%	N/A	N/A	0.0%	0.1%
Dislocations	1.9%	N/A	5.6%	9.4%	8.6%	9.3%	6.7%
Fractures	21.6%	23.6%	21.8%	22.5%	33.1%	45.8%	27.1%
Sprains/Strains	27.8%	26.5%	22.9%	37.8%	34.3%	7.5%	25.5%
Wounds	38.0%	37.9%	38.8%	25.8%	18.2%	25.6%	31.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
No. of Admissions	884,849	36,260	19,440	94	161	340	

*Excludes environmental and miscellaneous type injuries.
N/A = data unavailable

Table 5. Projected Environmental and Miscellaneous Non-Battle Injury Percentages For Europe, Northeast Asia, and Southwest Asia

	PC Codes	Europe	NE Asia	SW Asia
Environmental NBI				
Heat-related injuries		**0.12%**	**0.12%**	**7.42%**
Heat stroke	193	4.0%	4.0%	4.0%
Heat exhaustion	194	76.0%	76.0%	76.0%
Heat Cramps	195	20.0%	20.0%	20.0%
		100.0%	100.0%	100.0%
Cold-related injuries		**10.3%**	**9.3%**	**3.3%**
Trench foot (severe)	187	8.1%	9.5%	90.0%
Trench foot (moderate)	188	72.5%	85.1%	10.0%
Frostbite (severe)	190	1.9%	0.6%	0.0%
Frostbite (moderate)	191	11.0%	3.2%	0.0%
Hypothermia	192	6.6%	1.8%	0.0%
		100.0%	100.0%	100.0%
Miscellaneous NBI				
Bites and Stings		**0.74%**	**1.00%**	**1.40%**
Complicated	157	4.0%	6.0%	2.0%
Moderate	158	46.0%	33.0%	24.0%
Animal bites/rabies	328	50.0%	30.0%	63.0%
Snake bites	335	0.0%	31.0%	11.0%
		100.0%	100.0%	100.0%
Other injuries		**2.2%**	**2.2%**	**2.2%**
Blisters	156	46.4%	46.4%	46.4%
Toxic Inhalation	266	32.9%	32.9%	32.9%
White phosphorus burns/all	268	20.7%	20.7%	20.7%
		100.0%	100.0%	100.0%

Table 6. Estimated Percentage Distributions of Non-Battle Injury Types by Geographical Region

Injury Types	Weighted Average Estimation	Europe	NE Asia	SW Asia
Amputations	1.6%	1.3%	1.4%	1.3%
Burns	5.2%	4.5%	4.6%	4.5%
Concussions	2.5%	2.1%	2.2%	2.1%
Crush injuries	0.1%	0.1%	0.1%	0.1%
Dislocations	6.7%	5.8%	5.9%	5.8%
Fractures	27.1%	23.5%	23.7%	23.2%
Sprains/Strains	25.5%	22.1%	22.3%	21.9%
Wounds	31.2%	27.0%	27.2%	26.7%
Subtotal	100.0%	86.7%	87.4%	85.6%
Heat-related injuries		0.1%	0.1%	7.4%
Cold-related injuries		10.3%	9.3%	3.3%
Bites and stings		0.7%	1.0%	1.4%
Blisters		1.0%	1.0%	1.0%
Toxic inhalation		1.2%	1.2%	1.2%
Total		100.0%	100.0%	100.0%

Table 7. Percentage Distributions of Anatomical Locations by Traumatism for NBI Admissions

Anatomical Location	*% of Traumatism*
Amputations (1.6%)	
above knee	5.4%
forearm	6.4%
full arm	3.6%
below knee	5.4%
foot	12.0%
hand	67.2%
pelvis	0.0%
	100.0%
Burns (5.2%)	
head	20.9%
lower extremities	27.3%
thorax	11.6%
upper extremities	40.2%
	100.0%
Concussions (2.5%)	
head moderate	70.6%
head severe	17.6%
head (hematoma)	11.8%
	100.0%
Crush injuries (0.14%)	
arm	19.0%
leg	62.9%
thorax	18.1%
	100.0%
Dislocations (6.7%)	
hand/wrist	3.2%
shoulder	70.0%
elbow	9.5%
finger	7.8%
hip	4.9%
toes	4.6%
	100.0%
Closed fractures (19.0%)	
face	6.0%
femur	5.0%
foot/toe	20.5%
hand/finger	15.4%
humerus	4.0%
knee	1.4%
pelvis	1.6%
radius/ulna	9.9%
ribs	1.7%
skull/closed	12.0%
shoulder	2.7%
spine	6.6%
tibia/fibula	13.2%
	100.0%

Anatomical Location	*% of Traumatism*
Open fractures (8.1%)	
face	6.0%
femur	5.0%
foot/toe	20.5%
hand/finger	15.4%
humerus	4.0%
knee	1.4%
pelvis	1.6%
radius/ulna	9.9%
ribs	1.7%
skull/open	12.0%
shoulder	2.7%
spine	6.6%
tibia/fibula	13.2%
	100.0%
Sprains/Strains (25.5%)	
sacroiliac	4.8%
wrist	6.0%
thumb	1.7%
fingers	4.0%
ankle	45.1%
knee	36.2%
vertebral	0.5%
lumbosacral	0.1%
tenosynovitis	1.7%
	100.0%
Wounds (31.2%)	
abdomen	2.1%
arm	12.3%
buttocks	1.1%
eye	3.5%
face/neck	6.3%
foot/ankle/toe	11.0%
hand/finger	17.8%
head	6.8%
kidney	0.5%
leg	27.6%
liver	0.2%
thorax	7.5%
fragment/wounds	3.0%
spleen	0.3%
	100.0%

Table 8. Percentage Distributions of NBI PC Codes by Traumatism and Anatomical Location

Anatomical Locations	*PC Codes And (Proportions)*
Amputations (1.6%)	
above knee	**147** (100%)
forearm	**70** (100%)
full arm	**71** (100%)
below knee	**145** (100%)
foot	**144** (100%)
hand	**69** (100%)
pelvis	**146** (100%)
Burns (5.2%)	
head	**35** (3%), **37** (7%), **39** (4%), **36** (54%), **38** (21%), **40** (11%)
lower extremities	**150** (1%), **151** (5%), **152** (10%), **153** (24%), **154** (30%), **155** (30%)
thorax	**90** (6%), **91** (9%), **92** (11%), **93** (17%), **94** (34%), **95** (23%)
upper extremities	**75** (24%), **76** (24%), **77** (18%), **78** (12%), **79** (15%), **80** (7%)
Concussions (2.5%)	
head moderate	**2** (100%)
head severe	**1** (100%)
head (hematoma)	**5** (33%), **7** (34%), **11** (33%)
Crush injuries (0.14%)	
arm	**61** (40%), **62** (60%)
leg	**138** (30%), **139** (70%)
thorax	**84** (100%)
Dislocations (6.7%)	
hand/wrist	**67** (100%)
shoulder	**64** (100%)
elbow	**65** (100%)
finger	**68** (100%)
hip	**140** (100%)
toes	**143** (100%)
Closed fractures (19.0%)	
face	**15** (40%), **16** (60%)
femur	**120** (100%)
foot/toe	**132** (65%), **133** (35%)
hand/finger	**55** (80%), **56** (20%)
humerus	**44** (100%)
knee	**N/A**
pelvis	**112** (40%), **113** (60%)
radius/ulna	**49** (70%), **50** (30%)
ribs	**81** (15%), **82** (85%)
skull/closed	**3** (16%), **4** (74%), **6** (5%), **8** (5%)
shoulder	**41** (100%)
spine	**25** (23%), **26** (52%), **27** (7%), **28** (18%)
tibia/fibula	**127** (100%)

Table 8. (Cont.) Percentage Distribution of NBI PC Codes by Anatomical Location and Truamatism

Anatomical Locations	*PC Codes And (Proportions)*
Open fractures (8.1%)	
face	**17** (50%), **18** (50%)
femur	**123** (25%), **124** (75%)
foot/toe	**136** (20%), **137** (80%)
hand/finger	**59** (25%), **60** (15%), **319** (60%)
humerus	**47** (15%), **48** (85%)
knee	**125** (83%), **126** (17%)
pelvis	**114** (50%), **115** (50%)
radius/ulna	**53** (15%), **54** (85%)
ribs	**87** (10%), **88** (90%)
skull/open	**9** (50%), **10** (50%)
shoulder	**42** (30%), **43** (70%)
spine	**29** (30%), **30** (70%)
tibia/fibula	**130** (20%), **131** (80%)
Sprains/Strains (25.5%)	
sacroiliac	**33** (10%), **34** (90%)
wrist	**72** (100%)
thumb	**73** (100%)
fingers	**74** (100%)
ankle	**148** (10%), **149** (90%)
knee	**141** (15%), **142** (82%), **200**(3%)
vertebral	**31** (20%), **32** (80%)
lumbosacral	**201** (100%)
tenosynovitis	**262** (100%)
Wounds (31.2%)	
abdomen	**96** (7%), **97** (93%)
arm	**45** (2%), **46** (42%), **51** (6%), **52** (50%)
buttocks	**111** (100%)
eye	**22** (20%), **224** (50%), **311** (30%)
face/neck	**19** (12%), **20** (88%)
foot/ankle/toe	**134** (16%), **135** (84%)
hand/finger	**57** (30%), **58** (70%)
head	**13** (14%), **14** (86%)
kidney	**106** (20%), **107** (40%), **313** (40%)
leg	**121** (1%), **122** (24%), **128** (2%), **129** (73%)
liver	**98** (5%), **99** (19%), **103** (38%), **104** (38%)
thorax	**85** (15%), **86** (85%)
body	**186** (100%)
spleen	**100** (96%), **105** (4%)

Table 9. Percentage Distributions of Disease Admissions by ICD Category and Combat Operation

ICD Category *	Korea	Vietnam	Zagreb	Desert Shield
Infectious/Parasitic	12.2%	29.2%	10.1%	5.1%
Neoplasm	1.6%	1.7%	5.4%	0.4%
Endocrine	2.2%	0.8%	3.0%	1.2%
Diseases of the Blood	0.3%	0.6%	0.8%	0.0%
Mental Disorders	8.0%	6.9%	3.8%	5.6%
Nervous System	8.7%	6.0%	4.3%	6.2%
Circulatory	3.4%	2.4%	5.1%	5.9%
Respiratory	23.7%	6.3%	10.4%	8.2%
Digestive	9.5%	8.4%	25.1%	15.1%
Genitourinary	5.5%	3.8%	9.1%	7.5%
Skin/Subcutaneous	9.2%	11.6%	5.1%	10.1%
Musculoskeletal	4.5%	5.1%	9.6%	23.1%
Symptoms/ill-defined conditions	11.1%	17.2%	8.3%	11.5%
Total	100.0%	100.0%	100.0%	100.0%
No. of Admissions	290,210	84,113	642	1170

*Excludes NBI, pregnancies, perinatal conditions, congenital, and supplementary classifications.

