

# An Examination of Occupational Medicine Practices

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*The traditional occupational health on-site utilization of physicians as part of an overall occupational health program has been in decline in recent times. The on-site practitioner is increasingly being replaced by physicians who practice at an off-site location. The effects of this change on the health care delivered to the work force are largely unknown. By utilizing data from the 4490 facilities surveyed during the National Occupational Exposure Survey, it was possible to perform analyses of the association between the on- and off-site practice of medicine and several industrial facility characteristics and services usually associated with occupational medicine. Examination of the data indicated that, in comparison with on-site activity, the off-site practice of occupational medicine appears to result in diminished provision of the screening tests and medical examinations for which data were available.*

The traditional delivery of health care services in the occupational setting involved the presence of a physician and/or other medical personnel in a special facility or health unit at the work site. However, corporate attitudes have been changing since the early 1970s, with management demonstrating increasing interest in preventive medicine, as shown in the rapid increase of health promotion activity<sup>1,2</sup> and in the discussions of incentive programs in health and safety.<sup>3,4</sup>

Simultaneously, the general practice of medicine in the United States has been shifting rapidly from the solo practitioner to the various forms of group practice, or medicine as a business.<sup>5-8</sup> The escalating costs of health care<sup>9</sup> and the resulting economic impact on corporate

health care plans, coupled with the changes in corporate attitudes and medical practice, are having a profound effect on the delivery of health care related to employment.

An increasing proportion of the work force is being provided with some form of health care, but this work-related health care is more frequently being delivered off-site through contractual sources.<sup>10</sup> Particular emphasis on the provision of pre-employment physical examinations, possibly in conjunction with some form of drug testing, has received much recent attention in the popular press. (R. Rickles, *The Wall Street Journal*, January 3, 1989).

The effects of using off-site and/or contractual sources for work-related health care are largely unknown. Therefore, this study was undertaken to examine some of the procedural differences between the on- and off-site practice of occupational medicine.

## Methods

The National Occupational Exposure Survey (NOES),<sup>11-13</sup> conducted by the National Institute for Occupational Safety and Health (NIOSH) from 1981 to 1983, was a cross-sectional survey of American industry intended to describe the health and safety characteristics of the workplace. The sampling frame for the NOES was generally defined as those industrial facilities in the private sector with eight or more workers covered under the Occupational Safety and Health Act of 1970.<sup>14</sup> The survey consisted of a probability sample of business facilities selected by a stratified, multistage sampling plan that considered geographical location, industry type by Standard Industrial Classification,<sup>15</sup> and number of employees per facility. The NOES consisted of 4490 site visits in 98 geographical areas, and each visit consisted of two parts: the administration of a standardized survey questionnaire to facility management, conducted in interview format by a NIOSH representative;

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and a walk-through survey of the facility, which resulted in an inventory of the chemical, physical, and biological agents present in the work environment. Analysis of potential chemical and physical exposure data and the interaction between these variables and health care characteristics are the intended subjects of future research projects.

The data presented in this paper are derived from the management responses to the survey questionnaire, which contained 62 questions asked at each survey site. These questions were divided into four major sections: general facility information (nine questions), medical services (14 questions), industrial hygiene and safety practices (34 questions), and general recordkeeping (five questions). These responses were subjected to cross-tabulation and analysis in a NIOSH research project that involved the pairing of selected facility-specific management responses from the 4490 interviews conducted. For example, a response indicating that a physician was employed by a specific facility would be checked to determine whether that same facility also employed a nurse. The distribution of these two answers across the entire data base (positive or negative) was recorded, and the results were subjected to correlation analysis to determine whether the two events were dependent or independent, and to what degree. The results of this analysis were compared for different pairs and provided quantitative insight into the relationship between various occupational health and safety factors. For our study, this meant selecting those analyses which would give an assessment of various occupational medicine practices.

