

First-aid Training and Bystander Actions at Traffic Crashes — A Population Study

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Abbreviations:

CPR = cardiopulmonary resuscitation
HIV = human immunodeficiency virus
SNRA = Swedish National Road Administration

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Abstract

Introduction: Traffic crashes constitute a major, worldwide public-health problem that cause disabilities, life-long suffering, and huge economic losses. When a person is injured in a traffic crash, actions taken by bystanders often are of crucial importance. To perform first-aid actions in a correct manner, bystanders, often lay persons, need both the courage and the knowledge to do so. For preventive purposes, society spends large resources to inform and educate the public in order to enhance people's ability to take correct actions. However, there only is little information on the rate in a population of persons who have had first-aid training, have been bystanders at a traffic crash, on the actions taken by such persons, and on effects of first-aid training on patient care.

Objective: The aim of this study was to acquire knowledge about: (1) the prevalence of first-aid training; (2) the incidence of being a bystander and of the first aid provided at traffic crashes and other emergencies; and (3) the impact of first-aid training on the risks people take in road traffic

Methods: A questionnaire was administered to 2,800 randomly selected persons aged 18–74 years.

Results: The response rate was 67.5%. During the previous five years, 39% of the population had received first-aid training, with a higher rate among younger individuals and those with a higher education. After training, 30% of the respondents had used their skills, and 41% took fewer risks in traffic, particularly those who were older or had a lower level of education. Fourteen percent of those with training (significantly more men) had been bystanders at a traffic crash. At 20% of the crashes, a bystander had administered first aid, and one-third of those who provided such assistance had had use of their training.

Conclusion: Intensified first-aid training of the general public could lead to citizens who are more cautious in traffic and to bystanders who provide more immediate and adequate first aid at traffic crashes and other emergencies.

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Introduction

Worldwide, road traffic crashes cause severe injuries and a large number of deaths each year,^{1–3} and therefore, are regarded as a substantial public health problem.⁴ In 1998, within the European Union, about 44, 000 persons were killed and 1.7 million were injured in traffic, but there are differences in the data obtained from the individual member nations.⁵ Although Sweden boasts a high degree

of road safety, about 60 persons per million population are killed in traffic annually, and 400 are severely injured.⁶ By comparison, Portugal has the highest rate of crash fatalities in Europe, with 240 deaths per million people per year.⁵

The number of fatalities has decreased in recent years, due at least partly, to improved crash worthiness of motor vehicles and the use of safety

1. **Have you had any first-aid training during the past five years?**
Yes, once. Yes, two or more times. No.
2. **Who organized your latest first-aid training?**
My employer. The Swedish Armed Forces. Primary (compulsory) or secondary school. Driving school. The Red Cross. Other agency, please designate:_____.
3. **Could the first-aid training have been organized in some other way to be of better use for you?**
Yes, in what way?..... No. Don't know.
4. **Have you ever had cause to use the skills you acquired at first-aid training?**
Yes, at a traffic accident. Yes, at some other trauma. Yes, at some other emergency. Yes, during education. No. Don't know. (Respondents were allowed to choose more than one alternative.)
5. **How well do you agree with the following statement: As a result of first-aid training, I take fewer risks in traffic.**
Completely. Partly. Very little. Not at all. No opinion.
6. **Have you been involved in a traffic accident or been a bystander at a crash site during the past five years?**
Yes, once. Yes, two or more times. No.
7. **Did a civilian bystander (i.e., not an EMT, police officer, or fireman) give crash victims first aid? (If you stopped at more than one crash site, please answer regarding the most serious accident.)**
I gave first aid together with other bystanders. I alone gave first aid. Other bystanders gave first aid. No bystander could or dared give first aid. First aid seemed unnecessary. Don't know.
8. **How much use of your first-aid training did you have at the crash site?**
Very much. Quite a lot. Neither much nor little. Very little. No. Don't know.
9. **Would you like to get first-aid training in the near future that would teach you how to act in case of an emergency?**
Yes. No. Don't know.

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Table 1—Questions added to the Swedish National Road Administration survey

belts.⁷ Nonetheless, traffic crashes often are responsible for disabilities that entail lifelong suffering, of which neurological traumas are the most devastating.^{4,8} As such, they place a substantial economic burden on society.⁹ Assistance given during the first few minutes after a crash often is of great importance for those who are injured, especially in terms of future health and quality of life.^{3,10} A considerable amount of time may pass before an ambulance arrives and professional help can be provided. Thus, it is imperative that bystanders, who often are laypersons, have both the confidence and the knowledge to correctly administer first aid to the victims.^{10,11} Without prompt life-saving assistance, an injured person may die for a number of reasons, such as airway obstruction or other causes correlated to prehospital death following trauma.^{11,12} The first bystander to arrive at the scene of a crash initially should protect the affected person from further injury, send for more help, and assure that an ambulance has been summoned. Subsequent measures that are provided are referred to as *first aid*,¹³ which also has been defined as the immediate help given by a bystander for all types of emergencies while awaiting the arrival of expert medical care.¹⁴

Bystanders may hesitate to offer first aid due to insufficient knowledge or the fear of making things worse and believing that an ambulance will arrive soon,^{15,16} or that apprehensions may become manifest that they will be exposed to agents that cause infectious diseases, such as human immunodeficiency virus (HIV).¹⁷⁻¹⁹ Also, the presence of more than one bystander may result in no first-aid actions being taken, especially in ambiguous situations.^{20,21} It has been indicated that women provide first aid less often than do men,²⁰ but there is little evidence of gender differences in first-aid training and actions taken. Nevertheless, bystanders seldom seem to provide emergency assistance that is completely incorrect,¹⁶ and, in fact, in many cases, it seems that it probably would be advantageous if they were

to give more help.²² No data are available regarding the rate of adults in a population who actually have been bystanders at crash sites.