Table 10. Percentage Distributions of Male Admissions by ICD Categories During Peacetime Deployments from 1991 to 1995 by Geographical Location

ICD Category *	Europe	South Korea	Turkey
Infectious/Parasitic	5.21%	5.34%	5.25%
Neoplasm	2.58%	2.42%	1.72%
Endocrine	0.83%	0.89%	0.61%
Diseases of the Blood	0.32%	0.53%	0.30%
Mental Disorders	21.01%	15.78%	4.65%
Nervous System	3.08%	4.47%	2.73%
Circulatory	4.00%	5.22%	4.24%
Respiratory	9.07%	9.71%	9.70%
Digestive	16.78%	14.95%	28.28%
Genitourinary	6.90%	4.69%	6.36%
Skin/Subcutaneous	3.94%	5.62%	5.35%
Musculoskeletal	20.97%	22.35%	24.95%
Symptoms/ill-defined conditions	5.31%	8.02%	5.86%
Total	100%	100%	100%
No. of Admissions	6290	6558	1207

* Excludes NBI, congenital anomalies, and supplementary classifications.

Table 11. Estimated Percentage Distributions for Combat Troop Admissions by ICD Category and Geographical Region

ICD Category	Europe	NE Asia	SW Asia
Infectious/Parasitic	13.4%	13.5%	11.7%
Neoplasm	3.4%	2.2%	1.4%
Endocrine	2.3%	2.1%	1.5%
Diseases of the Blood	0.3%	0.4%	0.2%
Mental Disorders	6.1%	6.1%	6.1%
Nervous System	5.3%	7.4%	4.7%
Circulatory	4.2%	4.6%	4.0%
Respiratory	12.0%	14.5%	11.0%
Digestive	15.7%	11.1%	18.4%
Genitourinary	8.3%	5.1%	6.6%
Skin/Subcutaneous	7.7%	9.9%	9.5%
Musculoskeletal	9.9%	8.8%	12.9%
Symptoms/ill-defined conditions	11.4%	14.3%	11.8%
Total	100.0%	100.0%	100.0%

Table 12. Mapping of ICD Category Percentages into PC Code Clusters

ICD Category	PC Clusters	Vietnam %	Adjusted %
Infectious/Parasitic	Infectious/Parasitic	73%	54%
	Gastrointestinal	19%	32%
	Dermatological	4%	7%
	Respiratory	2%	4%
	STD	2%	3%
		100%	**100%**
Neoplasm	Surgical	73%	
	Miscellaneous	27%	
		100%	
Endocrine	NA	**100%**	
Diseases of Blood	NA	**100%**	
Mental Disorders	Neuropsychiatric	**100%**	
Nervous System	Eye/Ear	50%	
	NA	41%	
	Infectious/Parasitic	7%	
	Miscellaneous	2%	
		100%	
Circulatory	Cardiovascular	50%	
	Surgical	38%	
	NA	11%	
	Infective	1%	
		100%	
Respiratory	Respiratory	**100%**	
Digestive	Gastrointestinal	68%	
	Surgical	32%	
		100%	
Genitourinary	Genitourinary	**100%**	
Skin/Subcutaneous	Dermatological	100%	
Musculoskeletal	NA	64%	
	Sprains/Strains (NBI)	36%	
		100%	
Ill-defined Symptoms	Unidentifiable	80%	0%
	Gastrointestinal	12%	25%
	Genitourinary	3%	0%
	Respiratory	3%	13%
	Cardiovascular	2%	0%
	Infectious/Parasitic	0%	40%
	Dermatological	0%	22%
		100%	**100%**

Table 13. Estimated Percentage Distributions of Combat Troop (Male) Admissions by PC Cluster and Geographical Region

Cluster	Europe	NE Asia	SW Asia
Surgical	10.8%	8.2%	10.3%
Dermatological	13.3%	16.6%	15.8%
Eye/Ear	3.2%	4.4%	2.9%
Respiratory	16.7%	20.1%	15.9%
Gastrointestinal	21.3%	18.4%	23.5%
Cardiovascular	2.5%	2.7%	2.4%
STD	0.5%	0.5%	0.4%
Genitourinary	9.9%	6.1%	8.1%
Infectious/Parasitic	14.6%	16.1%	14.0%
Neuropsychiatric	6.1%	6.1%	6.1%
Miscellaneous	1.2%	0.9%	0.6%
Total	100.0%	100.0%	100.0%

Table 14. Percentage Distributions of Female Admissions by ICD Categories during Peacetime Deployments from 1991 to 1995 by Geographical Location

ICD Category *	Europe	South Korea	Turkey
Infectious/Parasitic	5.90%	5.71%	1.9%
Neoplasm	5.54%	5.31%	4.5%
Endocrine	1.13%	0.93%	1.2%
Diseases of the Blood	0.54%	0.66%	0.5%
Mental Disorders	12.63%	12.68%	4.3%
Nervous System	3.10%	4.71%	2.6%
Circulatory	2.74%	2.92%	2.6%
Respiratory	9.65%	9.56%	10.0%
Digestive	9.71%	8.43%	19.1%
Genitourinary	25.27%	24.24%	27.8%
Skin/Subcutaneous	3.04%	3.25%	2.4%
Musculoskeletal	13.95%	12.08%	17.9%
Symptoms/ill-defined conditions	6.79%	9.50%	5.0%
Total	100%	100%	100%
Number of Admissions	1678	1506	418

* Excludes NBI, pregnancies, perinatal conditions, congenital, and supplementary classifications.

Table 15. Estimated Percentage Distributions for Female Troop Admissions by ICD Category and Geographical Region

ICD Category	Europe	NE Asia	SW Asia
Infectious/Parasitic	14.2%	14.7%	8.4%
Neoplasm	5.3%	4.1%	3.1%
Endocrine	2.6%	2.2%	2.2%
Diseases of the Blood	0.6%	0.5%	0.3%
Mental Disorders	4.9%	4.9%	4.9%
Nervous System	5.5%	8.6%	5.4%
Circulatory	3.0%	2.9%	3.0%
Respiratory	11.1%	12.6%	11.1%
Digestive	10.1%	6.9%	15.4%
Genitourinary	16.3%	12.9%	15.7%
Skin/Subcutaneous	6.7%	7.8%	7.0%
Musculoskeletal	6.3%	4.6%	11.0%
Symptoms/ill-defined conditions	13.4%	17.4%	12.5%
Total	100.0%	100.0%	100.0%

Table 16. Estimated Percentage Distributions for Female Admissions by PC Cluster and Geographical Region

Cluster	Europe	NE Asia	SW Asia
Surgical	9.5%	7.1%	10.1%
Dermatological	12.2%	14.3%	12.4%
Eye/Ear	3.2%	4.8%	3.2%
Respiratory	15.3%	17.5%	15.7%
Gastrointestinal	16.9%	15.5%	19.6%
Cardiovascular	1.7%	1.6%	1.8%
STD	0.5%	0.5%	0.3%
Genitourinary	7.3%	5.7%	7.4%
Female Specific	11.4%	8.9%	11.5%
Infectious/Parasitic	15.4%	17.6%	12.0%
Neuropsychiatirc	4.9%	4.9%	4.9%
Miscellaneous	1.8%	1.4%	1.1%
Total	100.00%	100.00%	100.00%

Appendix A. Estimated Wounded-in-Action Patient Condition Code Percentages

PC Code	PC Code Description	Estimated WIA %
1	Cerebral / concussion / and / or / fracture / severe	0.27%
2	Cerebral / concussion / and / or / fracture / moderate	1.08%
3	Cerebral / contusion / and / or / fracture / loss	0.01%
4	Cerebral / contusion / and / or / fracture / moderate	0.05%
5	Cerebral / contusion / and / or / fracture / hematoma	0.08%
6	Cerebral / contusion / fracture / severe / loss	0.03%
7	Cerebral / contusion / fracture / severe	0.08%
8	Cerebral / contusion / fracture / moderate	0.03%
9	Cerebral / contusion / fracture / open / severe	0.25%
10	Cerebral / contusion / fracture / open	0.25%
13	Wound / scalp / open / severe	1.22%
14	Wound / scalp / open / moderate	1.50%
15	Fracture / facial / exclusive / mandible / severe	0.05%
16	Fracture / facial / exclusive / mandible / moderate	0.04%
17	Wound / face / jaw / neck / open / fracture	0.37%
18	Wound / face / jaw / neck / open / fracture	0.30%
19	Wound / face / neck / open / airway	0.69%
20	Wound / face / neck / open	5.09%
21	Eye / wound / severe	0.52%
22	Eye / wound / lacerated / moderate	0.21%
23	Hearing impairment / severe	0.16%
24	Hearing impairment / moderate	0.64%
25	Fracture / spine / closed / unstable lesion	0.04%
26	Fracture / spine / closed	0.10%
27	Fracture / spine / closed / cord / respiratory	0.04%
28	Fracture / spine / closed / cord / below / cervical	0.09%
29	Fracture / spine / open / cord / cervical / respiratory	0.12%
30	Fracture / spine / open / cord / below cervical	0.28%
33	Strain / sprain / sacroiliac / severe	0.09%
34	Strain / sprain / sacroiliac / moderate	0.84%
35	Burn / superficial / head / neck / 5-10% / eye	0.01%
36	Burn / superficial / head / neck / 0-5%	0.20%
37	Burn / partial / head / neck / 5-10% / eye	0.07%
38	Burn / partial / head / neck / 0-5%	0.19%
39	Burn / full / head / neck / 5-10% / eye	0.04%
40	Burn / full / head / neck / 0-5%	0.10%
41	Fracture / clavicle	0.09%
42	Wound / shoulder girdle / open / bone	0.54%
43	Wound / shoulder girdle / open	0.13%
44	Fracture / humerus	0.11%
45	Wound / upper arm / open / severe / nerve	1.09%
46	Wound / upper arm / open	2.88%
47	Wound / upper arm / open / fracture / nerve / vascular	0.30%
48	Wound / upper arm / open / fracture / nerve	1.72%
49	Fracture / radius / ulna / closed / severe	0.17%
50	Fracture / radius / ulna / closed / moderate	0.07%
51	Wound / forearm / open / severe	1.09%
52	Wound / forearm / open	4.86%