The analyses presented here result from the cross-tabulation and calculation of probability or correlation values for 42 paired responses from the medical services and general facility information sections of the survey management questionnaire. They were selected from the total of 1491 pairs analyzed during the cross-tabulation of the NOES management interview responses project (D. Pedersen, H. Venable, and W. Sieber, unpublished NIOSH report). The potential for further use by researchers interested in specific occupational health variables is quite extensive. Documentation of the research effort, including analyses performed and complete data files, is available on either a three-diskette set for PC utilization or in hard copy, upon written request to the authors.

## Results

The results from this cross-tabulation effort are shown in Tables 1 and 2. It needs to be emphasized that, for the results presented here, the selected pairs that represented on-site physicians did not reflect whether they were corporate employees or contract physicians. Only the fact that they conducted their practices at the work site was considered. In contrast, off-site physicians were those with whom management had a contractual relationship and who provided their services at off-site locations or who would travel to the facility on an on-

call basis. On-call physicians were regarded by the authors as off-site physicians because they are at a facility only upon specific request, and such intermittent visits were not, in the authors' opinion, equivalent to on-site practice. Those facilities observed to have both on- and off-site physicians were regarded as having on-site observations.

The data on screening tests, medical examinations, and recordkeeping are the result of determining whether industrial management had a policy of providing them on a periodic basis. Therefore, to the extent that physicians made an independent decision to provide screening tests or examinations, the data shown here are lacking. However, it is doubtful that a large amount of medical activity would take place without at least the tacit acceptance and/or encouragement of management, which would have resulted in an affirmative management response when the questionnaire was administered.

Finally, the authors observed that hospital industry data, almost without exception, reported the presence of physicians and/or nurses to provide occupational health care. This is in marked contrast to the observations in other industries. Accordingly, to eliminate a bias toward on-site physicians, hospital data were deleted from further consideration. This reduced the total number of facility observations from 4490 to 4261, of which 339 reported on-site physicians and 2517 reported contractual arrangements with off-site sources of physician services. The remaining 1405 facilities reported no formal medical arrangement.

The data in Table 1 are derived from the cross-tabulation project files. These percentages are calculated by dividing the number of desired outcomes by the total number of times the desired outcome was possible (eg, the number of times the presence of an on-site physician coincided with the provision of blood tests divided by the total number of on-site physicians observed).

These data indicate that facilities with on-site physicians are considerably more likely to provide all the medical services profiled than those using off-site physicians. The reader is cautioned that the data displayed for on-site physicians in small facilities are based on only 15 observations. We elected to display these data for comparison with off-site small plant data in spite of the limited number of observations because we believe that the incidence of on-site physicians in small plants is very low, and this is confirmed by the 324 observations in large plants out of the total 339 on-site observations. Nonetheless, great care should be used in interpreting the on-site small plant data.

This tendency for the provision of most occupational health care services to be associated more probably with the existence of an on-site physician has considerable significance in view of the recent decline in the industrial presence of on-site physicians<sup>10,16-18</sup> and the rapid growth of off-site occupational medical practice.<sup>8,18,19</sup>

The relatively high percentage of facilities with off-site physicians providing post-illness and pre-placement examinations, as well as recording health data on new

**TABLE 1**  
Provision of Specific Medical Services by Type of Physician and Facility (Workplace) Employment Size

	On-Site Physician		Off-Site Physician	
	% Small* Facilities (n = 15)	% Large* Facilities (n = 324)	% Small* Facilities (n = 1411)	% Large* Facilities (n = 1106)
Ophthalmology	60.0	75.9	13.7	28.0
Audiometry	60.0	91.4	18.9	46.7
Blood tests	87.5	75.3	12.7	26.7
Urine tests	87.5	74.1	13.3	25.9
Pulmonary tests	87.5	75.3	11.0	25.6
Radiography examinations	87.5	73.5	10.1	23.9
Allergy tests	6.6	10.8	2.7	5.1
Immunizations	33.0	37.0	4.2	10.8
Pre-placement examinations	73.3	95.1	37.1	61.3
Record health data on new employees	80.0	97.5	63.0	81.4
Post-illness examinations	73.3	90.4	48.0	69.0
Employment termination examinations	6.6	25.0	0.8	4.1

\* Small facilities employ fewer than 100 workers; large facilities employ 100 or more.

employees, lead us to speculate that the provision of episodic care<sup>17</sup> may be the predominant medical function of off-site medical contractors.

