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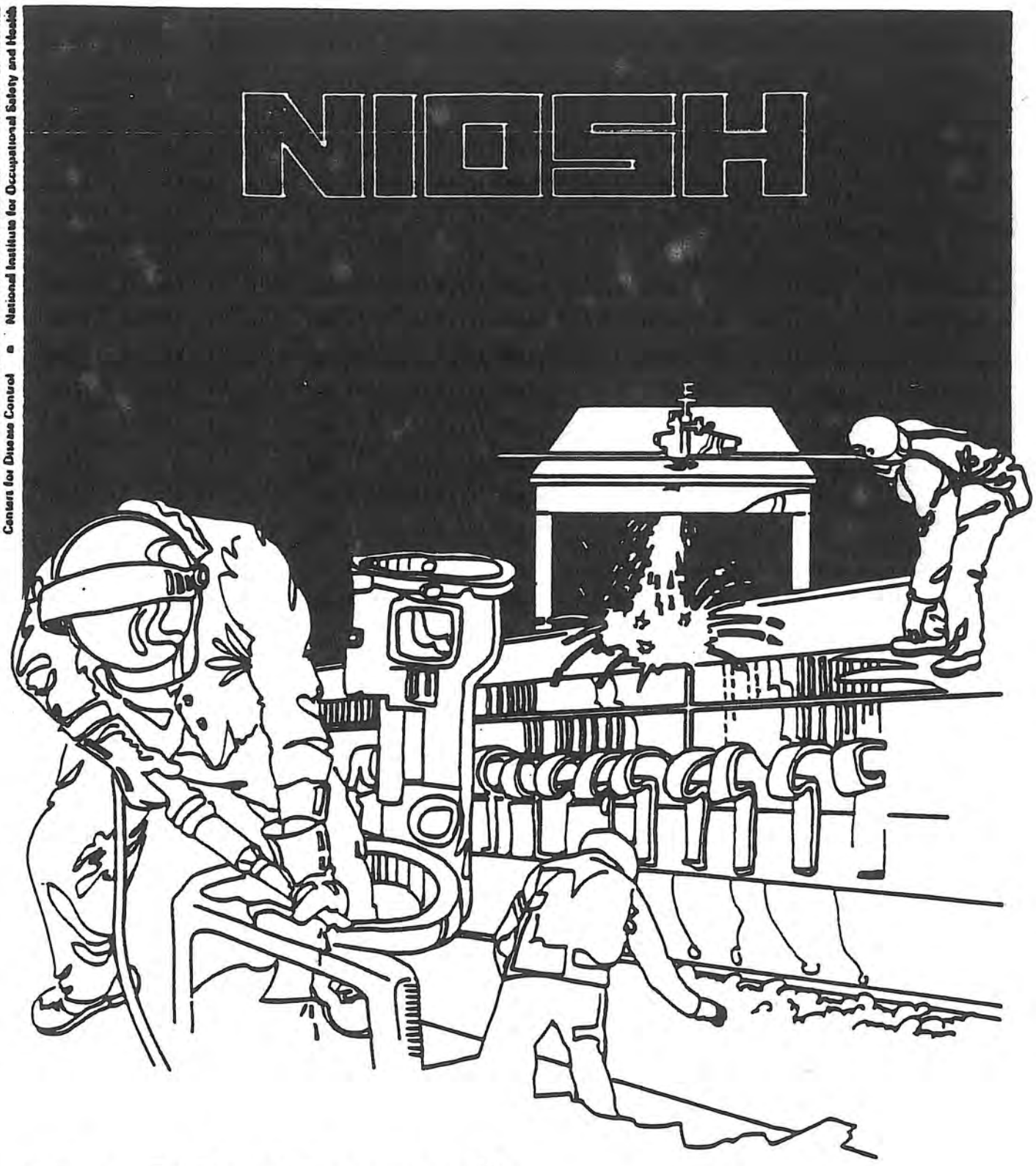

