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THE EFFECT OF TIME IN A NEW JOB ON HOSPITALIZATION  
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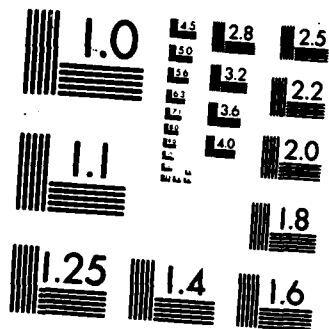
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# THE EFFECT OF TIME IN A NEW JOB ON HOSPITALIZATION RATES FOR ACCIDENTS AND INJURIES IN THE U.S. NAVY, 1977-1983

J. C. HELMKAMP  
C. M. BONE

REPORT NO. 86-10

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THE EFFECT OF TIME IN A NEW JOB ON HOSPITALIZATION RATES  
FOR ACCIDENTS AND INJURIES IN THE U.S. NAVY, 1977-1983

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SUMMARY

Problem

Injuries are the leading cause of death and disability among Americans under age 45 accounting for the loss of more working years of life than all forms of cancer and heart disease combined. In order to provide a basis for focusing accident prevention programs and medical resources where they are most needed, it is necessary to obtain a better understanding of the major factors that contribute to accidents in the U.S. Navy.

Objective

The objective of this study was to extend a previous investigation concerned with the influence of time in assignment on accidental injury hospitalization rates by expanding the data base to cover an additional four years, 1980-1983.

Approach

Participants included all male enlisted personnel (E2 through E9) who had an accident during the period 1977-1983 that resulted in hospitalization, a Medical Board, a Physical Evaluation Board or death (N = 35,322). Data were obtained from the medical and service history files maintained at the Naval Health Research Center. The following classifications were used to further describe the circumstances of individual injuries: (1) external cause of injury, (2) paygrade, (3) work environment (sea or shore), (4) duty status (on or off duty), and (5) time in assignment prior to injury.

Results

When comparing work environments, time was shown to influence the risk of injury for shore-based but not for sea-based personnel. Shore-based personnel had significantly elevated risks of hospitalization from athletic, fall, automobile, motorcycle, and machinery-related accidents during the first few weeks in a new job compared to sea-based personnel. The leading external causes of injury (motorcycles, automobiles, and athletics) did not change appreciably over time among E2-E9 personnel.

Conclusions/Recommendations

The results of this study have shown that risk of injury among Naval enlisted personnel varies as a function of their work environment and the length of time an individual has been assigned to a new shore-based duty station. Analysis of temporal, individual, occupational, and causal factors has helped contribute to a better understanding of accident risk among Navy personnel.



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## INTRODUCTION

Injuries are the leading cause of death and disability among Americans under age 45, accounting for the loss of more working years of life than all forms of cancer and heart disease combined.<sup>1,2</sup> Injury is the most common cause of hospitalization within this age group.<sup>2</sup> The U.S. Navy has a large majority of personnel less than 45 years old (90%) and, therefore, is especially vulnerable to manpower losses resulting from non-combat injuries. The risks of injury in Navy industrial and operational environments are diverse, especially aboard ship where the effects of injury and accident-related hospitalizations on individual and group performance, and thus on overall operational readiness, are important.

Archival medical data gathered by the Navy Medical Department has made possible epidemiologic investigations that describe disease and injury occurrence as well as studies of various etiologic and exposure variables. Previous research<sup>3-5</sup> has reported that accident rates vary with occupation or type of work assignment. Individual characteristics such as age, education level, length-of-service, paygrade (seniority), and perception of work environment have also been shown to have a significant impact on overall accident and illness rates.<sup>6-8</sup>

A recent study by Helmkamp and Bone<sup>9</sup> indicated that the shipboard environment was a major risk factor for accidents and injuries. Analyses focused on the contributions that duty station assignment, duty status, seniority and external cause of accident may have had on the risk of accidental injury-related hospitalization during the period 1977-1979. The current investigation extends previously unpublished data<sup>10</sup> expanding the database to cover an additional four years, 1980-1983. Variable-specific hospitalization rates are calculated by paygrade, duty status, and external cause in relation to temporal factors, to determine if time in a new job affects an individual's risk of injury and subsequent hospitalization.

