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Statistical Report

MARINE CORPS MEDICAL EVACUATION PROCEDURES IN VIETNAM

*Bernard J. Cameron
Harry J. Older*

prepared for

**Physiological Psychology Programs
Office of Naval Research
Washington, D. C.**

**Contract No. N00014-70-C-0065
Work Unit No. NR 145-280**

April 1970

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BioTechnology, Inc.

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Introduction

This document presents a limited overview of two aspects of U. S. Marine medical evacuation procedures under combat conditions. The first issue concerns the development of a characteristic time profile for medevac missions. The second issue concerns the extent to which those casualties which occur under combat conditions are misclassified at the field level.

The research program from which the data derive was designed, initiated, and executed by Capt. Richard E. Luehrs, MC, USN, who collected the information during assignment as Wing Surgeon with the First Marine Aircraft Wing, Fleet Marine Forces, Pacific. Data processing and analysis were conducted by BioTechnology, Inc. under the direction of Dr. Gilbert C. Tolhurst, Head, Physiological Psychology Branch, Office of Naval Research, Washington, D. C.

Purpose

The purpose of the research procedure was to document a sufficient number of Marine helicopter medical evacuations to provide a basis for understanding the evacuation system as a whole, and to determine the nature and extent of a variety of operational problems in the two areas under consideration. Although it was recognized that a definitive, controlled study of medical evacuation procedures would be extremely difficult to conduct under combat conditions, any information which could be collected would be useful in selecting pertinent variables for further study. In addition, the advantages and limitations of specific techniques for studying medical evacuation procedures in a combat situation might suggest themselves upon examination of these data. In summary, the analytic portion of this study should be viewed primarily as a hypothesis-generating effort rather than a definitive study of Marine Corps medical evacuation.

Methodology

The data represented 2,146 individual medevac missions involving 4,392 casualties during a seven-month period extending from October 1968 through April 1969. These data represent only a sample and do not reflect all casualties handled by Medevac during this period. Information was recorded by medical personnel aboard a medevac helicopter during missions conducted under combat conditions in the Republic of Vietnam. The data provide a recorded chronology of selected individual mission events from the time of onset and classification of the injury, through a series of communications about the injury, including salient aspects of the evacuation procedure, and to the point where definitive care was administered to the casualty upon his ultimate arrival at a medevac hospital facility. Included were classification of casualties at the field level, by the flight corpsman, and by personnel at the medevac hospital facility. The characteristic sequence of medical evacuation events with which this portion of the study is concerned is shown in Table 1. The format within which information was collected is illustrated in Table 2.

Data Package

Punch Cards

All available data were systematically reduced and transferred onto 80-column punch cards for subsequent computer processing. These punch cards are provided as an adjunct to the present report, and labeled Appendix B. Data on the cards consist of the actual time, in terms of a 24-hour clock, that a particular mission event occurred, from onset of the casualty to delivery at a hospital facility. Also coded upon the cards are the number of kind of casualties as classified (1) at the field level, (2) by flight corpsmen, and (3) by hospital personnel for each mission. Coding instructions for the punch cards are provided in Table 3.

Table 1
Characteristic Medical Evacuation Sequence

1. Casualty occurs
2. Initial examination, classification, and treatment of casualties by field corpsman
3. Field corpsman informs unit leader of seriousness of injury
4. Unit leader has radioman call for medical evacuation
5. Radioman contacts Company or Battalion
6. Message transmitted to Regimental Aviation Liaison Officer (RALO)
7. RALO calls Direct Air Support Center (DASC)
8. DASC contacts Helicopter Director in the same center (HDC)
9. HDC calls the Marine Air Group (MAG)
10. MAG calls two squadrons, one is assigned a medical evacuation role, the other, a gunship escort task
11. Two aircraft launch after receiving briefing from Squadron Duty Officers
12. Aircraft fly to pickup zone
13. Aircraft contacts ground unit for information relevant to landing and pickup
14. Gunship escort descends to check out pickup zone
15. Medevac helicopter lands
16. Casualties loaded on helicopter
17. Additional treatment as necessary provided aboard helicopter by flight corpsman
18. Helicopter returns as directly and rapidly as possible to hospital facility
19. Casualties unloaded at hospital facility
20. Definitive treatment and classification provided to casualties