Health Hazard Evaluation Report

HETA 85-452-1698
AT&T, SOUTHERN BELL
AND UNITED TELEPHONE
NORTH CAROLINA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 85-452-1698
May, 1986
AT&T, SOUTHERN BELL AND UNITED TELEPHONE
NORTH CAROLINA

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I. Summary

On July 19, 1985 the National Institute for Occupational Safety and Health (NIOSH) received a request from the Communication Workers of America (CWA) to investigate an excessively high frequency of reported chest pain among its members. The increased frequency was identified by the union during a survey conducted of its members employed at three communications companies in North Carolina. The NIOSH reanalysis of the data indicates that chest pain was reported twice as frequently by VDT users than by non-users and that the reports of chest pain increased with amount of VDT use. The frequency of reported chest pain also increased as the employees' perception of their ability to control their work situation (job control) decreased.

Limitations in the survey restrict our ability to interpret the finding of increased reported chest pain with VDT use or low job control. These limitations include the low participation rate (35%) in the survey and the use of a cardiovascular symptom questionnaire which can not differentiate the source of the pain (cardiac, gastrointestinal or musculoskeletal). Because the study was conducted in a population of primarily younger women, gastrointestinal or musculoskeletal pain would be more likely than would ischemic heart disease as the source of the pain. It is important to determine whether this survey has identified an unrecognized source of occupational morbidity. This would be best accomplished through a separate study of chest pain in a different population using VDT's.

A reanalysis of data collected by the North Carolina Committee on Occupational Safety and Health, the Communication Workers of America and the University of North Carolina finds that the frequency of chest pain increased with frequency of VDT use and with decreasing control over the work situation (job control). However, limitations in the survey restrict our ability to interpret these findings. In a population of women under age 50, it is unlikely that the pain was due to coronary artery disease, although musculoskeletal, gastrointestinal or other cardiac causes remain plausible. Our recommendations are provided in Section VII of this report.

KEYWORDS: SIC Code # 4811, video display terminals, chest pain, angina, musculoskeletal, gastrointestinal, coronary artery disease, Rose questionnaire

II. Introduction

On July 19, 1985, the National Institute for Occupational Safety and Health (NIOSH) received a request from CWA to investigate an excessively high rate of chest pain among members of the Communication Workers of America (CWA) employed by AT&T, United Telephone and Southern Bell in North Carolina.

III. Background

In 1983-1984, the University of North Carolina, the North Carolina Committee on Occupational Safety and Health (NCOSH) and the CWA conducted a survey designed to evaluate stress among VDT users.[1] A preliminary analysis of the survey provided to CWA by the researchers confirmed the findings of other similar surveys showing increased rates of eyestrain, musculoskeletal problems and stress-related problems which were defined as headaches, nausea, tension, insomnia and fatigue. In addition, the researchers reported an increased rate of "angina"* among VDT users. The CWA and NCOSH prepared a report to the workers regarding this information[1] and the investigators presented the findings at two 1985 American Heart Association meetings[3,4] and at a 1984 Office of Technology Assessment meeting.[5]

The findings were based upon information obtained from a mailed questionnaire survey which had been sent to the members of seven CWA North Carolina locals between November 1983 and October 1984. Questions covered a wide range of health effects, working conditions and, for VDT users, the conditions of use. Forty percent (N=991) of 2,478 persons mailed the questionnaire responded to the survey. The analysis by UNC/NCOSH/CWA was limited to the 966 office workers who responded. The response rate among office workers was not provided.

To assess chest pain, the survey included a version of the Rose questionnaire[2] revised for a self-administered format. The specific questions asked in the survey are contained in Appendix 1. The Rose questionnaire was designed to screen for angina and has been used in predicting anginal pain in populations of white working men aged 35 to 69. Both the administration of the questions and the interpretation of the answers are rigidly specified by Rose[2].

The Rose questionnaire has been frequently used in assessing the prevalence of anginal pain in males. A limitation of the questionnaire is that it cannot discriminate between pain from coronary artery disease and that due to other causes. One study of Swedish males, age

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* - Angina is defined as chest pain resulting from insufficient oxygen supply to the heart due to coronary artery disease. There are other cardiac sources of chest pain as well as non-cardiac causes of chest pain such as gastrointestinal and musculoskeletal problems.