Appendix A. Estimated Wounded-in-Action Patient Condition Code Percentages

PC Code	PC Code Description	Estimated WIA %
53	Wound / forearm / open / Fracture / nerve / vascular /	0.31%
54	Wound / forearm / open / Fracture / nerve / vascular	1.77%
55	Fracture / hand or fingers / closed / sever	0.22%
56	Fracture / hand / and/or / fingers / closed / moderate	0.05%
57	Wound / hand / and/or / fingers / open / severe	0.79%
58	Wound / hand / and/or / fingers / open / moderate	1.84%
59	Wound / hand / open / crushed	0.57%
60	Wound / fingers / open / crushed	0.34%
61	Crush / upper extremities / severe / limb	0.04%
62	Crush / upper extremities / moderate	0.04%
64	Dislocation / shoulder	0.24%
65	Dislocation / fracture / elbow	0.00%
67	Dislocation / hand or wrist	0.01%
68	Dislocation / hand / wrist / fingers / closed	0.04%
69	Amputation hand / fingers	0.62%
70	Amputation forearm	0.14%
71	Amputation full arm	0.03%
72	Sprain / wrist	0.34%
73	Sprain / thumb / closed	0.01%
74	Sprain / fingers / closed / no thumb	0.03%
75	Burn / superficial / upper / 10-20%	0.08%
76	Burn / superficial / upper / 0-10%	0.08%
77	Burn / partial / upper / 10-20%	0.22%
78	Burn / partial / upper / 0-10%	0.15%
79	Burn / full / upper / 10-20%	0.15%
80	Burn / full / upper / 0-10%	0.06%
81	Fracture / ribs / closed / multiple	0.04%
82	Fracture / ribs / closed	0.08%
83	Injury / lung / closed / pneumohemothorax / severe	0.07%
84	Injury / lung / closed / pneumohemothorax / moderate	0.29%
85	Wound / thorax / open	0.16%
86	Wound / thorax / open	3.04%
87	Wound / thorax / open / rib / Fracture	0.15%
88	Wound / thorax / open / rib / Fracture	0.15%
90	Burn / trunk / superficial / 30-20%	0.03%
91	Burn / superficial / trunk / 10-20%	0.04%
92	Burn / trunk / partial / 30-20%	0.02%
93	Burn / partial / trunk / 10-20%	0.03%
94	Burn / trunk / full thickness / 30-20%	0.04%
95	Burn / full / trunk / 10-20%	0.02%
96	Wound / abdominal wall / severe	0.56%
97	Wound / abdominal wall / moderate	0.50%
98	Wound / liver / closed / major damage	0.01%
99	Wound / liver / closed / minor	0.03%
100	Wound / spleen	0.02%
101	Wound /abdomen / large bowel	0.23%
102	Wound /abdomen / small bowel	0.08%
103	Wound /abdomen / liver / major damage	0.05%

Appendix A. Estimated Wounded-in-Action Patient Condition Code Percentages

PC Code	PC Code Description	Estimated WIA %
104	Wound /abdomen / liver	0.05%
105	Wound /abdomen / spleen	0.03%
106	Wound /abdomen / shattered kidney	0.02%
107	Wound /abdomen / kidney / nephrectomy	0.03%
108	Wound /abdomen / shattered bladder	0.02%
109	Wound /abdomen / bladder	0.11%
110	Wound / buttocks / open / severe	0.46%
111	Wound / buttocks / moderate	1.46%
112	Displaced / fracture / pelvis	0.02%
113	Fracture / pelvis	0.05%
114	Wound /abdomen / open / pelvic / fracture	0.17%
115	Wound /abdomen / open / pelvic / fracture	0.17%
116	Wound / extremities / genitalia / male / severe	0.21%
117	Wound / extremities / genitalia / male / moderate	0.03%
118	Wound / extremities / genitalia / female / severe	0.00%
119	Wound / extremities / genitalia / female / moderate	0.00%
120	Fracture / femur	0.16%
121	Wound / thigh / open / debridement	1.60%
122	Wound / thigh / open	3.50%
123	Wound / thigh / open / fracture / unsalvageable	0.45%
124	Wound / thigh / open / fracture / nerve	1.81%
125	Wound / knee / open / shattered	0.16%
126	Wound / knee / open / penetration / cart	0.03%
127	Fracture / closed / tibia / fibula	0.59%
128	Wound / low / leg / open / debridement	1.75%
129	Wound / low / leg / open	7.72%
130	Wound / low / leg / fracture / unsalvageable	0.66%
131	Wound / low / leg / fracture / nerve	2.65%
132	Fracture / ankle / foot / closed / reduction	0.30%
133	Fracture / ankle / foot / closed /	0.05%
134	Wound / ankle / foot / toes / debridement	0.13%
135	Wound / ankle / foot / toes	2.50%
136	Wound / ankle / foot / toes / unsalvageable	0.40%
137	Wound / ankle / foot / toes / fracture / nerve	1.58%
138	Crush injury / low / limb unsalvageable	0.19%
139	Crush injury / lower limb	0.19%
141	Tear / ligament / knee / complete / rupture	0.19%
142	Tear / ligament / knee / incomplete	1.06%
144	Amputation foot	0.39%
145	Amputation below knee	0.45%
146	Amputation / hip disarticulation	0.00%
147	Amputation above knee	0.57%
148	Sprain / ankle / complete rupture	0.18%
149	Sprain / ankle / incomplete rupture	1.61%
150	Burn / superficial / low / genitalia / 40-30%	0.01%
151	Burn / superficial / low / genitalia / 15-30%	0.06%
152	Burn / partial thickness / low / genitalia / 40%	0.02%
153	Burn / partial / low / genitalia / 15-30%	0.06%

Appendix A. Estimated Wounded-in-Action Patient Condition Code Percentages

PC Code	PC Code Description	Estimated WIA %
154	Burn / low / genitalia / full / 40-30%	0.04%
155	Burn / full / low / genitalia / 15-30%	0.04%
159	Multiple Injury Wound (MIW) brain / chest / pneumohemothorax	0.41%
160	MIW brain / abdomen / colon	0.29%
161	MIW brain / abdomen / kidney	0.28%
162	MIW brain / abdomen / bladder	0.28%
163	MIW brain / abdomen / spleen	0.27%
164	MIW brain / abdomen / liver	0.28%
165	MIW brain / limbs / amputation	1.38%
166	MIW chest / pneumohemothorax / abdomen / colon	0.33%
167	MIW chest / pneumohemothorax / abdomen / kidney	0.31%
168	MIW chest / pneumohemothorax / abdomen / bladder	0.31%
169	MIW chest / pneumohemothorax / abdomen / spleen	0.31%
170	MIW chest / pneumohemothorax / abdomen / liver	0.31%
171	MIW chest / pneumohemothorax / limbs / fracture	2.28%
172	MIW abdomen / colon / bladder	0.11%
173	MIW abdomen / colon / spleen	0.11%
174	MIW abdomen / colon / liver	0.11%
175	MIW abdomen / limbs / colon / fracture	1.30%
176	MIW abdomen / pelvis / liver / kidney	0.10%
177	MIW abdomen / pelvis / spleen / bladder	0.09%
178	MIW abdomen / pelvis / limbs / fracture	2.14%
179	MIW abdomen / pelvis / limbs / penetrating	1.27%
180	MIW abdomen / limbs / fracture / nerve / penetrating	1.27%
181	MIW abdomen / limbs / penetrating	2.14%
182	MIW chest / pneumohemothorax / upper limbs	1.09%
183	MIW chest / pneumohemothorax / upper limbs / abdomen	1.17%
184	MIW chest / pneumohemothorax / pelvis / abdomen / colon	0.33%
185	MIW abdomen / chest / multiple organs	0.36%
186	Multiple nonperforating wounds	2.54%
311	Eye / wound / penetrated / eye salvage	0.31%
312	Wound / knee / open / penetration	0.04%
313	Wound / abdomen / kidney	0.03%
319	Wound / fingers / open / crushed	1.36%
322	Fracture / mandible / unstable	0.41%
323	Fracture / mandible / stable	0.09%
346	Eye / wound / laser / severe / macular / optic	0.12%
347	Eye / wound / laser / RFR / moderate / posterior	0.12%
348	Eye / wound / laser / moderate / nonmacular	0.12%
349	Eye / wound / laser / RFR / mild / anterior	0.12%
350	Eye / wound / laser / mild / flashblind	0.12%
		100.00%