## METHODS

Population data for all male enlisted personnel in eight paygrades (E2 through E9) were compiled from data files obtained from the Navy's Manpower and Personnel Management Information System. The estimate of the annual population at risk for each of the paygrades was based on the average personnel strength for five quarterly reporting periods (December of the previous year, March, June, September, and December) during each calendar year. Personnel in the lowest paygrade (E1) were not included in the analysis because the majority of the paygrade was made up of recruits undergoing basic training and individuals who may have been administratively reduced to E1 for disciplinary infractions.

Hospitalization and death data were obtained from computer files maintained at the Naval Health Research Center, San Diego. Participants in the study included all male enlisted personnel who suffered an accident during the seven-year period 1977-1983 that resulted in hospitalization, a Medical Board, a Physical Evaluation Board, or death (N = 35,322). The term "hospitalization" collectively describe these outcome events. Hospitalizations were considered to be due to an accident if the diagnoses were included in the "Accidents, Poisonings, and Violence" category of the International Classification of Diseases, eighth and ninth revisions (for 1977-1979 and 1980-1983 data, respectively). Self-inflicted, combat, or assault-related injuries were not included. Additional

classifications used to further describe individual injuries were: 1) external cause of injury, 2) work environment (sea or shore), 3) paygrade (a seniority measure), 4) duty status when the injury occurred (on-duty in the military is generally equivalent to "at job location" and off-duty in the military is generally equivalent to "at residence/away from job location" for civilian workers), and 5) time in assignment prior to injury; this latter variable is defined as the period between assignment to a new job and hospitalization for an injury.

Time intervals by month were calculated by dividing the number of days spent in a new job by 30, with the result truncated to the lower integer (for example, 1 month is 30 - 59 days, 2 months is 60 - 89 days, etc.) Accident-related hospitalization rates were then computed by taking the total number of injuries attributed to the specific time intervals and dividing by the appropriate total population in person-years. Ninety-five percent confidence intervals were calculated using the following formula:<sup>11</sup>

$$p \pm 1.96 \sqrt{\frac{p(1-p)}{N}}$$

Relative risk levels were then computed as the ratio of these rates; 95% confidence limits for the relative risks were calculated using the following formula:<sup>12</sup>

where:  $\exp [R (1 \pm 1.96/x)]$   
 $R = \ln [\text{relative risk}]$   
 $x = \sqrt{\chi^2}$  the calculated chi-square statistic

RESULTS

Figure 1 illustrates the effect of temporal factors on the incidence of accidental injury among male Navy enlisted personnel assigned to sea duty and those assigned to shore-based units.

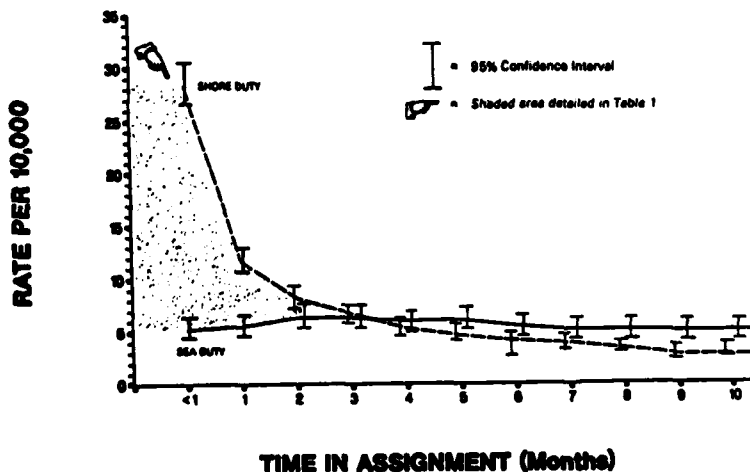


Figure 1. Accidental Injury Hospitalization Rates by Time in Assignment for Calendar Years 1977-1983

The hospitalization rates among shore-based personnel decreased dramatically following the first four weeks in a new job and continued to decline as time in assignment increased. The highest incidence of injury (28.4/10,000) occurred during the first few weeks, with approximately 35% of all shore-based injury-related hospitalizations occurring within the first month of a new job assignment. This rate was significantly higher than the rates observed for the other time intervals. The influence of time in assignment and its effect on accident incidence became much less apparent after shore-based personnel had worked at their new jobs for more than two months.

Rates did not vary significantly over time for personnel assigned to sea duty. Rates for personnel in both environments tended to parallel each other after four months; however, shore-based rates remained somewhat lower as time in assignment exceeded six months.