Table 2
Medevac Survey Form

Items

1. Date
2. Mission number
3. Time of injury
4. Time of OIC's call to Battalion
5. Time of Battalion's call to Direct Air Support Center (DASC)
6. Time of DASC's call to Marine Air Group (MAG)
7. Time of MAG's call to squadron
8. Time of squadron's deployment of helicopter
9. Time of helicopter's contact with ground
10. Time of landing
11. Time of pickup
12. Time of delivery
13. Medevac facility
14. Field category of injury: A, B, or C, and number each category
15. Flight corpsman's assessment of injury: A, B, or C and number each category
16. Hospital's assessment of injury: A, B, or C and number each category
17. Hospital summary (kinds of injuries)
18. Remarks (comments on kinds of patients, whether helicopter received fire, whether hoist was used, etc.)

Table 3

Coding Instructions for Medical Evacuation Data

<u>Punch Card Columns</u>	<u>Description of Information</u>
01-02	MAG number (16 or 39)
03-04	Month (01-12) from date
05-06	Day (01-31) from date
07-11	Mission number. Left justified
12-15	Time of injury (0001-2400)
16-19	Time of OIC's call to Battalion (0001-2400)
20-23	Time of BATT's call to DASC (0001-2400)
24-27	Time of DASC's call to MAG (0001-2400)
28-31	Time of MAG's call to Squadron (0001-2400)
32-35	Time of SQDN's deployment of HELO (0001-2400)
36-39	Time of HELO's contact with Ground (0001-2400)
40-43	Time of landing (0001-2400)
44-47	Time of pickup (0001-2400)
48-51	Time of delivery (0001-2400)
52-56	Name of Medical Facility. Left justified
57-62	Field Assessment Category
57-58	A (Emergency)
59-60	B (Priority)
61-62	C (Routine)
63-68	Flight Corpsmans Assessment
63-64	A (Emergency)
65-66	B (Priority)
67-68	C (Routine)
69-74	Hospital Assessment
69-70	A (Emergency)
71-72	B (Priority)
73-74	C (Routine)

NOTE: For columns 57-74, the numbers entered in columns correspond to the assessed rating (e. g., if A-4 was entered for field category, 04 is punched in columns 57-58; if A-3, B-1 were entered for flight corpsman's assessment, 03 is punched in columns 63-64, 01 is punched in columns 65-66.)

In addition to serving as an effective vehicle for statistical analyses, the punch cards provide a convenient format for storing the data for reference use, or for potential application to other projects.

Completeness of Data

No mission within the total sample provided all the information requested on the survey form. However, some information was obtained on every mission, and consequently the number of cases reported within each frequency distribution may not correspond to the total number of missions studied. Despite incomplete or limited information in some instances, appropriate techniques for processing missing-case data were employed throughout the data analysis.

Computer Printouts

Appendix A provides computer printouts of frequency distributions for each of the seven time segments for emergency, priority, and routine missions. Printouts are also provided for total time distributions for that major portion of the mission between the squadron's deployment of the helicopter and delivery of casualties to a hospital facility. Also included as a separate set of printouts are frequency distributions for each of the seven time segments for all missions combined.

A representative sample of the type of frequency distributions to be found in Appendix A for one of the mission segments, time from the squadron's deployment of the helicopter to the helicopter's contact with the ground unit, are reproduced as Tables 4 and 5. The measures of central tendency and dispersion indicated for this particular time segment have been computed for all other segments of the missions. The data presented in Tables 4 and 5 are intended only to illustrate the content of Appendix A.

