SARA Three Years Later

Emergency Physician's Knowledge, Beliefs, and Actions

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Abstract

Objective: *Investigate Emergency Physicians' knowledge about the Superfund Amendments and Reauthorization Act (SARA) Title III legislation, passed by the United States Congress in 1986, and to determine the factors contributing to their level of preparedness in dealing with patients exposed to toxic chemicals* ***Methods.*** *A 115-item questionnaire was mailed to the medical directors of all emergency departments (EDs) in the State of New York The results of the cross-sectional survey were analyzed using standard statistical methods* ***Results:*** *One hundred and eighty-seven (72%) of the directors of EDs in New York State responded to the survey. Three years after SARA was enacted, only 33% of the directors had heard about this legislation. Only 18% had been invited to attend the meetings of the Local Emergency Planning Committees (LEPC) Sixty percent of the directors knew whether or not the LEPC had devised plans that defined a role for their EDs in responding to environmental emergencies This knowledge about community planning mainly had an effect on preparedness of the EDs. Preparedness also was predicted by how recently the EDs had treated patients exposed to toxic chemicals, the perception that emergency physicians had a legitimate role in planning for and responding to chemical emergencies, and how often emergency physicians had attended continuing education courses about hazardous materials.* ***Conclusion:*** *Despite the finding that some emergency physicians are involved in community preparations, two main problems persist in planning a medical response to environmental emergencies. First, the ED directors generally are unaware of the legislation that mandates these preparations and are not interacting with community planners Second, there is not full involvement by the local EDs in the LEPC planning efforts.* ***Recommendations:*** *A procedure is needed to disseminate information about legislation which affects emergency physicians, such as SARA, and about regional planning for environmental emergencies Dissemination should include education about the professions' role in planning for and providing care for patients exposed to toxic chemicals*

Introduction

The accidental release of toxic chemicals is a threat to the health of the population in the United States (U.S.) and around the world. Over 11,000 incidents resulted in 309 deaths and 11,341 injuries in the U.S during the years 1982 through 1986 Of the accidents in which injuries occurred, an average of 11 4 people were harmed per accident.[1]

Seventeen of the accidents that occurred in the U.S in the past 25 years involved quantities of toxic chemicals which exceeded those prevailing in Bhopal [1,2] Containment of these accidents was eased by planning, attenuating the dangers, and responding competently to the incidents [1] The ubiquitous existence of toxic chemicals suggests that no community in the United States is immune.

The task of treating victims exposed to toxins has been made easier for emergency physicians by the Superfund Amendments and Reauthorization Act (SARA) of 1986 [3-5] The ability to provide good patient care is linked closely with the preparedness of the hospital that treats the patients Discussion of the implications of SARA for emergency physicians began with an instructional paper used to inform this professional group about the legislation.[6] This paper explores the knowledge and preparedness of emergency physicians three years after the implementation of SARA.

The medical field has been represented in the implementation of SARA both in the organization of programs and the delivery of clinical services. First professionals have participated in the development of their community's response plan because the law mandates that the Local Emergency Planning Com-

mittees (LEPCs) include representatives from the health field and local hospitals (Subtitle A, Sec. 301.c.). The law requires that local emergency plans include methods and procedures to be followed by medical personnel after a chemical accident (Subtitle A, Sec. 303 c.2.), which enable hospitals to coordinate their patient care with community agencies. Therefore, hospitals could design more precise disaster plans because the LEPCs identify locations in their communities which are most at risk for chemical emergencies.

Industry and government have accelerated their emergency planning since the catastrophe at Bhopal. Through the Community Awareness and Emergency Response Program, Landesman encouraged the medical sector to plan in cooperation with community groups.[7] Leonard defined the role of the hospital-based, non-emergency physician in disasters.[8,9] Several authors developed guidelines for handling victims of chemical and radiological accidents within hospitals.[4,10–13] Nevertheless, prior to this study, no one systematically has evaluated whether emergency physicians believe that they should be involved in preparing for and responding to this kind of chemical accident, or if they were participating in community planning.