The data presented in Table 2 result from pairing the on- or off-site physician variables with numerical variables such as the age of the industrial facilities. This combination of discrete and continuous variables required a specific measure of correlation. The authors chose to utilize Goodman and Kruskal's  $\gamma$  measure of correlation.<sup>20</sup> These concordance data are a measure of the relationship between the existence of a discrete variable (eg, physician type) and increasing values of the numeric variable. The higher the  $\gamma$  value, the greater the degree of association.

The data presented in Table 2 fall generally into two categories: those factors that are characteristically used to categorize industrial facilities (ie, age of plant, number of workers) and those factors that may be loosely descriptive of the level of occupational medicine effort in the workplace. In examining the categorization variables, it becomes obvious that the on-site practice of occupational medicine is far more highly correlated with older and larger industrial facilities than is off-site practice. It is generally acknowledged that there are probably more extensive resources available in such facilities,<sup>1,2</sup> which probably contributes heavily to the likelihood of the utilization of an on-site physician.

The data in Table 2 also imply that a smaller, newer plant is far more likely to rely upon off-site sources of health care, and demonstrate that male workers have a slightly higher association with the provision of physician services than do female workers. This effect may be simply a function of higher injury rates associated with those industrial activities (construction, manufacturing) that historically utilize a high proportion of male workers.<sup>21</sup>

The four factors displayed in the bottom half of Table 2 (number of physician hours per week, number of registered nurses, etc) are, we believe, descriptive of overall efforts in occupational medicine. In all four

**TABLE 2**  
Probability of Concordance\* between On- and Off-site Physicians and Selected Industry Facility Characteristics

	On-Site Physician	Off-Site Physician
No. y of facility operation	.566	.020
No. employees	.952	.208
No. male employees	.956	.356
No. female employees	.829	.241
No. physician h/wk	.985	.223
No. registered nurses	.978	.386
No. nurse/h/wk	.955	.082
No. y medical records kept	.477	.188

\* Goodman and Kruskal's  $\gamma$ .<sup>20</sup>

cases, the highest concordances occur between these factors and the presence of an on-site physician. This would seem to indicate that increased levels of health care are associated with on-site physician practice. Given that there seems to be a relationship between plant size and availability of resources, as discussed above, it is no surprise that the number of physician hours per week provided to individual plants appears to be highly correlated with on-site provision. However, the considerably lower correlation between physician hours per week and off-site services implies that the level of physician services actually provided is lower in plants providing physician access through off-site sources regardless of employment size because the sample in this project spanned a representative sample of facilities by employment size. Estimates contained in an NOES publication<sup>13</sup> on the number of physician hours per 10 000 workers show a tendency toward a lower number of physician hours per worker in smaller plants. These smaller plants, as discussed earlier, are more inclined to use off-site physician services.

The high probability of concordance between the existence of an on-site physician and the number of employed registered nurses when compared with that for off-site operations would appear to be confirmation of

the historical tendency to provide a physician with support staff. Because on-site physicians are most likely to practice in large plants, it would stand to reason that the number of employed nurses necessary to provide services to a large employee population would be correspondingly high. The relatively low probability of correlation between off-site medical operations and the number of nurses employed is probably partially due to the preference of smaller plants to rely exclusively on contract medical services, although the use of nurse practitioners may be increasing in industry.<sup>10,23</sup> The number of nurse hours per week also correlates very highly with on-site practice, probably for much the same reasons. However, it should be noted that the management response to this inquiry specifically included the time received from nurses employed by off-site medical contractors. The low probability of correlation between off-site practice and the number of nurse hours may be partly due to a lack of management awareness of the nurse service that workers receive through medical contracts.