Table 4

BIOTECHNOLOGY, INC.
 PREPARED FOR OFFICE OF NAVAL RESEARCH
 TIME ANALYSIS OF MEDIVAC MISSIONS
 FREQUENCY DISTRIBUTIONS

ALL MISSIONS
 TIME FROM SQUADRON'S DEPLOYMENT OF HELO TO HELO'S CONTACT WITH GROUND

INTERVAL	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT	MIDPOINT PERCENTILE RANK	STANDARD SCORE
86.00 TO 90.00	5	0.34	1475	100.00	99	5.08
81.00 TO 85.00	2	0.14	1470	99.66	99	4.73
76.00 TO 80.00	6	0.41	1468	99.53	99	4.37
71.00 TO 75.00	5	0.34	1462	99.12	98	4.02
66.00 TO 70.00	5	0.34	1457	98.78	98	3.67
61.00 TO 65.00	4	0.27	1452	98.44	98	3.31
56.00 TO 60.00	16	1.08	1448	98.17	97	2.96
51.00 TO 55.00	12	0.81	1432	97.08	96	2.61
46.00 TO 50.00	14	0.95	1420	96.27	95	2.25
41.00 TO 45.00	24	1.63	1406	95.32	94	1.90
36.00 TO 40.00	27	1.83	1382	93.69	92	1.55
31.00 TO 35.00	45	3.05	1355	91.86	90	1.20
26.00 TO 30.00	67	4.54	1310	88.81	86	0.84
21.00 TO 25.00	92	6.24	1243	84.27	81	0.49
16.00 TO 20.00	150	10.17	1151	78.03	72	0.14
11.00 TO 15.00	309	20.95	1001	67.86	57	-0.22
6.00 TO 10.00	393	26.64	692	46.92	33	-0.57
1.00 TO 5.00	299	20.27	299	20.27	10	-0.92

NUMBER OF CASES FOR THIS ANALYSIS 1475

MEAN

16.57

Q3

19.01

NUMBER OF CASES NOT ANSWERING 334

STANDARD DEVIATION

14.16

MEDIAN

11.24

CASES OUT OF RANGE(1.0 - 90.0)

STANDARD ERROR OF THE MEAN

0.37

Q1

6.39

HIGHEST OBSERVED VALUE 90.00

SIGMA OF STANDARD SCORE

1.00

U

6.31

LOWEST OBSERVED VALUE 1.00

MEAN OF STANDARD SCORE

0.0

Table 5

BIOTECHNOLOGY, INC.
 PREPARED FOR OFFICE OF NAVAL RESEARCH
 TIME ANALYSIS OF MEDIVAC MISSIONS
 FREQUENCY DISTRIBUTIONS

ALL MISSIONS
 TIME FROM SQUADRON'S DEPLOYMENT OF HELO TO HELO'S CONTACT WITH GROUND

FREQUENCY	295	393	309	150	92	67	45	27	8	9	24	14	12	16	4	5	5	5	6	2	5	
390		*																				
380		*																				
370		*																				
360		*																				
350		*																				
340		*																				
330		*																				
320		*																				
310		*																				
300		*																				
290	*																					
280	*																					
270	*																					
260	*																					
250	*																					
240	*																					
230	*																					
220	*																					
210	*																					
200	*																					
190	*																					
180	*																					
170	*																					
160	*																					
150	*			*																		
140	*			*																		
130	*			*																		
120	*			*																		
110	*			*																		
100	*			*																		
90	*			*		*																
80	*			*		*																
70	*			*		*																
60	*			*		*																
50	*			*		*																
40	*			*		*																
30	*			*		*																
20	*			*		*																
10	*			*		*																
FREQUENCY	295	393	309	150	92	67	45	27	8	9	24	14	12	16	4	5	5	5	6	2	5	
INTERVAL	1.	1.00 -		5.00		6.	26.00 -		30.00		30.00		11.	51.00 -		55.00		55.00	16.	76.00 -		80.00
	2.	6.00 -		10.00		7.	31.00 -		35.00		35.00		12.	56.00 -		60.00		60.00	17.	81.00 -		85.00
	3.	11.00 -		15.00		8.	36.00 -		40.00		40.00		13.	61.00 -		65.00		65.00	18.	86.00 -		90.00
	4.	16.00 -		20.00		9.	41.00 -		45.00		45.00		14.	66.00 -		70.00		70.00				
	5.	21.00 -		25.00		10.	46.00 -		50.00		50.00		15.	71.00 -		75.00		75.00				

Mission Time Profile

This section presents a limited overview of the time frame within which medical evacuation occurs. The data presented in this portion of the report are abstracted from the more detailed information provided on the computer printout sheets (Appendix A).