Appendix B. Estimated Battle Fatigue PC Code Percentage Distribution

PC Code	PC Code Descriptions	Estimated BF %
304	Stress / severe / unstable / slow improvement	1.0%
305	Stress / severe / stable / slow improvement	7.0%
310	Stress reaction / acute / mild	50.0%
314	Stress reaction / severe / unstable / delayed improvement	3.0%
315	Stress reaction / severe / unstable / unresponsive	2.0%
318	Stress reaction / severe / rapid improvement	26.0%
324	Stress reaction / severe / stable / delayed improvement	7.0%
325	Stress reaction / severe / stable / unresponsive	4.0%
		100.0%

Appendix C. Estimated NBI Patient Condition Code Percentages by Geographical Region

PC Code	PC Description	Europe	NE Asia	SW Asia
1	Cerebral/concussion/and/or/fracture/severe	0.38%	0.38%	0.37%
2	Cerebral/concussion/and/or/fracture/mod	1.51%	1.53%	1.50%
3	Cerebral/contusion/and/or/fracture/loss	0.32%	0.32%	0.31%
4	Cerebral/contusion/and/or/fracture/moderate	1.46%	1.47%	1.44%
5	Cerebral/contusion/and/or/fracture/hematoma	0.08%	0.08%	0.08%
6	Cerebral/contusion/fracture/severe/loss	0.10%	0.10%	0.10%
7	Cerebral/contusion/fracture/severe	0.08%	0.08%	0.08%
8	Cerebral/contusion/fracture/moderate	0.10%	0.10%	0.10%
9	Cerebral/contusion/fracture/open/severe	0.42%	0.43%	0.42%
10	Cerebral/contusion/fracture/open	0.42%	0.43%	0.42%
11	Intracranial hemorrhage/all	0.08%	0.08%	0.08%
13	Wound/scalp/open/severe	0.26%	0.26%	0.25%
14	Wound/scalp/open/mod	1.57%	1.58%	1.55%
15	Fracture/facial/exclusive/mandible/severe	0.39%	0.40%	0.39%
16	Fracture/facial/exclusive/mandible/mod	0.59%	0.60%	0.58%
17	Wound/face/jaw/neck/open/fracture	0.21%	0.21%	0.21%
18	Wound/face/jaw/neck/open/fracture	0.21%	0.21%	0.21%
19	Wound/face/neck/open/airway	0.21%	0.21%	0.20%
20	Wound/face/neck/open	1.51%	1.52%	1.49%
21	Eye/wound/severe	0.00%	0.00%	0.00%
22	Eye/wound/lacerated/mod	0.19%	0.19%	0.19%
23	Hearing impairment/severe	0.00%	0.00%	0.00%
24	Hearing impairment/mod	0.00%	0.00%	0.00%
25	Fracture/spine/closed/unstable lesion	0.25%	0.25%	0.25%
26	Fracture/spine/closed	0.57%	0.57%	0.56%
27	Fracture/spine/closed/cord/respiratory	0.08%	0.08%	0.08%
28	Fracture/spine/closed/cord/below/cervical	0.20%	0.20%	0.19%
29	Fracture/spine/open/cord/cervical/respiratory	0.23%	0.24%	0.23%
30	Fracture/spine/open/cord/below cervical	0.23%	0.24%	0.23%
31	Intevertebral disc disorders/resistant	0.02%	0.02%	0.02%
32	Intevertebral disc disorders/responding	0.09%	0.09%	0.09%
33	Strain/sprain/sacroiliac/severe	0.11%	0.11%	0.10%
34	Strain/sprain/sacroiliac/mod	0.95%	0.95%	0.94%
35	Burn/superficial/head/neck/5-10%/eye	0.03%	0.03%	0.03%
36	Burn/superficial/head/neck/0-5%	0.51%	0.52%	0.51%
37	Burn/partial/head/neck/5-10%/eye	0.07%	0.07%	0.07%
38	Burn/partial/head/neck/0-5%	0.20%	0.20%	0.20%
39	Burn/full/head/neck/5-10%/eye	0.04%	0.04%	0.04%
40	Burn/full/head/neck/0-5%	0.10%	0.11%	0.10%
41	Fracture/clavicle	0.45%	0.45%	0.44%
42	Wound/shoulder girdle/open/bone	0.06%	0.06%	0.06%
43	Wound/shoulder girdle/open	0.13%	0.13%	0.13%
44	Fracture/humerus	0.66%	0.67%	0.65%
45	Wound/upper arm/open/severe/nerve	0.07%	0.07%	0.07%
46	Wound/upper arm/open	1.37%	1.38%	1.35%
47	Wound/upper arm/open/fracture/nerve	0.04%	0.04%	0.04%
48	Wound/upper arm/open/fracture/nerve	0.24%	0.24%	0.24%
49	Fracture/radius/ulna/closed/severe	1.14%	1.15%	1.13%

Appendix C. Estimated NBI Patient Condition Code Percentages by Geographical Region

PC Code	PC Description	Europe	NE Asia	SW Asia
50	Fracture/radius/ulna/closed/mod	0.49%	0.49%	0.48%
51	Wound/forearm/open/severe	0.23%	0.24%	0.23%
52	Wound/forearm/open	1.67%	1.68%	1.65%
53	Wound/forearm/open/fracture/nerve/vas	0.10%	0.11%	0.10%
54	Wound/forearm/open/fracture/nerve/vas	0.59%	0.60%	0.58%
55	Fracture/hand or fingers/closed/sever	2.03%	2.05%	2.01%
56	Fracture/hand/and/or/fingers/closed/moderate	0.51%	0.51%	0.50%
57	Wound/hand/and/or/fingers/open/severe	1.44%	1.46%	1.43%
58	Wound/hand/and/or/fingers/open/mod	3.37%	3.40%	3.33%
59	Wound/hand/open/crushed	0.27%	0.27%	0.27%
60	Wound/fingers/open/crushed	0.16%	0.16%	0.16%
61	Crush/upper extremities/severe/limb	0.01%	0.01%	0.01%
62	Crush/upper extremities/mod	0.01%	0.01%	0.01%
64	Dislocation/shoulder	4.07%	4.11%	4.03%
65	Dislocation/fracture/elbow	0.56%	0.56%	0.55%
67	Dislocation/hand or wrist	0.45%	0.46%	0.45%
68	Dislocation/hand/wrist/fingers/closed	0.19%	0.19%	0.18%
69	Amputation hand	0.91%	0.91%	0.90%
70	Amputation forearm	0.09%	0.09%	0.09%
71	Amputation full arm	0.05%	0.05%	0.05%
72	Sprain/wrist	1.32%	1.33%	1.30%
73	Sprain/thumb/closed	0.38%	0.39%	0.38%
74	Sprain/fingers/closed/no thumb	0.89%	0.90%	0.88%
75	Burn/superficial/upp/10-20%	0.44%	0.44%	0.43%
76	Burn/superficial/upp/0-10%	0.44%	0.44%	0.43%
77	Burn/partial/upp/10-20%	0.33%	0.33%	0.32%
78	Burn/partial/upp/0-10%	0.22%	0.22%	0.22%
79	Burn/full/upp/10-20%	0.29%	0.29%	0.29%
80	Burn/full/upp/0-10%	0.11%	0.11%	0.11%
81	Fracture/ribs/closed/multiple	0.04%	0.04%	0.04%
82	Fracture/ribs/closed	0.23%	0.23%	0.23%
83	Injury/lung/closed/pneumohemothorax/severe	0.00%	0.00%	0.00%
84	Injury/lung/closed/pneumohemothorax/mod	0.02%	0.02%	0.02%
85	Wound/thorax/open	0.30%	0.31%	0.30%
86	Wound/thorax/open	1.72%	1.73%	1.70%
87	Wound/thorax/open/rib/fracture	0.01%	0.01%	0.01%
88	Wound/thorax/open/rib/fracture	0.11%	0.11%	0.10%
90	Burn/trunk/superficial/30-20%	0.03%	0.03%	0.03%
91	Burn/superficial/trunk/10-20%	0.05%	0.05%	0.05%
92	Burn/trunk/partial/30-20%	0.06%	0.06%	0.06%
93	Burn/partial/trunk/10-20%	0.09%	0.09%	0.09%
94	Burn/trunk/full thickness/30-20%	0.18%	0.18%	0.18%
95	Burn/full/trunk/10-20%	0.12%	0.12%	0.12%
96	Wound/abdominal wall/severe	0.03%	0.03%	0.03%
97	Wound/abdominal wall/mod	0.48%	0.48%	0.47%
98	Wound/liver/closed/major damage	0.01%	0.01%	0.01%
99	Wound/liver/closed/minor	0.03%	0.03%	0.03%
100	Wound/spleen	0.08%	0.08%	0.08%

Appendix C. Estimated NBI Patient Condition Code Percentages by Geographical Region