The data indicate that facilities with on-site physicians retain medical records longer than those with off-site physicians. This may be due to either differences between on- and off-site practice or discontinuity in recordkeeping operations as industrial facilities change off-site medical contractors. However, given the increasing role of contract medical care in industry, an important implication of this data is that retrospective studies of adverse health effects in the work force will become increasingly difficult, as retention periods decrease and recordkeeping becomes more fragmented.

## Discussion

The differences in the amount of health care offered to the work force as a result of the physical location of the provider appear to be substantial. The analyses presented indicate that the provision of every individual screening test or health examination presented here is more highly associated with on-site than off-site access to the services of a physician. Whether the additional services provided are really necessary and result in an improved state of health for the work force cannot be determined from NOES data. However, if it is hypothesized that on-site physicians are more aware of the occupational factors that adversely affect the health of the work force because of their continuous presence in the workplace, then it could be argued that a profile of on-site occupational medicine practices represents a level of effort that is more likely to prevent illness. Based on this hypothesis, evidence of any decrease from on-site levels in the provision of medical services would imply that the health of the work force may be adversely affected.

The rapid growth of group medical practices<sup>8,18,19</sup> is a well-documented fact. Their potential role in occupational medicine is considerable and growing.<sup>9,17</sup> The decline of the on-site occupational physician referenced earlier, combined with the increasing role of the off-site

group practice, appears to result in less health care provided to the work force.

Many of the discussions in the current literature regarding the differences between the traditional practice of medicine and the different types of group practices<sup>17,23-28</sup> note that although group practices deliver health care at reduced costs per individual employed,<sup>27-29</sup> they are criticized for being overly responsive to the economic pressures introduced by competition<sup>6,7,18</sup> and for lowering their costs by patient selection, scheduling routines, diminished referrals, and rationed use of technology.<sup>7,28</sup> This has resulted in such statements as "The most serious concern about HMOs is that doctors are ultimately faced with incentives to provide less care, rather than more" attributed to Kirk Johnson, General Counsel of the American Medical Association (B. Garcia, *The Wall Street Journal*, January 3, 1989). Several authors have raised the issue of medical ethics and the apparent conflict with the economic realities of for-profit medicine.<sup>6,7,30,31</sup>

On the other hand, the literature also contains studies that have compared the results of fee-for-service medical practice with those of various types of prepaid group practices,<sup>25,27,28</sup> and while finding real differences in the management of patients, concluded that there was no conclusive evidence that the health of the patient population suffered and that continuing study of the effects of the new medical care delivery systems on the health of the public is needed to determine whether there are real effects on the health of the consumer. Compounding the uncertainty surrounding the quality of care delivered by group practice medicine is the provision of occupational health care by physicians not specifically trained in occupational medicine. The minimal amount of exposure to occupational health in medical schools, and the national scarcity of Board-certified or eligible physicians<sup>18,23,32</sup> is believed to lead to a situation in which primary care physicians, who are untrained in occupational medicine and who do not practice medicine in the occupational environment, are delivering the majority of the health care provided to the American worker, and are doing so without any real knowledge of the accelerating complexity and diversity of the work environment.<sup>33</sup> It has been pointed out<sup>2,34</sup> that sporadic encounter with a working population is not conducive to the identification of those factors in the workplace that may be resulting in increased and unnecessary injury and illness.

The work presented here indicates that there is considerable difference in the occupational health care practices of the traditional on-site occupational medicine program and the emerging practice of off-site contractual health care. As discussed, the forces of economics are encouraging industry to utilize these off-site sources of health care for their workers and are forcing changes in the general practice of medicine and in the structure of the health care delivery system. The net effect of these changes on the health of the American work force is unknown. Identification of any changes in the health of the work force is complicated by the decline in traditional manufacturing and the rapid emergence

of the services sector,<sup>35</sup> which is typically composed of the relatively small, newer facilities that have been shown to be the most likely candidates for utilization of the off-site sources of health care. This imparts an additional urgency for further research into the effects of off-site occupational medicine and for the formulation of policies that would address the known weaknesses in the training and environmental knowledge of the physicians actually delivering occupational health care.

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