55+ found that 30% of subjects classified as having angina (pain due to coronary artery disease) by the Rose questionnaire actually suffered from esophageal dysfunction.[6] The potential for misclassification becomes more of a problem as the disease of interest becomes rare. For example, coronary artery disease is uncommon among young females, whereas other causes of chest pain are common. In such circumstances, one might expect the predictive value of the Rose questionnaire to be low. In the North Carolina VDT study, approximately 65% of the study population is female under age 50.

The initial report and presentations by UNC, NCOSH and CWA equate chest pain with "anginal pain." However, the Rose questionnaire does not allow any distinction to be made between ischemic heart disease symptoms and other sources of similar chest pain, such as musculoskeletal pain, gastrointestinal disorders and non-ischemic cardiac pain resulting from a prolapsing mitral valve. The questionnaire was also altered slightly for self-administration. These changes, although slight, could affect the predictive value of the questionnaire.

The initial analysis by UNC, NCOSH and CWA defined a person as a non-VDT user if he or she used a VDT less than 50% of the time. Users were those that spent at least 50% of their time at a VDT. Jobs were also classified as having high job control or low job control. Table 1 provides the data from the initial report which shows that a high frequency of "anginal pain" was reported by persons who had either low job control or used a VDT. Only persons who had both high job control and a non-VDT job reported a low frequency of "angina". The number of persons in these categories was not provided in the initial report.

Because the finding of "angina" had not previously been reported among VDT users, the CWA requested that NIOSH follow-up on the survey to determine the source of the "angina". We began by reevaluating the data tapes from the CWA/UNC/NCOSH Survey.

IV. Methods

A technical report of the study and the results has not yet been published by the investigators, although results have been presented at three meetings.[3-5] Therefore, our first step was to confirm the reported excess. We did this by conducting some analyses of the data. The CWA provided us with a Statistical Analysis System data set which contained the survey results on 978 persons.

We limited the analysis to the 839 persons (621 females, 210 males and 8 unknown sex) who responded to both the question: Do you use a VDT? and, Have you ever had chest pain or discomfort? We included all job categories in the analysis. We categorized VDT use differently than that presented in the initial report. We did not collapse the VDT use data into two cells ($< 50\%$ of work time and $\geq 50\%$ of work time).

Instead, we looked at the five categories elicited in the questionnaire: non-users, less than 25% of work time, 25-50% of work time, 50-75% of work time and 75-100% of worktime. Table 2 shows the distribution of the population with respect to VDT use. Over 82% of the respondents reported VDT use and 17.8% were non-users. Among the users, over 50% were heavy users. That is, they used a VDT at least 75% of the time.

V. Results

There were 839 persons who responded to the two questions of interest. This translates into a 34% response rate from the original 2,478 persons. We determined that 78 respondents reported "anginal pain", as defined by the Rose criteria[2].

Table 3 provides the age and sex distribution of "anginal pain". Females reported a higher frequency of chest pain than did males (10.1% versus 6.7%). Although the analysis is based on small numbers, an increasing frequency of chest pain with age was not observed for either men or women. However, the age distribution did differ between the sexes. In men, reported chest pain remained relatively stable (around 6%) until age 60, when the frequency was higher (33.3%, based upon only one case). Among women, an unexpectedly high frequency occurred in the 30-39 age group (11.8%).

Table 4 shows that the frequency of reported "anginal pain" was higher among VDT users than non-users (10.3% versus 4.7%) and that among VDT users the frequency of the pain increased with increasing VDT use, from 4.0% among infrequent users to 15.2% among heavy users. Because of the small numbers and low response rate we chose not to apply statistical tests to these data.

Next, we looked at job control. The initial report indicated which questions were used to evaluate job control, but did not describe a scoring system. We derived categories of high, medium and low by dividing the range of potential total scores into even tertiles. We limited the analysis to those who responded to each of the five job control questions (n=827) and assigned them to a high, medium or low category of job control based upon their total score.