Results

Table 6 shows measures of central tendency and dispersion, and presents a time profile developed from information on 1,834 medevac missions where the data were unambiguous. The table shows mean mission time to be one hour forty-nine minutes from onset of injury to delivery of the casualty at a medevac hospital facility. The means (averages) are not truly representative, however, since they are often excessively inflated by a relatively small number of missions which consumed a large amount of time. The median figures generally provide a more accurate picture.

The median mission required 64 minutes for completion. In a practical sense, this means that fifty percent of the 4,392 casualties on whom data were gathered reached a medevac hospital facility approximately one hour or less from the time they were injured.

One other median figure is of particular interest. It shows that if one omits the time necessary to complete the series of radio calls informing the squadron to deploy a helicopter, and considers only the time from the squadron's deployment of the helicopter to delivery of the casualty at a hospital facility, the median mission time is reduced to 31 minutes.

Additional data provided in Table 6 shows the relationship between casualty classification and mission time, i. e. , the amount of time required within each segment of the emergency evacuation loop, as opposed to the priority or routine. Each of these segments is discussed briefly below.

Table 6

Time Analysis of Medevac Missions
(Entries in Minutes)

<u>Time Interval</u>	<u>Type Mission</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>N</u>
From onset of injury to battalion's call to DASC	A	34.8	23.5	64.6	168
	B	74.7	25.0	125.7	95
	C	84.8	23.0	121.3	19
	*	51.5	23.8	95.9	283
From battalion's call to DASC to DASC's call to MAG	A	5.4	3.5	8.7	326
	B	8.6	4.1	13.7	180
	C	13.1	5.2	17.7	55
	*	7.2	3.8	11.9	561
From DASC's call to MAG to MAG's call to squadron	A	5.9	4.5	4.5	21
	B	8.5	4.4	10.7	11
	C	5.0	--	--	1
	*	6.8	4.4	7.3	33
From MAG's call to squad- ron to squadron's deploy- ment of helicopter	A	4.1	3.6	5.0	38
	B	9.5	4.0	12.8	17
	C	15.0	--	--	1
	*	5.9	3.8	8.6	56
From squadron's deploy- ment of helicopter to helicopter's contact with ground unit	A	16.0	11.5	12.2	701
	B	16.5	11.0	14.3	538
	C	18.6	10.8	18.5	236
	*	16.6	11.2	14.2	1475
From helicopter's contact with ground unit to landing	A	6.5	4.0	7.3	704
	B	5.0	3.6	5.5	568
	C	4.4	3.4	4.5	249
	*	5.6	3.7	6.3	1521

*All missions combined.

Table 6 (Cont'd)

<u>Time Interval</u>	<u>Type Mission</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>N</u>
From helicopter's landing to completion of casualty pickup	A	2.2	3.1	2.9	741
	B	1.9	3.1	2.8	598
	C	2.0	3.1	4.7	257
	*	2.1	3.1	3.2	1596
From casualty pickup to delivery at medevac hospital facility	A	13.6	10.2	9.7	761
	B	13.3	9.9	10.1	608
	C	14.0	10.7	9.7	270
	*	13.5	10.2	9.9	1639
Total mission	A	88.5	63.9	14.4	860
	B	138.0	65.1	24.4	668
	C	156.9	56.2	22.0	306
	*	109.2	64.0	19.7	1834
From squadron's deployment of helicopter to delivery of casualty at medevac hospital facility	A	39.1	31.9	25.5	750
	B	38.7	29.2	28.5	587
	C	42.6	31.3	34.0	259
	*	39.5	30.6	28.2	1596

*All missions combined.