Table 1 provides a breakdown of the shaded area in Figure 1 by external cause of accident and duty status to help explain the rate differences observed between the two environments during the first two months of a new duty assignment. Relative risks (hospitalization rate shore/hospitalization rate sea) and their 95% confidence intervals are listed only for those causative agents that differed significantly between the two environments.

TABLE 1  
Relative Risk Comparisons for Selected External Causes of Hospitalization among  
Shore- and Sea-based Personnel by Duty Status During the First Months in a  
New Job Assignment for Calendar Years 1977-1983

External Cause	OFF-DUTY								
	< 1 Month			1 Month			2 Months		
	Rel. Risk	95% C.I.		Rel. Risk	95% C.I.		Rel. Risk	95% C.I.	
Athletics	4.5	(3.5, 5.7)		2.2	(1.6, 2.9)		1.3	(0.9, 1.7)	
Falls	3.6	(2.7, 4.7)		2.3	(1.6, 3.2)		1.3	(0.9, 1.8)	
Motorcycles	6.9	(5.3, 8.9)		2.3	(1.7, 3.1)		1.1	(0.8, 1.4)	
Automobiles	4.5	(3.5, 5.8)		2.6	(1.9, 3.9)		2.2	(1.6, 3.0)	
Machinery	5.3	(3.3, 8.5)		3.4	(2.1, 5.6)		2.3	(1.4, 3.8)	
	ON-DUTY								
Athletics	28.1	(13.2, 59.8)		5.0	(2.2, 11.2)		4.1	(1.6, 10.6)	
Falls	4.7	(3.4, 6.5)		1.7	(1.2, 2.5)		0.6	(0.4, 0.9)	
Motorcycles	9.3	(2.7, 32.5)		3.6	(0.6, 21.4)		1.8	(0.3, 99.7)	
Automobiles	14.3	(2.8, 74.0)		5.8	(1.4, 24.8)		2.2	(0.2, 27.6)	
Machinery	2.8	(2.0, 4.0)		1.3	(0.9, 2.0)		0.9	(0.6, 1.4)	

The data in Table 1 show that during the first month in a new job accidents due to athletics, falls, motorcycles, automobiles, and machinery were responsible for significantly elevated hospitalization rates among off-duty shore-based personnel compared to off-duty personnel assigned to sea duty. Using relative risk as a comparison of incidence rates, athletic, machinery, and automobile-related accidents caused approximately five times more hospitalizations for off-duty shore personnel compared to off-duty ship personnel during the first weeks in a new job. For the

same time period, off-duty shore-based personnel were 6.9 and 3.6 times more likely to be hospitalized for an injury caused by a motorcycle or fall-related accident, respectively, than off-duty sea-based personnel.

The differences in injury risk lessened, but still remained statistically significant, for automobile and machinery-related accidents, throughout the first two months in a new job. After two months, the risk of injury to off-duty personnel were the same in both environments.

All five external causes listed in Table 1 contributed to relatively high levels of accident risk for on-duty shore-based personnel compared to on-duty sea-based personnel during the first weeks in a new job. After working four weeks in the same job, the risk of falls, athletic, and automobile-related injuries remained significantly elevated for shore personnel. By two months, only the risk of athletic injury remained significantly elevated for shore personnel; following this time period, the risk of injury to on-duty personnel due to specific causes was similar between the two environments.