Gender	%
Men	88
Women	12
Time as Director (yr)	**%**
< 1	22.7
1–2	14.1
2–3	17.4
3–4	7.0
> 4	38.9
Board-Certified/Eligible	**%**
1 Specialty	52
2 or more specialties	48
No certification/eligibility	2
Emergency Medicine	65
Internal Medicine	35
Family/General Practice	8
Surgery	13
Pediatrics	3
Other	1
n = 185	
Age (yrs) 30–69, mean = 41 yrs	

Table 1—Demographic Characteristic of Respondents

Methods

In the fall of 1989, a self-administered questionnaire was mailed to the directors of the Emergency Departments of all the acute care hospitals in New York State. This survey was conducted in cooperation with the New York Chapter of the American College of Emergency Physicians (ACEP). No randomization procedure was used because of the interest in obtaining information about each hospital. After a literature review indicated that no research instruments had been generated in this area, a questionnaire, "Preparedness for Chemical Accident Inventory," was designed using techniques to ensure validity and reliability.[14] The questionnaire consisted of 115 items that asked questions about chemical incidents including characteristics of the hospitals' preparedness of the organizations and of the facilities, knowledge and attitudes of the physicians' and tasks done in the implementation of SARA. These variables were evaluated collectively as a scale. The fourteen items were scored as dichotomous, yes—no, variables. The scores were

Preparations Made by Organization	Mean	SD
List of companies with chemicals	1.45	.49
Toxicological consultant available	1.28	.45
ED staff trained for patients (pts) exposed to toxins	1.30	.46
ED trains EMS to care for pts exposed to toxins	1.21	.41
Identified contacts in industry	1.65	.94
Hospital has disaster plan	1.81	.39
Hospital has plan for handling major chemical accident	1.56	.50
Hospital conducts drill using plan for chemical accidents	1.07	.82
Hospital uses external sources for information about toxin-exposed pts. CHEMTREC	1.18	.38
Hotlines	1.07	.25
City/County agencies	1.25	.43
State agencies	1.13	.33
Federal agencies	1.08	.27
Total	18.09	2.98
Alpha Reliability = 0.72		

Table 2—Alpha Reliability Coefficients of Organizational Preparedness

Modifications Made to the Facility	Mean	SD
Area for patient decontamination	1 72	.44
System to collect wastewater from decontamination (DECON)	1.41	.49
Separate entryway to the DECON area	1.38	.49
Separate air circulation system	1.07	.26
Protective gear for staff	1.55	.50
Capacity to monitor blood	1.42	.49
Quick access to a Geiger Counter	1.60	.49
Designated disposal for contaminates	1.49	.50
Appropriate antidotes	1.56	.50
Total	13.21	2.76
Alpha Reliability = 0.84		

Table 3—Alpha Reliability Coefficients of Facility Preparedness

summed to form a composite scale Variables with values of 1 0–1.5 had a more negative inclination than did variables with values 1.5–2.0.

Before the first mailing, an article about the study appeared in the newsletter of the ACEP chapter. A pre-nonfication postcard also was sent to each director Follow-up included a reminder postcard, a second mailing of the questionnaire, phone contact, a third mailing of the questionnaire, and a final phone call to all non-respondents

The data were analyzed using the Statistical Package for the Social Sciences (SPSS-PC). A database of the number of accidents that had occurred in New York (1983–1987), collected by the Office of Attorney General of the State was added for analyses involving risks [15,16] The analyses included Chi-Square tests of proportions and multiple regression techniques. Two types of scales were used First a four-point Likert scale was used to measure perception of role Second, the study protocol defined two components that contribute to a hospital's ability to respond to chemical accidents· the preparations made by the organization of the hospital ("organizational preparedness"); and the modifications or designations made within the facility ("preparedness of the facility"). Two composite measures were developed to measure these preparedness variables For these two scales, the intercorrelated items were added and were evaluated by calculating alpha reliability coefficients