From onset of injury to battalion's call to DASC. Because no data were recorded for one segment of the time profile--that interval between the time of injury and the time the ground unit radioman notified the battalion--data in this portion of the table condense several events. As might be predicted, the average figures suggest that emergency casualties are reported significantly faster than either priority or routine casualties. However, much of this apparent difference is dissipated when medians for the various mission types are compared.

From battalion's call to DASC to DASC's call to MAG. Mean figures for this portion of the missions suggest that information was relayed more than twice as quickly if the casualties were called in as emergency (5 minutes) rather than as routine (13 minutes). Although the order of elapsed time for median figures is the same as that for the averages, --least time required for emergency casualties, most time for routine casualties, --the differences between time required for the various missions becomes much less pronounced.

From DASC's call to MAG to MAG's call to Squadron. Median figures are close to identical for this portion of the missions. About four and one-half minutes were required to relay the information.

From Squadron's deployment of helicopter to helicopter's contact with ground unit. The median amount of time required for this portion of the missions was approximately 11 minutes. There was little difference among means or medians for emergency, priority, or routine missions.

From helicopter's contact with the ground unit to helicopter's landing. Median time required for this portion of the missions was approximately 5 minutes. Differences among means or medians for the three types of mission classifications were minimal.

From helicopter's landing to completion of casualty pickup. The amount of time required for casualty pickup averaged about 2 minutes. Distinctions between the amount of time required to pick up emergency, as

opposed to priority or routine cases were not warranted on the basis of these data.

From casualty pickup to delivery at medevac hospital facility. This portion of the mission required an average time of about 13 minutes, and a median time of about 10 minutes. As is the case with most of the other time segments of these missions, there is less than one full minute's difference in average or median time between emergency, as opposed to priority or routine missions.

From Squadron's deployment of helicopter to delivery of casualties at hospital facility. The median amount of time expended between notification of the helicopter pilot and the time the emergency casualty was off-loaded at a medical facility was 32 minutes (mean = 39). For priority missions, the median figure was 29 minutes (mean = 39), while routine missions required 31 minutes (mean = 43).

Interpretation

The absence of any pronounced difference among mean or median figures for the total mission time suggests that, regardless of the kind of casualties reported from the field, a similar degree of effort (probably maximum) is expended to retrieve them as quickly as possible.

What is particularly striking about these data is their uniformity both within any given segment of the mission time profile or for the mission as a whole. For example, if one considers that major portion of the missions which lies between the time the helicopter was deployed and the point where casualties were delivered to a hospital facility, there is less than 3 minutes difference between mean, or median figures for any of the three types of missions. The measures of dispersion, for example, the cumulative frequency distributions provided in Appendix A are as markedly similar as the measures of central tendency.

Tables 7 through 11 show time interval distributions of selected mission events for all missions combined. Included in each table is the frequency, relative frequency and cumulative frequency of events falling within a particular time interval. These tables are presented within the body of the report because they represent the more critical intervals within the evacuation procedure. All segments of the operational procedure are presented in much greater detail in Appendix A.

The distribution of time intervals from the point where the helicopter landed until completion of the casualty pickup is not included because of the severe skewness of the distribution. Ninety-six percent of the time the pickup was completed in less than five minutes.

Casualty Classification

Method

This section deals with the relationship between field classification and flight corpsman assessment of the categories of sustained injuries. The classification system in use included four categories of casualties: emergency, priority, routine, and tactical emergency. These were defined as indicated below.

Emergency. Immediate medical care and hospitalization are required to save life. (1) Active uncontrollable bleeding, (2) severe shock, (3) penetrating wound of chest or abdomen, and (4) amputation of upper or lower extremities.

Priority. Medical care is required, but the injury does not warrant immediate attention by a medical facility. Care is required within 24 hours.

Routine. Medical care is required within 72 hours. (1) Consultations and (2) care of killed-in-action.

Tactical Emergency. The combat unit must move or fight and casualties must be evacuated immediately.