PC Code	PC Description	Europe	NE Asia	SW Asia
101	Wound/abdomen/large bowel	0.06%	0.06%	0.06%
102	Wound/abdomen/small bowel	0.00%	0.00%	0.00%
103	Wound/abdomen/liver/major damage	0.002%	0.002%	0.002%
104	Wound/abdomen/liver	0.002%	0.002%	0.002%
105	Wound/abdomen/spleen	0.003%	0.003%	0.003%
106	Wound/abdomen/shattered kidney	0.00%	0.00%	0.00%
107	Wound/abdomen/kidney/nephrectomy	0.00%	0.00%	0.00%
108	Wound/abdomen/shattered bladder	0.00%	0.00%	0.00%
109	Wound/abdomen/bladder	0.00%	0.00%	0.00%
110	Wound/buttocks/open/severe	0.00%	0.00%	0.00%
111	Wound/buttocks/moderate	0.29%	0.29%	0.29%
112	Displaced/fracture/pelvis	0.11%	0.11%	0.10%
113	Fracture/pelvis	0.16%	0.16%	0.16%
114	Wound/abdomen/open/pelvic/fracture	0.06%	0.06%	0.06%
115	Wound/abdomen/open/pelvic/fracture	0.06%	0.06%	0.06%
116	Wound/extremities/genitalia/male/severe	0.00%	0.00%	0.00%
117	Wound/extremities/genitalia/male/mod	0.00%	0.00%	0.00%
118	Wound/extremities/genitalia/female/severe	0.00%	0.00%	0.00%
119	Wound/extremities/genitalia/female/mod	0.00%	0.00%	0.00%
120	Fracture/femur	0.83%	0.83%	0.82%
121	Wound/thigh/open/debridement	0.30%	0.30%	0.30%
122	Wound/thigh/open	2.76%	2.78%	2.73%
123	Wound/thigh/open/fracture/unsalvageable	0.09%	0.09%	0.09%
124	Wound/thigh/open/fracture/nerve	0.27%	0.27%	0.26%
125	Wound/knee/open/shattered	0.27%	0.27%	0.27%
126	Wound/knee/open/penetration/cart	0.06%	0.06%	0.05%
127	Fracture/closed/tibia/fibula	2.18%	2.19%	2.15%
128	Wound/low/leg/open/debridement	0.82%	0.83%	0.81%
129	Wound/low/leg/open	3.51%	3.54%	3.47%
130	Wound/low/leg/fracture/unsalvageable	0.19%	0.19%	0.18%
131	Wound/low/leg/fracture/nerve	0.75%	0.75%	0.74%
132	Fracture/ankle/foot/closed/reduction	2.19%	2.21%	2.16%
133	Fracture/ankle/foot/closed/	1.18%	1.19%	1.17%
134	Wound/ankle/foot/toes/debridement	0.47%	0.48%	0.47%
135	Wound/ankle/foot/toes	2.49%	2.51%	2.46%
136	Wound/ankle/foot/toes/unsalvageable	0.29%	0.29%	0.29%
137	Wound/ankle/foot/toes/fracture/nerve	1.16%	1.16%	1.14%
138	Crush injury/low/limb unsalvageable	0.02%	0.02%	0.02%
139	Crush injury/lower limb	0.05%	0.05%	0.05%
140	Dislocation/hip	0.29%	0.29%	0.28%
141	Tear/ligament/knee/complete/rupture	1.20%	1.21%	1.19%
142	Tear/ligament/knee/incomplete	6.58%	6.63%	6.50%
143	Dislocation/toes/closed	0.27%	0.27%	0.27%
144	Amputation foot	0.16%	0.16%	0.16%
145	Amputation below knee	0.07%	0.07%	0.07%
146	Amputation/hip disarticulation	0.00%	0.00%	0.00%
147	Amputation above knee	0.07%	0.07%	0.07%
148	Sprain/ankle/complete rupture	1.00%	1.01%	0.99%

Appendix C. Estimated NBI Patient Condition Code Percentages by Geographical Region

PC Code	PC Description	Europe	NE Asia	SW Asia
149	Sprain/ankle/incomplete rupture	8.98%	9.05%	8.87%
150	Burn/superficial/low/genitalia/40-30%	0.01%	0.01%	0.01%
151	Burn/superficial/low/genitalia/15-30%	0.06%	0.06%	0.06%
152	Burn/partial thickness/low/gent/40%	0.12%	0.12%	0.12%
153	Burn/partial/low/genitalia/15-30%	0.30%	0.30%	0.29%
154	Burn/low/genitalia/full/40-30%	0.37%	0.37%	0.37%
155	Burn/full/low/genitalia/15-30%	0.37%	0.37%	0.37%
156	Blisters, hand, fingers,foot/friction	1.03%	1.03%	1.03%
157	Insect bites and stings/respiratory	0.03%	0.06%	0.03%
158	Insect bites and stings/moderate	0.34%	0.33%	0.34%
186	Multiple nonperforating wounds	0.82%	0.82%	0.81%
187	Trench foot/immersion foot/vesicle/severe	0.83%	0.88%	0.33%
188	Trench foot/immersion foot/vesicle/mod	7.43%	7.91%	3.00%
190	Frostbite/full skin thickness	0.20%	0.05%	0.00%
191	Frostbite/less than full thickness	1.13%	0.30%	0.00%
192	Hypothermia	0.68%	0.16%	0.00%
193	Heat stroke	0.00%	0.00%	0.30%
194	Heat exhaustion	0.09%	0.09%	5.64%
195	Heat cramps	0.02%	0.02%	1.48%
200	Internal derangement/knee	0.24%	0.24%	0.24%
201	Strain/lumbosacral	0.02%	0.02%	0.02%
224	Corneal abrasion	0.47%	0.48%	0.47%
262	Tenosynovitis	0.37%	0.37%	0.36%
265	Near Drowning	0.00%	0.00%	0.00%
266	Toxic Inhalation/respiratory burn	0.60%	0.60%	0.60%
268	White phosphorus burns/all	0.60%	0.60%	0.60%
311	Eye/wound/penetrated/eye salvage	0.28%	0.29%	0.28%
312	Wound/knee	0.07%	0.08%	0.07%
313	Wound/abdomen/kidney	0.14%	0.14%	0.14%
319	Wound/fingers/open/crushed	0.65%	0.66%	0.65%
328	Animal bites and rabies exposure	0.37%	0.30%	0.88%
335	Snake bites	0.00%	0.31%	0.15%
		100.00%	**100.00%**	**100.00%**

Appendix D. Estimated Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Males

Surgical Disease Cluster (Cluster Percentages)		(10.8%)	(8.2%)	(10.3%)
PC	Diagnoses	Europe	NE Asia	SW Asia
196	Appendicitis/perforation/rupture/peritonitis	10.0%	10.0%	10.0%
197	Appendicitis/rupture/peritonitis	14.0%	14.0%	14.0%
198	Inguinal hernia/complicated/incarceration	4.0%	4.0%	4.0%
199	Inguinal/hernia/no incarceration of bowel	20.0%	20.0%	20.0%
212	Pilonidal/cyst/abscess/requiring excision	0.5%	0.5%	0.5%
213	Pilonidal/cyst/abscess/incision	1.5%	1.5%	1.5%
249	Peptic ulcer/gastric/duodenal/perforated	0.5%	0.5%	0.5%
256	Hemorrhoidal disease	22.0%	22.0%	22.0%
277	Ureteral calculus/obstruct/impacted	5.0%	5.0%	5.0%
285	Cholecystitis/cholelithiasis	0.5%	0.5%	0.5%
290	Neoplasms/benign	22.0%	22.0%	22.0%
		100%	**100%**	**100%**

Dermatological Disease Cluster (Cluster Percentages)		(13.3%)	(16.6%)	(15.8%)
PC	Diagnoses	Europe	NE Asia	SW Asia
202	Eczema/derma/seborrheic/affecting	7.0%	7.0%	7.0%
203	Eczema/derma/seborrheic/not affect	22.0%	22.0%	22.0%
204	Boils/furuncles/pyoderma/surgery	2.5%	2.5%	2.5%
205	Boils/furuncles/pyoderma/no surgery	1.5%	1.5%	1.5%
206	Cellulitis/face/weight bearing areas	21.0%	21.0%	21.0%
207	Cellulitis/other than face or weight	32.0%	32.0%	32.0%
208	Dermatophytosis/severe/feet	1.5%	1.5%	1.5%
209	Dermatophytosis/all other cases	5.0%	5.0%	5.0%
210	Pediculosis/lice	0.5%	0.5%	0.5%
211	Scabies	0.5%	0.5%	0.5%
216	Herpes simplex	1.0%	1.0%	1.0%
219	Hyperhidrosis	5.5%	5.5%	5.5%
		100%	**100%**	**100%**

Eye/Ear Disease Cluster (Cluster Percentages)		(3.2%)	(4.4%)	(2.9%)
PC	Diagnoses	Europe	NE Asia	SW Asia
220	Blepharitis/inflammation/eyelid	3.0%	3.0%	3.0%
221	Conjunctivitis/severe/eyelid lining	9.0%	9.0%	9.0%
222	Conjunctivitis/moderate	13.0%	13.0%	13.0%
223	Corneal ulcer	3.5%	3.5%	3.5%
225	Iridocyclitis/acute/visual impairment	4.5%	4.5%	4.5%
226	Iridocyclitis/acute/min impairment	5.0%	5.0%	5.0%
227	Refraction/accommodation/refraction required	13.0%	13.0%	13.0%
228	Refraction/accommodation/spectacles required	11.0%	11.0%	11.0%
229	Otitis/external	12.0%	12.0%	12.0%
230	Otitis/media/acute/suppurative	8.0%	8.0%	8.0%
231	Mastoiditis/chronic	18.0%	18.0%	18.0%
		100%	**100%**	**100%**

Respiratory Disease Cluster (Cluster Percentages)		(16.7%)	(20.1%)	(15.9%)
PC	Diagnoses	Europe	NE Asia	SW Asia
232	Allergic/rhinitis	3.0%	3.0%	3.0%
233	Upper/respiratory/infection	52.0%	52.0%	52.0%
234	Bronchitis	19.0%	19.0%	19.0%
235	Asthma/disabling/repeated attacks	0.5%	0.5%	0.5%
236	Asthma	0.5%	0.5%	0.5%
239	Respiratory/distress/syndrome/severe	7.0%	7.0%	7.0%
240	Respiratory/distress/syndrome/moderate	18.0%	18.0%	18.0%
		100%	**100%**	**100%**