Table 5 shows that the frequency of "anginal pain" decreased with increasing job control for the total population (13.9%, 8.0% and 7.2%) and for VDT users (14.8%, 9.3% and 7.9%). The number of non-users reporting pain was too small for interpretation (n=7).

When we looked at specific VDT use categories, we did not see this trend. (Table 6) Among heavy VDT users (75-100% of work time) the frequency of "anginal pain" remained high regardless of the amount of job control (17.0%, 14.4% and 15.9%). The other categories of VDT use had too few observations for comment.

VI. Discussion

The data, although based on small numbers in each strata, indicate that the frequency of chest pain increases both with increasing amount of time spent at a VDT and with decreasing job control. Our findings differ somewhat from those in the initial report (Table 1). The data, as presented in the initial report, did not show an effect of job control on the frequency of chest pain among VDT users (16% and 15%).

The survey has two major limitations which restrict our ability to interpret the association of chest pain, specifically anginal pain, with VDT use or low job control. First, the response rate was less than 35% and hence response bias must be a serious concern. For example, if persons who are having health problems which they think might be associated with their work were more likely to respond than others, then the frequency of chest pain among VDT users would be overestimated. To avoid this problem, most questionnaire surveys aim for a response rate of at least 80%. Second, it is not clear that the questionnaire measured anginal pain. It is possible that, the source of the pain may be gastrointestinal or musculoskeletal rather than cardiac. Even if it is cardiac, the pain might result from problems other than ischemia, such as from a prolapsing mitral valve. Nevertheless, the association, if real, might represent a large source of unrecognized occupational morbidity resulting in increased medical costs and lost worktime among office workers. Further investigations in another population would be valuable in addressing this concern.

VII. Recommendations

1. Other studies should be conducted to address the question of whether VDT use and job control are related to chest pain.

   a. If the association with chest pain is identified in a survey with high participation, follow-up medical examinations should be conducted to determine the etiology of the chest pain.

2. The workers in this study who reported chest pain should be individually notified of the results of the survey and the possible implications of the findings.

VIII. References

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IX. Authorship and Acknowledgments

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X. Distribution and Availability of Report

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Communications Workers of America
2. American Telephone and Telegraph
3. Southern Bell
4. United Telephone
5. NIOSH, Region IV
6. OSHA, Region IV

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE 1

NORTH CAROLINA STUDY -
FREQUENCY OF "ANGINAL PAIN"
AS MEASURED BY THE ROSE QUESTIONNAIRE

	LOW JOB CONTROL	HIGH JOB CONTROL
VDT USE	16%	15%
NON-VDT USE	13%	4%

TABLE 2

DISTRIBUTION OF RESPONDENTS
BY VDT USE

VDT USE	NUMBER	PERCENT
Non-user	142	17.8
User	690	82.2
TOTAL POPULATION	839	100.0

VDT USE	NUMBER	PERCENT
< 25% of time	124	18.0
25 - 50% of time	61	8.8
50 - 75% of time	58	8.4
75 -100% of time	348	50.4
% of time unknown	99	14.3
TOTAL USERS	690	100.0

TABLE 3

FREQUENCY OF "ANGINAL PAIN"*
BY AGE AND SEX

AGE (In Years)	SEX			
	MALES	FEMALES	UNKNOWN	TOTAL
	% (#)	% (#)	% (#)	% (#)
< 20	-	-	25.0 (1)	14.3 (1)
20-29	7.7 (2)	8.7 (10)	-	8.5 (12)
30-39	5.9 (5)	11.8 (39)	-	10.6 (44)
40-49	6.1 (4)	6.6 (7)	-	6.4 (11)
50-59	6.9 (2)	10.2 (6)	-	9.1 (8)
60 +	33.3 (1)	12.5 (1)	-	15.4 (2)
ALL AGE GROUPS	6.7 (14)	10.1 (63)	12.5 (1)	9.3 (78)
POPULATION SIZE	N=210	N=621	N=8	N=839