Results

The directors of 187 hospitals (72%) completed and returned the questionnaires. The physicians who responded had varied experience and backgrounds (Table 1) Ages ranged from 30 to 69 years, with a mean of 41 years Almost a quarter of the respondents (n = 42) had less than a year of experience as director; 38% (n = 70) had one to four years of experience; and almost 40% (n = 74) had more than four years of experience Only two percent (n = 3) of the sample was not board certified or board eligible. Forty-eight percent (n = 89) were certified in two or more sub-specialties. Most of the respondents were board certified/eligible in emergency medi-

Rank	Role
1	Develop protocols for patient management
2	Participate in developing community plan
3.	Know contacts for information at local industry
4.	Conduct disaster drills for toxic exposures
5.	ED director should be personally involved
6.	Maintain file of Material Safety Data Sheets
7.	Maintain file of Toxic Chemical Release Forms
8.	Get involved only in the event of an accident

Table 4—Ranking of Perception of Role of Emergency Physicians

cine (65%), followed by internal medicine (35%), surgery (8%), family medicine/general practice (8%), pediatrics (3%), and other (1%)

The scaled items, measuring organizational preparedness, had an alpha reliability value of 0.72 (Table 2). Thirteen intercorrelated dichotomous items formed the scale measuring preparedness of the organization The item which measured if a hospital had a list of community-based facilities where accidents might occur had a mean value of 1.45. The mean score for the designation of a consultant who could advise about toxic exposures was 1.28. The establishment of training programs for ED staff had a mean of 1.30, and training emergency medical services had a mean of 1.21. Whether the hospitals had identified contacts within local industry had a mean score of 1.65. Whether the hospitals had a disaster plan had the highest mean score (1.81) of the items in the measure. Having a special disaster plan for chemical accidents had a mean score of 1.56 Exercising the plan for chemical disasters had one of the lowest mean values, at 1.07. The mean scores for the five sources where hospitals sought information about chemicals ranged from 1.07 to 1.25

The second scale, measuring preparedness of the

Predictor Variable	Beta	t	p-values
Perception of physician role	.239	3 79	< .001
Age of director	.035	.51	< .61
Medical specialty	.307	00	1.00
How recently patients were treated	.258	4.19	<.001
Continuing education on hazardous materials	.214	3.32	<.001
Knows community-defined procedures	.246	3 81	<.001
Number of years as director	.106	1.54	<.12

R^2 = .35; df = 7, 175; F = 13 66, p <.0001

Table 5—Multiple Regression Model of Physician Variables Predicting Preparedness of the Organization

Predictor Variable	Beta	t	p-values
Perception of MD role	.112	1.62	<.10
Age of director	−.057	-.76	< 45
Medical specialty	171	2.51	< .01
How recently patients were treated	.214	3 15	< .002
Continuing education on hazardous materials	.178	2 51	<.01
Knows community-defined procedures	.169	2.39	<.02
Number of years as director	.049	.66	< 51

R^2 = 22; df = 7, 174, F = 7.129, p <.0001

Table 6—Multiple Regression Model of Physician Variables Predicting Preparedness of the Organization

facility, had an alpha value of 0.84 (Table 3). The dichotomous items in the scale measuring preparedness of the facility had mean scores that generally were higher than the scale measuring organizational preparedness. They ranged from 1.07 (having a separate air circulation supply) to 1.72 (having a designated area for patient decontamination)

Physicians and SARA

Three years after SARA was enacted, only 33% of the directors had heard about the legislation. Only 18% of the respondents (n = 33) had been invited to attend one of the 58 LEPC meetings in the state. Slightly more (n = 39) reported actually attending LEPC meetings. Participation was distributed in 24 of the 60 counties in the state. Fewer than 12% of the directors indicated that they had received surveys from the LEPCs inquiring about the capabilities of their respective hospitals. Even less of the hospitals (5%) had participated in a site visit by the LEPCs. While the LEPCs had failed to survey most hospitals in the state, 22% (n = 41) reported that their facilities had informed the LEPCs about their ability to care for patients. Participation in the LEPCs was not related to how recently patients were treated or to a