Table 7

Time Interval Distribution from Onset of Injury to
Terminal Telephone Communication

<u>Interval (minutes)</u>	<u>Missions</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
61 +	75	.18	1.00
56 - 60	13	.03	.83
51 - 55	10	.02	.80
46 - 50	12	.03	.78
41 - 45	20	.05	.75
36 - 40	17	.04	.70
31 - 35	13	.03	.66
26 - 30	33	.08	.63
21 - 25	27	.06	.55
16 - 20	39	.09	.49
11 - 15	62	.15	.40
6 - 10	50	.12	.25
1 - 5	55	.13	.13

Cases: 426

No Data: 1408

Table 8

Time Interval Distribution from Squadron's Deployment of
Helicopter to Helicopter's Contact with Ground Unit

<u>Interval (minutes)</u>	<u>Missions</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
86 - 90	5	-	1.00
81 - 85	2	-	-
76 - 80	6	-	-
71 - 75	5	-	-
66 - 70	5	-	.99
61 - 65	4	-	-
56 - 60	16	.01	.98
51 - 55	12	.01	.97
46 - 50	14	.01	.96
41 - 45	24	.02	.95
36 - 40	27	.02	.94
31 - 35	45	.03	.92
26 - 30	67	.04	.89
21 - 25	92	.06	.84
16 - 20	150	.10	.78
11 - 15	309	.21	.68
6 - 10	393	.27	.47
1 - 5	299	.20	.20

Cases: 1475

No Data: 334

Outside Range: 25

Table 9

Time Interval Distribution from Point of Helicopter's Contact
With Ground Unit to Helicopter's Landing

<u>Interval (minutes)</u>	<u>Missions</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
71 - 75	1	-	1.00
66 - 70	0	-	-
61 - 65	0	-	-
56 - 60	0	-	-
51 - 55	2	-	-
46 - 50	2	-	-
41 - 45	2	-	-
36 - 40	3	-	-
31 - 35	4	-	-
26 - 30	16	.01	.99
21 - 25	16	.01	.98
16 - 20	27	.02	.97
11 - 15	72	.05	.95
6 - 10	200	.13	.90
1 - 5	1176	.77	.77

Cases: 1521

No Data: 304

Outside Range: 9

Table 10

Time Interval Distribution from Point of Completion of Casualty
Pickup to Delivery at Medevac Hospital Facility

<u>Interval (minutes)</u>	<u>Missions</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
76 - 80	1	-	1.00
71 - 75	3	-	-
66 - 70	4	-	-
61 - 65	1	-	-
56 - 60	4	-	-
51 - 55	6	-	-
46 - 50	10	.01	.99
41 - 45	9	.01	-
36 - 40	18	.01	.98
31 - 35	27	.02	.97
26 - 30	54	.03	.95
21 - 25	99	.06	.92
16 - 20	164	.10	.86
11 - 15	382	.23	.76
6 - 10	571	.35	.52
1 - 5	286	.17	.17

Cases: 1639

No Data: 184

Outside Range: 11

Table 11

Time Interval Distribution from Point of Squadron's Deployment of
Helicopter to Delivery of Casualty at Medevac Hospital Facility

<u>Interval (minutes)</u>	<u>Missions</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
391 - 420	1	-	1.00
361 - 390	-	-	-
331 - 360	-	-	-
301 - 330	-	-	--
271 - 300	-	-	-
241 - 270	1	-	-
211 - 240	2	-	-
181 - 210	5	-	-
151 - 180	5	-	-
121 - 150	17	.01	.99
91 - 120	39	.02	.98
61 - 90	127	.08	.96
31 - 60	604	.38	.88
1 - 30	795	.50	.50

Cases: 1639

No Data: 237

Outside Range: 1

The requirement for accuracy and consistency in field categorization is vital, since in some instances the integrity of the medevac helicopter as well as the lives of the aircraft crew may become needlessly jeopardized as a result of misclassification at the field level. For example, in one instance what had been reported and received by the pilot as a mission to evacuate four emergency U. S. casualties in an area that had taken heavy fire ten minutes earlier, actually involved more than twenty Arvin personnel, including two photographers, boarding the helicopter upon its arrival in the combat zone. The flight corpsman reported, "When the nonwounded were chased out of the helo, what remained were four killed-in-action, and six routine wounded, all with minor shrapnel injuries that required no additional treatment." The helicopter received heavy fire.