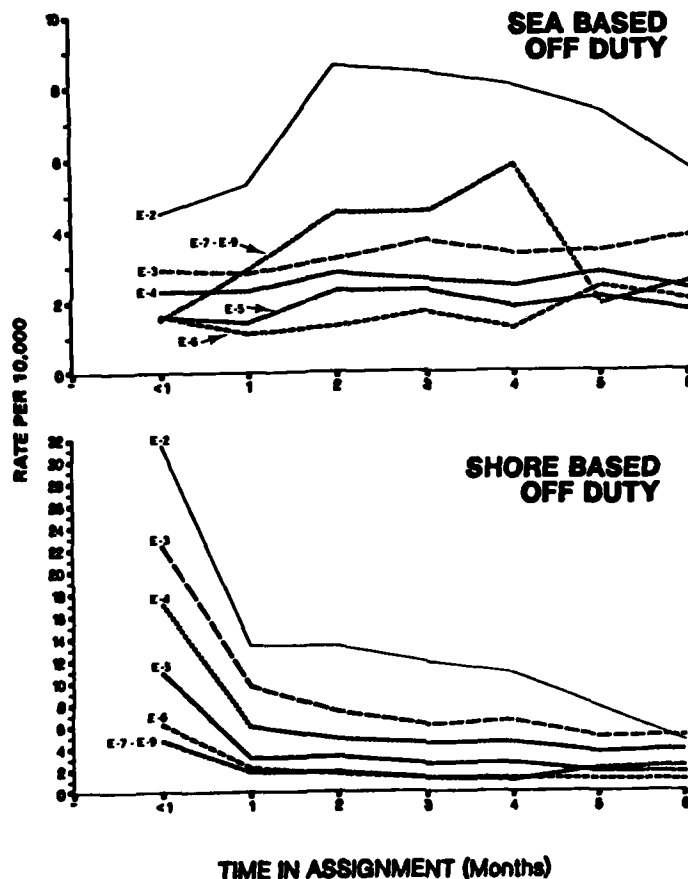


Figure 2. Accidental Injury Hospitalization Rates Among Off-duty Shore- and Sea-based Personnel by Paygrade and Time in Assignment for Calendar Years 1977-1983

The data in Figures 2 and 3 illustrate the influence paygrade, work environment, duty status, and time in a new job had on the incidence of accidental injury hospitalization. The effects of paygrade agree with findings in previous studies, where an inverse relationship was observed between risk of injury and seniority, with personnel in lower paygrades experiencing higher injury rates.<sup>3,9</sup> Trend lines in the two lower panels (of Figures 2 and 3) also indicate that the relative time an individual had been in an assignment played a major role in injury risk among shore-based personnel. The effect is much more pronounced for personnel who were in an off-duty status, especially during the first few weeks at a new job, where middle grade level personnel (E2-E5) exhibited hospitalization rates that were about seven times higher than those experienced by more senior personnel (E6-E9). Rates decreased sharply after the first few weeks, then gradually levelled off after five months. For on-duty shore-based personnel (Figure 3), rates levelled off among the senior paygrades (E6-E9) after two months; the rates among E2s and E3s continued to gradually decline through five months on the job.

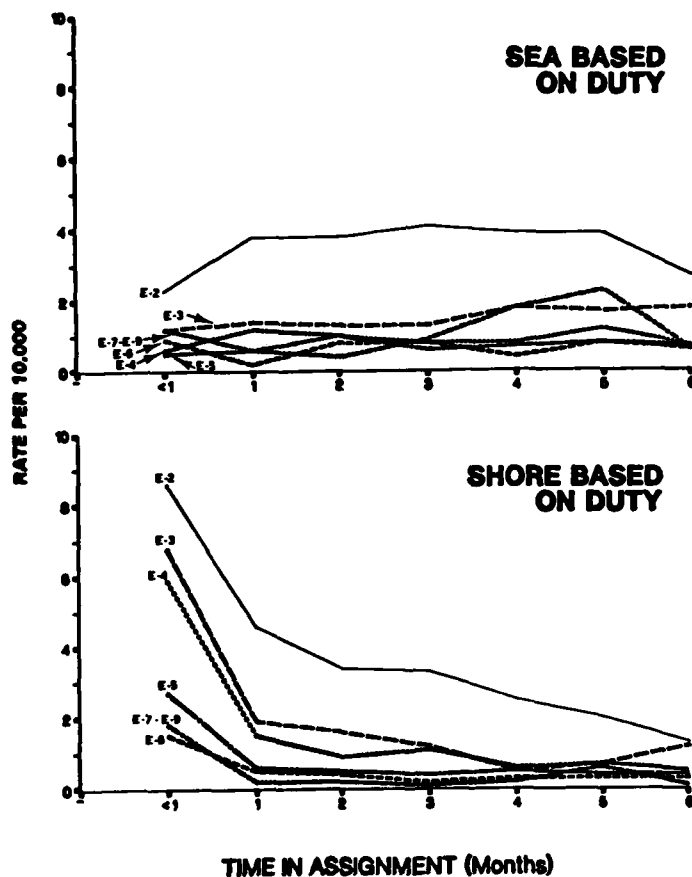


Figure 3. Accidental Injury Hospitalization Rates Among On-duty Shore- and Sea-based Personnel by Paygrade and Time in Assignment for Calendar Years 1977-1983

Temporal factors did not appear to significantly effect the incidence of injury among sea-based personnel, as shown in the upper panels of Figures 2 and 3. There was a slight increase in injury incidence following the first month at a new job. This increase was somewhat greater for off-duty personnel especially in the E2 and E7-E9 paygrades.