* - as defined by Rose criteria

TABLE 4

FREQUENCY OF "ANGINAL PAIN"*
BY VDT USE CATEGORY

VDT USE	POPULATION SIZE #	"ANGINAL PAIN"* #	
NON USER	149	7	4.7
USER	690	71	10.3
TOTAL POPULATION	839	78	9.3

VDT USERS	POPULATION SIZE N	"ANGINAL PAIN"* N	%
< 25% OF TIME	124	5	4.0
25- 50% OF TIME	61	4	6.6
50- 75% OF TIME	58	4	6.9
75-100% OF TIME	348	53	15.2
% Unknown	99	5	5.1
TOTAL USERS	690	71	10.3

* - as defined by Rose criteria

TABLE 5

FREQUENCY OF "ANGINAL PAIN"* BY VDT USE AND JOB CONTROL

VDT USE	N	JOB CONTROL LOW % (#)	MEDIUM % (#)	HIGH % (#)	TOTAL % (#)
NON-USER	145	11.3 (6)	(0)	3.4 (1)	4.8 (7)
USER	682	14.8 (23)	9.3 (35)	7.9 (12)	10.3 (70)
TOTAL POPULATION		13.9 (29)	8.0 (35)	7.2 (13)	9.3 (77)+
POPULATION SIZE		N=208	N=438	N=181	N=827

* - as defined by Rose Criteria

+ - One case dropped out of this analysis due to incomplete information on job control factors.

TABLE 6

FREQUENCY OF "ANGINAL PAIN"* BY AMOUNT OF VDT USE AND JOB CONTROL AMONG VDT USERS ONLY

VDT USE	N	JOB CONTROL LOW % (#)	MEDIUM % (#)	HIGH % (#)	TOTAL % (#)
< 25% time	121	12.5 (1)	4.2 (3)	2.4 (1)	4.1 (5)
25- 50% time	61	- (0)	2.8 (1)	15.0 (3)	6.6 (4)
50- 75% time	60	9.1 (1)	6.7 (2)	5.3 (1)	6.7 (4)
75-100% time	336	17.0 (19)	14.4 (26)	15.9 (7)	15.5 (52)
% time unknown	104	10.5 (2)	5.1 (3)	- (0)	4.8 (5)
TOTAL USERS		14.8 (23)	9.3 (35)	7.9 (12)	10.3 (70)+
POPULATION SIZE		N=155	N=375	N=152	N=682

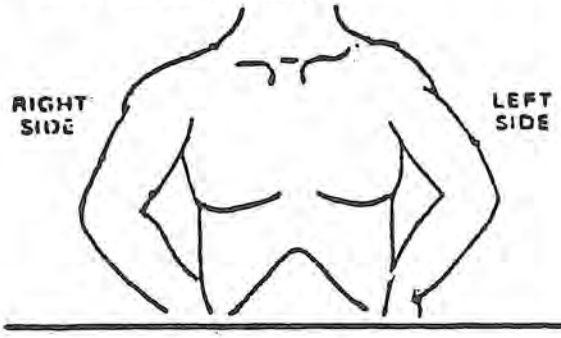
* - as defined by Rose Criteria

+ - One case dropped out of this analysis due to incomplete information on job control factors.

APPENDIX

ROSE QUESTIONNAIRE AS USED IN THE
OFFICE WORKER STRESS SURVEY

4. Have you ever had any pain or discomfort in your chest?			58
5. Have you ever had any pressure or heaviness in your chest?			59
If you responded yes to either question 4 or 5, please answer the following questions. If you answered no to both 4 and 5, then go on to question 12. 6. Do you get it (the pain or discomcomfort and/or pressure or heaviness in your chest) when you walk uphill or hurry?			60
7. Do you get it when you walk at an ordinary pace on the level?			61
8. When you get it in your chest, what do you do?			
☐ Stop (1)			62
☐ Slow down (2)			63
☐ Continue at same pace (3)			64
9. Does it go away when you stand still?			65
10. Where do you get this pain or discomfort? (mark the place with an "X" on the diagram.)			66-68



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