Attitudes about Hospital Preparedness

In response to questions about the level at which each hospital should be prepared, 62% of the directors (n = 115) agreed that *designated treatment centers* should be established for the care of patients exposed to toxic chemicals. Forty-six and one half percent (n = 99) agreed that every hospital should have state-of-the-art facilities for responding to chemical accidents. While less than half of the respondents held this belief, doing so was associated positively with higher levels of preparedness (p <.001). Sixty-seven percent (n = 105) agreed or strongly agreed that chemical accidents are common in both urban and rural locations. This belief was associated positively with the relative preparedness of the organization (p<.03). Only 19% (n = 35) believed that preparing their hospital for chemical accidents mainly is an administrative task, not a medical one. This belief was not associated with being better prepared

Physicians and Risk

Physicians' perception that their communities were at risk for chemical accidents was related to how recently they had treated patients for exposure to toxins (Chi

in local planning for chemical emergencies (3.2 on a 4.0 scale). Only four respondents indicated that someone other than themselves, should be designated for this task. The physicians were asked to rate their agreement with tasks associated with preparedness. Table 4 lists the ranking of their responses.

In descending order of agreement, respondents agreed that it was the role of the ED director to: 1) develop protocols for patient management; 2) participate in developing a community plan for response to chemical accidents; 3) know who to contact for information at local industry; 4) conduct disaster drills for toxic exposures, 5) be personally involved, as director of the ED; 6) maintain files of Material Safety Data Sheets; 7) maintain files of Toxic Chemical Release Forms; and 8) get involved only in the event of an accident.

Characteristics of Professionals Predicting Preparedness of the Organization

A multiple regression approach was used to determine whether characteristics of the physicians had an effect on the preparedness of the organization and of the facilities themselves. The four variables which predicted organizational preparedness by the hospital were 1) Belief that ED directors should participate actively in preparing for chemical accidents ($p < .0002$); 2) Knowledge of procedures, defined by the community, that the hospital should follow ($p < .0002$). 3) Recency of treating patients in their emergency department ($p < .001$); and 4) Attendance at courses for continuing education that dealt with hazardous materials ($p < .001$) (Table 5). Interestingly, at the extreme, those who were the least prepared sought out the most information through classes (Figure 1). The age of the director, the number of years that the physician had been in the director's position, and the medical specialty of the director were not significant predictors of organizational preparedness.

Characteristics of Professionals that Predict Preparedness of the Facility

Four characteristics of the physicians had an effect on the preparedness of the facility. 1) medical specialty of the physician, ($p < .01$), 2) how recently the patients were treated ($p < .002$), 3) attendance at courses about hazardous materials ($p < .01$), and 4) knowing community defined procedures ($p < .02$) (Table 6).

Discussion

These findings reflect the perceptions of physicians in charge of emergency departments in only one state. (since SARA was implemented in each of the states in the United States). However, they represent a larger sample, since over 13% of many physicians in the United States currently are trained in New York State.[17]

To the degree that these findings are generalizable and replicable, this study suggests that dissemination of information about SARA has been lacking. Despite articles in pertinent peer-reviewed journals, few of the directors of emergency departments were aware of legislation that could have a direct impact on providing care for patients exposed to toxic chemicals.