Appendix D. Estimated Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Males

Gastrointestinal Disease Cluster (Cluster Percentages)		(21.3%)	(18.4%)	(23.5%)
PC	Diagnoses	Europe	NE Asia	SW Asia
243	Food poisoning/severe/disabling	4.0%	2.5%	1.4%
244	Food poisoning/moderate	30.6%	19.0%	10.4%
245	Diarrheal/severe	8.1%	5.0%	2.7%
246	Diarrheal/moderate	23.8%	47.5%	71.3%
248	Gastritis/dyspepsia	4.0%	2.5%	1.4%
250	Peptic Ulcer/gastro or duodenal/moderate	9.7%	6.0%	3.3%
251	Regional ileitis/disabling/unresponsive	3.2%	2.0%	1.1%
252	Regional ileitis/responding to treatment	8.9%	5.5%	3.0%
253	Helminthiasis	3.8%	7.5%	4.1%
286	Pancreatitis	0.8%	0.5%	0.3%
287	Cirrhosis	3.2%	2.0%	1.1%
		100%	**100%**	**100%**

Cardiovascular Disease Cluster (Cluster Percentages)		(2.5%)	(2.7%)	(2.4%)
PC	Diagnoses	Europe	NE Asia	SW Asia
258	Hypertension/essential	56.0%	56.0%	56.0%
259	Ischemic heart/disease	34.0%	34.0%	34.0%
260	Phlebitis/deep vein involvement	10.0%	10.0%	10.0%
		100%	**100%**	**100%**

Sexually Transmitted Disease Cluster (Cluster Percentages)		(0.5%)	(0.5%)	(0.4%)
PC	Diagnoses	Europe	NE Asia	SW Asia
269	STD/urethritis	86.0%	86.0%	86.0%
270	STD/genital ulcers/adenopathy	12.0%	12.0%	12.0%
271	STD/complicated	2.0%	2.0%	2.0%
		100%	**100%**	**100%**

Genitourinary Disease Cluster (Cluster Percentages)		(9.9%)	(6.1%)	(8.1%)
PC	Diagnoses	Europe	NE Asia	SW Asia
272	Glomerulonephritis/acute	3.5%	3.5%	3.5%
273	Glomerulonephritis/chronic	3.5%	3.5%	3.5%
274	Pyelonephritis/secondary to obstruction	3.5%	3.5%	3.5%
275	Pyelonephritits/bacterial/infection	5.0%	5.0%	5.0%
276	Nephrotic/syndrome	5.0%	5.0%	5.0%
278	Ureteral calculus/not causing obstruction	18.5%	18.5%	18.5%
279	Epididymitis/cystitis/prostatitis	42.0%	42.0%	42.0%
280	Balanoposthitis	19.0%	19.0%	19.0%
		100%	**100%**	**100%**

Infectious/Parasitic Cluster (Cluster Percentages)		(14.6%)	(16.1%)	(14.0%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
263	Menigo/encephalitis/complicated	3.0%	3.0%	1.3%
264	Menigo/encephalitis/uncomplicated	1.0%	1.0%	0.4%
282	Infectious/mononucleosis	4.5%	4.5%	2.0%
283	Hepatitis/infectious/viral	4.3%	4.3%	2.0%
329	Trachoma	1.0%	1.0%	0.4%
330	Schistosomiasis	0.0%	0.0%	1.0%
331	Malaria/severe	0.0%	0.0%	0.0%
332	Malaria/moderate	0.0%	0.0%	43.7%
333	Febrile illness/acute/severe	8.6%	8.6%	3.5%
334	Febrile illness/acute/moderate	77.6%	77.6%	35.4%
339	Cutaneous ulcers/leishmaniasis	0.0%	0.0%	10.1%
		100.0%	**100.0%**	**100.0%**

Appendix D. Estimated Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Males

Neuropsychiatric Disease Cluster (Cluster Percentages)		(6.1%)	(6.1%)	(6.1%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
301	Psychosis	9.4%	9.4%	9.4%
302	Conduct Disorders	45.1%	45.1%	45.1%
303	Non-psychotic mental disorders	39.2%	39.2%	39.2%
306	Alcohol dependency/moderate	2.0%	2.0%	2.0%
307	Alcohol misuse/simple intoxication	1.5%	1.5%	1.5%
308	Drug dependency/severe	0.0%	0.0%	0.0%
309	Drug misuse/moderate	2.2%	2.2%	2.2%
316	Alcohol dependency/severe	0.3%	0.3%	0.3%
317	Drug misuse/severe	0.3%	0.3%	0.3%
		100.0%	**100.0%**	**100.0%**

Miscellaneous Disease Cluster (Cluster Percentages)		(1.2%)	(0.9%)	(0.6%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
255	Migraine	80.0%	80.0%	80.0%
289	Neoplasms/malignant	20.0%	20.0%	20.0%
		100%	**100%**	**100%**

Appendix E. Estimated PC Code Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Females

Surgical Disease Cluster (Cluster Percentages)		(9.5%)	(7.1%)	(10.1%)
PC	Diagnoses	Europe	NE Asia	SW Asia
196	Appendicitis/perforation/rupture/peritonitis	10.0%	10.0%	10.0%
197	Appendicitis/rupture/peritonitis	14.0%	14.0%	14.0%
198	Inguinal hernia/complicated/incarceration	4.0%	4.0%	4.0%
199	Inguinal/hernia/no incarceration of bowel	20.0%	20.0%	20.0%
212	Pilonidal/cyst/abscess/requiring excision	0.5%	0.5%	0.5%
213	Pilonidal/cyst/abscess/incision	1.5%	1.5%	1.5%
249	Peptic ulcer/gastric/duodenal/perforated	0.5%	0.5%	0.5%
256	Hemorrhoidal disease	22.0%	22.0%	22.0%
277	Ureteral calculus/obstruct/impacted	5.0%	5.0%	5.0%
285	Cholecystitis/cholelithiasis	0.5%	0.5%	0.5%
290	Neoplasms/benign	22.0%	22.0%	22.0%
		100%	**100%**	**100%**

Dermatological Disease Cluster (Cluster Percentages)		(12.2%)	(14.3%)	(12.4%)
PC	Diagnoses	Europe	NE Asia	SW Asia
202	Eczema/derma/seborrheic/affecting	7.0%	7.0%	7.0%
203	Eczema/derma/seborrheic/not affect	22.0%	22.0%	22.0%
204	Boils/furuncles/pyoderma/surgery	2.5%	2.5%	2.5%
205	Boils/furuncles/pyoderma/no surgery	1.5%	1.5%	1.5%
206	Cellulitis/face/weight bearing areas	21.0%	21.0%	21.0%
207	Cellulitis/other than face or weight	32.0%	32.0%	32.0%
208	Dermatophytosis/severe/feet	1.5%	1.5%	1.5%
209	Dermatophytosis/all other cases	5.0%	5.0%	5.0%
210	Pediculosis/lice	0.5%	0.5%	0.5%
211	Scabies	0.5%	0.5%	0.5%
216	Herpes simplex	1.0%	1.0%	1.0%
219	Hyperhidrosis	5.5%	5.5%	5.5%
		100%	**100%**	**100%**

Eye/Ear Disease Cluster (Cluster Percentages)		(3.2%)	(4.8%)	(3.2%)
PC	Diagnoses	Europe	NE Asia	SW Asia
220	Blepharitis/inflammation/eyelid	3.0%	3.0%	3.0%
221	Conjunctivitis/severe/eyelid lining	9.0%	9.0%	9.0%
222	Conjunctivitis/moderate	13.0%	13.0%	13.0%
223	Corneal ulcer	3.5%	3.5%	3.5%
225	Iridocyclitis/acute/visual impairment	4.5%	4.5%	4.5%
226	Iridocyclitis/acute/min impairment	5.0%	5.0%	5.0%
227	Refraction/accommodation/refraction required	13.0%	13.0%	13.0%
228	Refraction/accommodation/spectacles required	11.0%	11.0%	11.0%
229	Otitis/external	12.0%	12.0%	12.0%
230	Otitis/media/acute/suppurative	8.0%	8.0%	8.0%
231	Mastoiditis/chronic	18.0%	18.0%	18.0%
		100%	**100%**	**100%**

Respiratory Disease Cluster (Cluster Percentages)		(15.3%)	(17.5%)	(15.7%)
PC	Diagnoses	Europe	NE Asia	SW Asia
232	Allergic/rhinitis	3.0%	3.0%	3.0%
233	Upper/respiratory/infection	52.0%	52.0%	52.0%
234	Bronchitis	19.0%	19.0%	19.0%
235	Asthma/disabling/repeated attacks	0.5%	0.5%	0.5%
236	Asthma	0.5%	0.5%	0.5%
239	Respiratory/distress/syndrome/severe	7.0%	7.0%	7.0%
240	Respiratory/distress/syndrome/moderate	18.0%	18.0%	18.0%
		100%	**100%**	**100%**

Appendix E. Estimated PC Code Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Females

Gastrointestinal Disease Cluster (Cluster Percentages)		(16.9%)	(15.5%)	(19.6%)
PC	Diagnoses	Europe	NE Asia	SW Asia
243	Food poisoning/severe/disabling	4.0%	2.5%	1.4%
244	Food poisoning/moderate	30.6%	19.0%	10.4%
245	Diarrheal/severe	8.1%	5.0%	2.7%
246	Diarrheal/moderate	23.8%	47.5%	71.3%
248	Gastritis/dyspepsia	4.0%	2.5%	1.4%
250	Peptic ulcer/gastro or duodenal/moderate	9.7%	6.0%	3.3%
251	Regional ileitis/disabling/unresponsive	3.2%	2.0%	1.1%
252	Regional ileitis/responding to treatment	8.9%	5.5%	3.0%
253	Helminthiasis	3.8%	7.5%	4.1%
286	Pancreatitis	0.8%	0.5%	0.3%
287	Cirrhosis	3.2%	2.0%	1.1%
		100%	**100%**	**100%**

Cardiovascular Disease Cluster (Cluster Percentages)		(1.7%)	(1.6%)	(1.8%)
PC	Diagnoses	Europe	NE Asia	SW Asia
258	Hypertension/essential	56.0%	56.0%	56.0%
259	Ischemic heart/disease	34.0%	34.0%	34.0%
260	Phlebitis/deep vein involvement	10.0%	10.0%	10.0%
		100%	**100%**	**100%**