The external cause of an accident by paygrade and time in assignment prior to injury was analyzed to determine if risk varied as the work environment became more familiar. Motorcycle, automobile, and athletic-related accidents remained the leading causes of injury for each time in assignment interval.

#### DISCUSSION

Our shore-based findings agree with those of a U.S. Bureau of Labor report<sup>1</sup> citing North Carolina and Iowa data which stated that workers are most likely to suffer an occupational injury or illness during their first month on the job. This trend decreased only slightly with increasing seniority.

Athletic, automobile, and motorcycle-related accidents should be dismissed from work environment hospitalization rate comparisons since personnel serving onboard ship have relatively little exposure to those particular risks. There is decreased opportunity for motor vehicle use and athletic participation aboard ship which lessens the risk of serious injury (from these specific causes) for shipboard personnel compared to those personnel assigned to shore duty.

The potential to experience an on-duty machinery or fall-related accident, however, should be similar in both environments. One explanation of why time in a new job may exert a greater influence on the risk of injury for personnel on shore assignments but not for those on sea duty might be that orientation and initial training procedures may be different between the two environments. During his first one to two months in a new job, a man aboard ship receives a thorough indoctrination in routine evolutions and safety procedures common to shipboard duty and his new job assignment. A ship is essentially a "closed environment" where there is much more dependency developed between shipmates. On the other hand, a man just transferred to a more "open environment," such as shore duty, may be expected to perform his job immediately without benefit of a familiarization period or specific training concerning hazards inherent to that work environment. The worker may not receive the safety information he needs--even on jobs involving dangerous equipment where training is clearly essential.

An alternate explanation of our results may be inferred from studies reporting that transitory life events and the resultant changes they impose are an important factor in accident etiology.<sup>13-15</sup> These studies suggest that recent life events (e.g., birth of a child, divorce, death of a friend or relative, change of job, financial change, etc.) which bring about a significant change in an individual's ongoing life pattern may cause psychological turmoil that can exacerbate the risk of accident or illness. Assignment to a new job could be considered to be among those personal life change events which cause stress and thereby contribute to an increased incidence of hospitalization. Although one would expect the stress and psychological effect resulting from a job change to be equivalent for both ship and shore environments, sea duty has been considered more stressful than shore duty.<sup>16</sup> This paradoxical relationship of lower accident rates in a more stressful shipboard environment may be explained, in part, by the perception of personnel (at all

levels of seniority) that they live and work in a more hazardous environment and therefore must exercise a greater degree of "safety vigilance" compared to their counterparts ashore. This vigilance may be expressed as stricter adherence to safety procedures and instructions and more attention to detail on new and unfamiliar tasks.

Most probably, the new work environment, the life (job) change event, and inadequate indoctrination periods contributed to the high hospitalization rates observed for shore-based personnel during the first month in a new job assignment. The time (often up to thirty days) between leaving the old duty station and reporting to the new one also may be a critical period in assessing the risk of accident and subsequent hospitalization. Further investigation into the relative contribution of each of these factors is warranted.

Although our data are historical in nature, they have been useful in identifying problems, defining their extent, and determining causative factors that may be amenable to intervention. We agree with the National Research Council's Committee on Trauma Research<sup>2</sup> that epidemiologic studies of injuries should not exist in isolation but must be able to draw ideas and methods from clinical, laboratory, and biomedical research, just as other forms of research need to draw from epidemiology.

#### CONCLUSIONS

The results of this study have shown that risk of injury among shore-based, but not sea-based, Navy enlisted personnel, varies as a function of their work environment and the length of time an individual has been assigned to a new duty station. Analysis of temporal, individual, occupational, and causal factors has helped contribute to a better understanding of accident risk among Navy personnel.

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athletic, fall, automobile, motorcycle, and machinery-related accidents during the first few weeks in a new job compared to sea-based personnel. The leading external causes of injury (motorcycles, automobiles, and athletics) did not change appreciably over time among E2-E9 personnel.

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