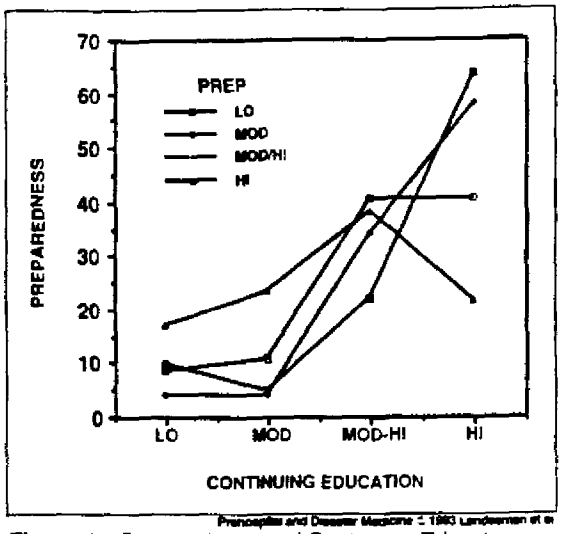

Figure 1—Preparedness and Continuing Education

Often, there is a lag between the time that innovations become available and the time that new procedures are incorporated into daily practice.[18] However, with this innovation, the lag time that could occur should be reduced, since accelerated preparation for chemical accidents may save lives.

How can emergency departments be expected to be well-prepared to treat victims exposed to toxins if their chief medical administrator does not know about legislation affecting the department or of community efforts to respond to accidents? If the director is burdened by other responsibilities, someone in the department should be designated to keep current on the subject. Since so few of the responding directors indicated a preference for delegating this responsibility, a system is needed which facilitates their ability to be involved personally.

Knowing about procedures that hospitals should follow was found to be related directly to a hospital being prepared. Despite the fact that a third of the directors had attended LEPC meetings, what they learned and knew about community efforts to prepare for chemical emergencies was not shared with their counterparts at other sites. Alarmingly, 40% of the respondents were not knowledgeable about their role in treating patients in the event of an accident in the community. Professional associations should develop mechanisms to improve the dissemination of information about environmental legislation that affects their members.

One also might question the validity of efforts made by the LEPCs. The fact that only 12% of the hospitals were surveyed by the planning groups and that this percentage of surveys was spread among 21 counties, raises a question about the LEPCs' efforts to assess the entire community and to develop comprehensive plans to meet chemical emergencies. These findings point out the need for the emergency medicine community to reach out to their local planning committees and participate in defining their response to local emergencies.

Perception of Risks

The findings in this study indicate that directors of emergency departments may associate local risks with how recently patients exposed to toxins were treated, not how often accidents had occurred in their communities. If, as the data suggest, physicians are not participating in preparedness activities in communities which are at risk, it is important to involve them in local planning and to educate them in order to bridge the gap between perception and need. Further research is needed to determine other characteristics which contribute to perceptions of risk and to discover more about what causes directors of EDs to participate in risk reduction activities

Conclusion

The study indicates that continuing education was a predictor of preparedness for chemical accidents. Those involved in developing continuing educational symposia and materials should evaluate these programs to enrich the content which addresses exposures to chemicals Further, professional associations could organize orientation materials for new directors to improve their understanding of the need to prepare for chemical accidents, their understanding of the ED director's role in preparedness, and their repertory of preparedness skills.

Hospitals do not set policy, organize programs, or order equipment and supplies. It is the personnel who work in these hospitals that make things happen. The accelerated education of physicians about the proper management of patients exposed to toxins should be the first step in improving preparedness. Greater physician knowledge about managing chemical incidents is a prerequisite to identification and correction of institutional deficiencies

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Editorial Comment

James O. Page, JD, Carlsbad, California, USA—Among the frustrations of modern life is our inability to keep up with all the horrible risks that surround us For example, the suggestion that no community in the U.S. is immune from the risks of toxic chemicals. To their credit, legislators try to concoct schemes to protect us from the risks. To their discredit, most of the schemes are unworkable.

It shouldn't surprise us that three years after SARA was enacted only one in three ED directors in New York well-planned community response, with input from physicians? On the other hand, can we really expect the physician who toils in the bloody arena of urban anarchy to get excited about a statistical risk of one toxic chemical death per ED every 86 years? Who knows an ED director who's got time for more meetings?

The problem began with our federal government's failure to adopt and enforce national policy on what is