Sexually Transmitted Disease Cluster (Cluster Percentages)		(0.5%)	(0.5%)	(0.3%)
PC	Diagnoses	Europe	NE Asia	SW Asia
269	STD/urethritis	86.0%	86.0%	86.0%
270	STD/genital ulcers/adenopathy	12.0%	12.0%	12.0%
271	STD/complicated	2.0%	2.0%	2.0%
		100%	**100%**	**100%**

Genitourinary Disease Cluster (Cluster Percentages)		(7.3%)	(5.7%)	(7.4%)
PC	Diagnoses	Europe	NE Asia	SW Asia
272	Glomerulonephritis/acute	9.0%	9.0%	9.0%
273	Glomerulonephritis/chronic	9.0%	9.0%	9.0%
274	Pyelonephritis/secondary to obstruction	9.0%	9.0%	9.0%
275	Pyelonephritis/bacterial/infection	12.8%	12.8%	12.8%
276	Nephrotic/syndrome	12.8%	12.8%	12.8%
278	Ureteral calculus/not causing obstruction	47.4%	47.4%	47.4%
279	Epididymitis/cystitis/prostatitis	0.0%	0.0%	0.0%
280	Balanoposthitis	0.0%	0.0%	0.0%
		100%	**100%**	**100%**

Female Specific Disease Cluster (Cluster Percentages)		(11.4%)	(8.9%)	(11.5%)
PC	Diagnoses	Europe	NE Asia	SW Asia
291	Abnormal uterine bleeding	15.7%	15.7%	15.7%
292	Dysmenorrhea/ amenorrhea	51.0%	51.0%	51.0%
293	Pelvic Inflammatory disease (PID)	25.5%	25.5%	25.5%
294	Cervicitis/endocervicitis/leukorrhea	3.9%	3.9%	3.9%
295	Vulvovaginitis	3.9%	3.9%	3.9%
297	Tubal pregnancy	0.0%	0.0%	0.0%
299	Abortion spontaneous	0.0%	0.0%	0.0%
		100%	**100%**	**100%**

Appendix E. Estimated PC Code Percentage Distributions of PC Codes by Disease Cluster and Geographical Region for Females

Infectious/Parasitic Cluster (Cluster Percentages)		(15.4%)	(17.6%)	(12.0%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
263	Menigo/encephalitis/complicated	3.0%	3.0%	1.3%
264	Menigo/encephalitis/uncomplicated	1.0%	1.0%	0.4%
282	Infectious/mononucleosis	4.5%	4.5%	2.0%
283	Hepatitis/infectious/viral	4.3%	4.3%	2.0%
329	Trachoma	1.0%	1.0%	0.4%
330	Schistosomiasis	0.0%	0.0%	1.0%
331	Malaria/severe	0.0%	0.0%	0.0%
332	Malaria/moderate	0.0%	0.0%	43.7%
333	Febrile illness/acute/severe	8.6%	8.6%	3.5%
334	Febrile illness/acute/moderate	77.6%	77.6%	35.4%
339	Cutaneous ulcers/leishmaniasis	0.0%	0.0%	10.1%
		100%	**100%**	**100%**

Neuropsychiatric Disease Cluster (Cluster Percentages)		(4.9%)	(4.9%)	(4.9%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
301	Psychosis	9.5%	9.5%	9.5%
302	Conduct Disorders	47.4%	47.4%	47.4%
303	Non-psychotic mental disorders	41.3%	41.3%	41.3%
306	Alcohol dependency/moderate	0.6%	0.6%	0.6%
307	Alcohol misuse/simple intoxication	0.6%	0.6%	0.6%
308	Drug dependency/severe	0.0%	0.0%	0.0%
309	Drug misuse/moderate	0.0%	0.0%	0.0%
316	Alcohol dependency/severe	0.6%	0.6%	0.6%
317	Drug misuse/severe	0.0%	0.0%	0.0%
		100%	**100%**	**100%**

Miscellaneous Disease Cluster (Cluster Percentages)		(1.8%)	(1.4%)	(1.1%)
PC	Diagnoses	Europe	NE Asia	SW ASIA
255	Migraine	80.0%	80.0%	80.0%
289	Neoplasms/malignant	20.0%	20.0%	20.0%
		100%	**100%**	**100%**

Appendix F. Estimated Disease Patient Condition Codes by Geographical Region for Males

PC Code	PC Description	Europe	NE Asia	SW Asia
196	Appendicitis/perforation/rupture/peritonitis	1.08%	0.82%	1.03%
197	Appendicitis/rupture/peritonitis	1.52%	1.15%	1.45%
198	Inguinal hernia/complicated/incarceration	0.43%	0.33%	0.41%
199	Inguinal/hernia/no incarceration of bowel	2.17%	1.65%	2.06%
202	Eczema/derma/seborrheic/affecting	0.93%	1.16%	1.10%
203	Eczema/derma/seborrheic/not affect	2.93%	3.65%	3.47%
204	Boils/furuncles/pyoderma/surgery	0.33%	0.41%	0.39%
205	Boils/furuncles/pyoderma/no surgery	0.20%	0.25%	0.24%
206	Cellulitis/face/weight bearing areas	2.80%	3.49%	3.31%
207	Cellulitis/other than face or weight	4.26%	5.31%	5.05%
208	Dermatophytosis/severe/feet	0.20%	0.25%	0.24%
209	Dermatophytosis/all other cases	0.67%	0.83%	0.79%
210	Pediculosis/lice	0.07%	0.08%	0.08%
211	Scabies	0.07%	0.08%	0.08%
212	Pilonidal/cyst/abscess/requiring excision	0.05%	0.04%	0.05%
213	Pilonidal/cyst/abscess/incision	0.16%	0.12%	0.15%
216	Herpes simplex	0.13%	0.17%	0.16%
219	Hyperhidrosis	0.73%	0.91%	0.87%
220	Blepharitis/inflammation/eyelid	0.09%	0.13%	0.09%
221	Conjunctivitis/severe/eyelid lining	0.28%	0.40%	0.26%
222	Conjunctivitis/moderate	0.41%	0.57%	0.38%
223	Corneal ulcer	0.11%	0.15%	0.10%
225	Iridocyclitis/acute/visual impairment	0.14%	0.20%	0.13%
226	Iridocyclitis/acute/minimal impairment	0.16%	0.22%	0.14%
227	Refraction/accommodation/refraction required	0.41%	0.57%	0.38%
228	Refract/accommodation/spectacles required	0.35%	0.49%	0.32%
229	Otitis/external	0.38%	0.53%	0.35%
230	Otitis/media/acute/suppurative	0.25%	0.35%	0.23%
231	Mastoiditis/chronic	0.57%	0.79%	0.52%
232	Allergic/rhinitis	0.50%	0.60%	0.48%
233	Upper/respiratory/infection	8.70%	10.44%	8.28%
234	Bronchitis	3.18%	3.81%	3.03%
235	Asthma/disabling/repeated attacks	0.08%	0.10%	0.08%
236	Asthma	0.08%	0.10%	0.08%
239	Respiratory/distress/syndrome/severe	1.17%	1.40%	1.12%
240	Respiratory/distress/syndrome/moderate	3.01%	3.61%	2.87%
243	Food poisoning/severe/disabling	0.86%	0.46%	0.32%
244	Food poisoning/moderate	6.51%	3.49%	2.44%
245	Diarrheal/severe	1.71%	0.92%	0.64%
246	Diarrheal/moderate	5.05%	8.72%	16.74%
248	Gastritis/dyspepsia	0.86%	0.46%	0.32%
249	Peptic ulcer/gastric/duodenal/perforated	0.05%	0.04%	0.05%
250	Peptic ulcer/gastro or duodenal/moderate	2.06%	1.10%	0.77%
251	Regional ileitis/disabling/unresponsive	0.69%	0.37%	0.26%
252	Regional ileitis/responding to treatment	1.88%	1.01%	0.71%
253	Helminthiasis	0.80%	1.38%	0.96%
255	Migraine	0.97%	0.71%	0.47%
256	Hemorrhoidal disease	2.38%	1.81%	2.27%

Appendix F. Estimated Disease Patient Condition Codes by Geographical Region for Males