Results

Misclassifications. Table 12 shows the distribution of 4,392 casualties as classified by field personnel and flight corpsmen. The figures show that in slightly more than 81% of the instances the two agreed as to appropriate classification, whether emergency, priority, or routine. In 17% of the instances, the flight corpsman subsequently downgraded the field assessment category; in 1% of the instances he upgraded it. Of particular interest is the finding that fully 11% of casualties classified in the field as emergency were subsequently categorized as priority (9%) or routine (2%). Also of interest is the fact that despite the existence of the tactical emergency category, there were no instances reported in the data where the classification was actually used.

Not represented in the table are the relatively few cases (N = 168 = 3%) where the flight corpsman's assessment was subsequently downgraded by hospital personnel. In the latter instances, 79 emergency cases became priority, 19 emergency cases became routine, and 70 priority cases became routine.

Table 12

Relative Frequency of Agreement and Disagreement
in Casualty Classification

<u>Field Category</u>	<u>Flight Corpsman Classification</u>	<u>N</u>	<u>Relative Frequency</u>
Emergency	Emergency	1091	.2484
Priority	Priority	1381	.3144
Routine	Routine	1117	.2543
	<u>Subtotal</u>	<u>3589</u>	<u>.8171</u>
Emergency	Priority	397	.0903
Emergency	Routine	123	.0280
Priority	Routine	241	.0548
	<u>Subtotal</u>	<u>761</u>	<u>.1731</u>
Routine	Priority	31	.0070
Priority	Emergency	11	.0025
	<u>Subtotal</u>	<u>42</u>	<u>.0095</u>
	<u>Total</u>	<u>4392</u>	<u>.9997</u>

Hostile Fire. An analysis was performed to determine how often the medical evacuation helicopter was fired upon, as this related to ground time during the interval between landing and completion of the casualty pickup. Of 2,146 documented missions, the helicopter received fire 157 times (7%). In these instances, the average time the helicopter spent on the ground was 3.74 minutes (median = 1.5 minutes). The standard deviation was 6.75 minutes. Range was from one to 35 minutes.

In 76% of the 157 instances, the helicopter was on the ground two minutes or less. Eleven percent of the time (n = 17) it remained on the ground 15 minutes or more. The data do not distinguish between kind of fire taken, i. e., mortar, small arms, etc., nor do they permit a determination of how long the helicopter was on the ground before it began to draw fire.

Of these 157 missions, 116 (74%) were for emergency casualties, 36 (23%) were for priorities, and 9 (6%) were for routines.

Interpretation

Because the number of designated medevac helicopters is finite, the data on the extent of disagreement between field personnel and flight corpsmen suggest that the system of evacuation, which depends on accurate field classification, may be being needlessly diluted. To the extent that the helicopters and their crews exert all-out effort to evacuate routine cases which have been called in as emergency cases--real emergency cases may wait longer for evacuation than is desirable, and the morale of the helicopter crews as well as the ground troops may be undermined. When a medical evacuation helicopter is launched to pick up an emergency patient, and upon its arrival in a hot zone, the patient runs aboard the aircraft, the retrieval of some other actual emergency is delayed by the amount of time the fraudulent mission required, and what may be described as a potent sense of frustration is induced in the helicopter crew.

Summary

This document and its appendices present a limited statistical overview of two aspects of U. S. Marine Corps medical evacuation procedures under combat conditions. These are: (1) the time involved in evacuating a casualty, from the point when injury occurs to delivery of the casualty at a hospital facility, (2) the extent of casualty misclassification. Measures of central tendency and dispersion are presented for each segment of the evacuation mission time profile. Data bearing on the relationship between field classification and flight corpsmen assessment of the categories of sustained injuries are also presented.

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