PC Code	PC Description	Europe	NE Asia	SW Asia
258	Hypertension/essential	1.40%	1.52%	1.37%
259	Ischemic heart/disease	0.85%	0.92%	0.83%
260	Phlebitis/deep vein involvement	0.25%	0.27%	0.24%
263	Menigo/encephalitis/complicated	0.43%	0.48%	0.19%
264	Menigo/encephalitis/uncomplicated	0.14%	0.16%	0.06%
269	STD/urethritis	0.41%	0.41%	0.37%
270	STD/genital ulcers/adenopathy	0.06%	0.06%	0.05%
271	STD/complicated	0.01%	0.01%	0.01%
272	Glomerulonephritis/acute	0.35%	0.21%	0.28%
273	Glomerulonephritis/chronic	0.35%	0.21%	0.28%
274	Pyelonephrititis/secondary to obstruction	0.35%	0.21%	0.28%
275	Pyelonephritits/bacterial/infection	0.49%	0.30%	0.41%
276	Nephrotic/syndrome	0.49%	0.30%	0.41%
277	Ureteral calculus/obstruct/impacted	0.54%	0.41%	0.52%
278	Ureteral calculus/not causing obstruction	1.83%	1.13%	1.50%
279	Epididymitis/cystitis/prostatitis	4.15%	2.56%	3.41%
280	Balanoposthitis	1.88%	1.16%	1.54%
282	Infectious/mononucleosis	0.66%	0.73%	0.29%
283	Hepatitis/infectious/viral	0.63%	0.70%	0.27%
285	Cholecystitis/cholelithiasis	0.05%	0.04%	0.05%
286	Pancreatitis	0.17%	0.09%	0.06%
287	Cirrhosis	0.69%	0.37%	0.26%
289	Neoplasms/malignant	0.24%	0.18%	0.12%
290	Neoplasms/benign	2.38%	1.81%	2.27%
291	Abnormal uterine bleeding	0.00%	0.00%	0.00%
292	Dysmenorrhea/amenorrhea	0.00%	0.00%	0.00%
293	Pelvic inflammatory disease (PID)	0.00%	0.00%	0.00%
294	Cervicitis/endocervicitis/leukorrhea	0.00%	0.00%	0.00%
295	Vulvovaginitis	0.00%	0.00%	0.00%
297	Tubal pregnancy	0.00%	0.00%	0.00%
299	Abortion spontaneous	0.00%	0.00%	0.00%
301	Psychosis	0.57%	0.57%	0.57%
302	Conduct Disorders	2.73%	2.73%	2.73%
303	Non-psychotic mental disorders	2.38%	2.38%	2.38%
306	Alcohol dependency/moderate	0.12%	0.12%	0.12%
307	Alcohol misuse/simple intoxication	0.09%	0.09%	0.09%
308	Drug dependency/severe	0.00%	0.00%	0.00%
309	Drug misuse/moderate	0.13%	0.13%	0.13%
316	Alcohol dependency/severe	0.02%	0.02%	0.02%
317	Drug misuse/severe	0.02%	0.02%	0.02%
329	Trachoma	0.14%	0.16%	0.06%
330	Schistosomiasis	0.00%	0.00%	0.14%
331	Malaria/severe	0.00%	0.00%	0.00%
332	Malaria/moderate	0.00%	0.00%	6.10%
333	Febrile illness/acute/severe	1.14%	1.26%	0.49%
334	Febrile illness/acute/moderate	11.42%	12.62%	4.94%
339	Cutaneous ulcers/leishmaniasis	0.00%	0.00%	1.41%
		100.00%	**100.00%**	**100.00%**

Appendix G. Estimated Disease Patient Condition Codes by Geographical Region for Females

PC Code	PC Description	Europe	NE Asia	SW Asia
196	Appendicitis/perforation/rupture/peritonitis	0.95%	0.71%	1.01%
197	Appendicitis/rupture/peritonitis	1.33%	0.99%	1.41%
198	Inguinal hernia/complicated/incarceration	0.38%	0.28%	0.40%
199	Inguinal/hernia/no incarceration of bowel	1.90%	1.42%	2.02%
202	Eczema/derma/seborrheic/affecting	0.85%	1.00%	0.87%
203	Eczema/derma/seborrheic/not affect	2.68%	3.15%	2.73%
204	Boils/furuncles/pyoderma/surgery	0.30%	0.36%	0.31%
205	Boils/furuncles/pyoderma/no surgery	0.18%	0.21%	0.19%
206	Cellulitis/face/weight bearing areas	2.56%	3.01%	2.60%
207	Cellulitis/other than face or weight	3.89%	4.58%	3.97%
208	Dermatophytosis/severe/feet	0.18%	0.21%	0.19%
209	Dermatophytosis/all other cases	0.61%	0.72%	0.62%
210	Pediculosis/lice	0.06%	0.07%	0.06%
211	Scabies	0.06%	0.07%	0.06%
212	Pilonidal/cyst/abscess/requiring excision	0.05%	0.04%	0.05%
213	Pilonidal/cyst/abscess/incision	0.14%	0.11%	0.15%
216	Herpes simplex	0.12%	0.14%	0.12%
219	Hyperhidrosis	0.67%	0.79%	0.68%
220	Blepharitis/inflammation/eyelid	0.09%	0.15%	0.10%
221	Conjunctivitis/severe/eyelid lining	0.28%	0.44%	0.29%
222	Conjunctivitis/moderate	0.41%	0.63%	0.42%
223	Corneal ulcer	0.11%	0.17%	0.11%
225	Iridocyclitis/acute/visual impairment	0.14%	0.22%	0.15%
226	Iridocyclitis/acute/minimal impairment	0.16%	0.24%	0.16%
227	Refraction/accommodation/refraction required	0.41%	0.63%	0.42%
228	Refract/accommodation/spectacles required	0.35%	0.53%	0.36%
229	Otitis/external	0.38%	0.58%	0.39%
230	Otitis/media/acute/suppurative	0.25%	0.39%	0.26%
231	Mastoiditis/chronic	0.57%	0.87%	0.58%
232	Allergic/rhinitis	0.46%	0.53%	0.47%
233	Upper/respiratory/infection	7.97%	9.12%	8.16%
234	Bronchitis	2.91%	3.33%	2.98%
235	Asthma/disabling/repeated attacks	0.08%	0.09%	0.08%
236	Asthma	0.08%	0.09%	0.08%
239	Respiratory/distress/syndrome/severe	1.07%	1.23%	1.10%
240	Respiratory/distress/syndrome/moderate	2.76%	3.16%	2.82%
243	Food poisoning/severe/disabling	0.68%	0.39%	0.27%
244	Food poisoning/moderate	5.19%	2.95%	2.04%
245	Diarrheal/severe	1.36%	0.78%	0.54%
246	Diarrheal/moderate	4.02%	7.38%	13.98%
248	Gastritis/dyspepsia	0.68%	0.39%	0.27%
249	Peptic ulcer/gastric/duodenal/perforated	0.05%	0.04%	0.05%
250	Peptic ulcer/gastro or duodenal/moderate	1.64%	0.93%	0.64%
251	Regional ileitis/disabling/unresponsive	0.55%	0.31%	0.21%
252	Regional ileitis/responding to treatment	1.50%	0.85%	0.59%
253	Helminthiasis	0.64%	1.17%	0.80%
255	Migraine	1.42%	1.15%	0.92%
256	Hemorrhoidal disease	2.09%	1.56%	2.22%

Appendix G. Estimated Disease Patient Condition Codes by Geographical Region for Females

PC Code	PC Description	Europe	NE Asia	SW Asia
258	Hypertension/essential	0.96%	0.91%	1.03%
259	Ischemic heart/disease	0.58%	0.55%	0.62%
260	Phlebitis/deep vein involvement	0.17%	0.16%	0.18%
263	Menigo/encephalitis/complicated	0.45%	0.52%	0.16%
264	Menigo/encephalitis/uncomplicated	0.15%	0.17%	0.05%
269	STD/urethritis	0.42%	0.43%	0.26%
270	STD/genital ulcers/adenopathy	0.06%	0.06%	0.04%
271	STD/complicated	0.01%	0.01%	0.01%
272	Glomerulonephritis/acute	0.65%	0.51%	0.66%
273	Glomerulonephritis/chronic	0.65%	0.51%	0.66%
274	Pyelonephrititis/secondary to obstruction	0.65%	0.51%	0.66%
275	Pyelonephritits/bacterial/infection	0.93%	0.73%	0.94%
276	Nephrotic/syndrome	0.93%	0.73%	0.94%
277	Ureteral calculus/obstruct/impacted	0.47%	0.35%	0.50%
278	Ureteral calculus/not causing obstruction	3.45%	2.70%	3.49%
279	Epididymitis/cystitis/prostatitis	0.00%	0.00%	0.00%
280	Balanoposthitis	0.00%	0.00%	0.00%
282	Infectious/mononucleosis	0.70%	0.80%	0.24%
283	Hepatitis/infectious/viral	0.67%	0.76%	0.23%
285	Cholecystitis/cholelithiasis	0.05%	0.04%	0.05%
286	Pancreatitis	0.14%	0.08%	0.05%
287	Cirrhosis	0.55%	0.31%	0.21%
289	Neoplasms/malignant	0.36%	0.29%	0.23%
290	Neoplasms/benign	2.09%	1.56%	2.22%
291	Abnormal uterine bleeding	1.78%	1.40%	1.81%
292	Dysmenorrhea/amenorrhea	5.80%	4.55%	5.87%
293	Pelvic inflammatory disease (PID)	2.90%	2.27%	2.93%
294	Cervicitis/endocervicitis/leukorrhea	0.45%	0.35%	0.45%
295	Vulvovaginitis	0.45%	0.35%	0.45%
297	Tubal pregnancy	0.00%	0.00%	0.00%
299	Abortion spontaneous	0.00%	0.00%	0.00%
301	Psychosis	0.46%	0.46%	0.46%
302	Conduct Disorders	2.20%	2.20%	2.20%
303	Non-psychotic mental disorders	1.91%	1.91%	1.91%
306	Alcohol dependency/moderate	0.10%	0.10%	0.10%
307	Alcohol misuse/simple intoxication	0.07%	0.07%	0.07%
308	Drug dependency/severe	0.00%	0.00%	0.00%
309	Drug misuse/moderate	0.11%	0.11%	0.11%
316	Alcohol dependency/severe	0.01%	0.01%	0.01%
317	Drug misuse/severe	0.01%	0.01%	0.01%
329	Trachoma	0.15%	0.17%	0.05%
330	Schistosomiasis	0.00%	0.00%	0.12%
331	Malaria/severe	0.00%	0.00%	0.00%
332	Malaria/moderate	0.00%	0.00%	5.23%
333	Febrile illness/acute/severe	1.21%	1.38%	0.42%
334	Febrile illness/acute/moderate	12.08%	13.80%	4.24%
339	Cutaneous ulcers/leishmaniasis	0.00%	0.00%	1.21%
		100.00%	**100.00%**	**100.00%**

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Estimates of the distribution of medical admissions by patient condition (PC) code are a key component in forecasting adequate resources to meet the medical needs of combat operations. This study examined medical admissions incurred during previous combat operations going back to World War II for battle injuries, non-battle injuries and disease casualties. Within the injury categories, the observed incidence was analyzed by traumatism type and anatomical region, with the percentages corresponding to these subcategories mapped to the most appropriate PC codes. For the empirical disease data, admissions were first mapped to the appropriate PC cluster, and then distributed according to the estimated incidence percentage for individual PC codes within a cluster.

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