Modern first-aid training of voluntary laypersons was introduced in England 120 years ago.²³ At that time, like today, the purpose of the training was to teach life-saving techniques that would help avoid worsening the situation for an injured person, and to facilitate future recovery.²⁴ Early first aid may have a secondary, preventive effect: although it does not prevent traffic crashes, in some cases, it may alleviate the consequences of the trauma.¹⁴ First-aid training is offered by schools, the military services, employers, the Red Cross, and other agencies. However, no data have been compiled concerning the number of persons who have taken part in such training, nor have there been any evaluations of whether individuals who are trained actually can apply their life-saving skills in a real emergency.

There is a large amount of scientific evidence relative to the effects and advantages of the application of early cardiopulmonary resuscitation (CPR) in cases of cardiac arrest,^{25,26} but little is known about specific interventions provided by bystanders at crash sites or other emergencies.^{3,27} A change in attitudes and an increased desire to help among bystanders has been shown in individuals who participated in first-aid training. In the state of Iowa (USA), it was found that a group of more than 2,000 citizens trained in bystander trauma care were more likely to provide assistance, and to do so in a correct manner, as compared to untrained individuals.³ Moreover, it is assumed that widespread dissemination of information about first aid may lower the rate of traffic crashes, since informed citizens will be more motivated to avoid situations that can lead to an emergency. In a community project in an English town, first-aid training of 1,200 persons was found to reduce the accident injury rate, as compared to the rate in a town in which such a project was not implemented.²⁴ Another

		Number	(%)
All		1,907	(100)
Gender	Female	835	(44)
	Male	765	(40)
	Not reported	307	(16)
Age (years)	18–24	206	(11)
	25–34	339	(18)
	35–44	342	(18)
	45–54	415	(22)
	55–64	344	(18)
	65–74	251	(13)
	Not reported	10	(0)
Education	Primary school	574	(30)
	Secondary school	845	(44)
	University	453	(24)
	Not reported	35	(2)

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Table 2—Distributions by gender, age, and education

large study indicated that first-aid training led to a lower rate of industrial accidents and heightened safety awareness, but that additional factors were required to reduce the rate of traffic crashes.²⁸

The aim of this study was to acquire knowledge about the: (1) Prevalence of first-aid training in the adult Swedish population; (2) Incidence of being a bystander and first aid provided at traffic crashes and other emergencies; and (3) Impact of first-aid training on the risks people take in road traffic.

Materials and Methods

The Swedish National Road Administration (SNRA) regularly conducts a survey of traffic habits and road safety by mailing a comprehensive questionnaire to a representative sample of the Swedish population, comprising 2,800 persons 18–74 years of age. In 1999, nine items concerning first aid and the experiences of and care given by bystanders at crash sites were added to the questionnaire; these nine questions were composed on the basis of the results of previous studies,^{22,29} and they were included in the SNRA questionnaire.

Three reminders were sent to non-responders, and the final response rate was 67.5%. The distributions by gender, age, and level of education in the study group was equivalent to that in the Swedish population in general. The analyses covered demographic data (gender, age, and educational level), and the responses to the nine additional questions listed in Table 1.

The data were analyzed statistically using chi-squared tests for two-way tables for more than two categories in each variable have been used for tests of possible associations between variables using a p -value of <0.05 for statistical significance.³⁰ Furthermore, the odds ratio was calculated for the relationship between being a bystander at a traffic crash and having had first-aid training.

Results

Data on the distribution of gender, age, and level of education in the study group are in Table 2. The distributions in each class are representative of the population of Sweden. There were slightly more females than males (44% vs 40% respectively). The distributions by ages were evenly spread between 25 and 64 years, and 44% had completed secondary education and 24% had attended a university.

First-aid Training

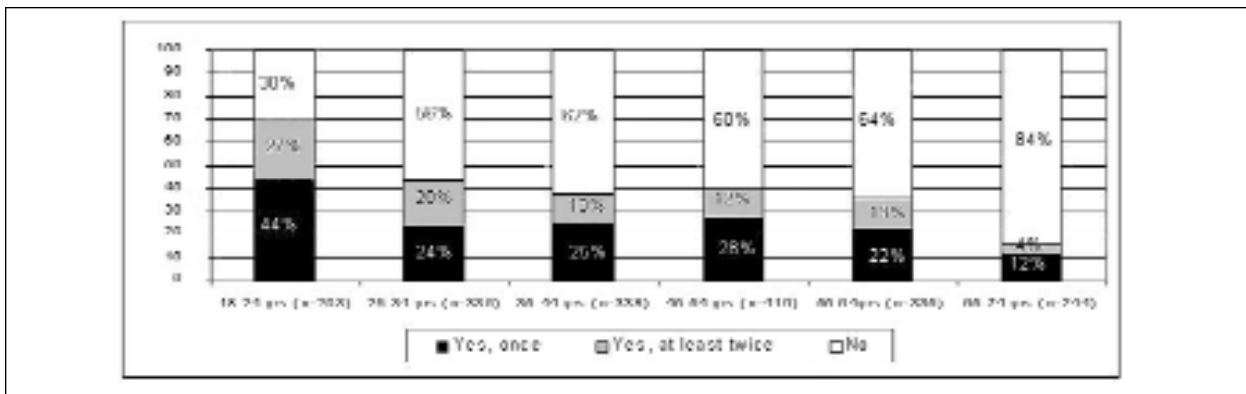
During the previous five years, 25% of the respondents had participated at least once in some type of first-aid training, 14% had participated two or more times, and the majority (61%) had had no training. There were no gender differences in the participation rate. However, there was an age difference ($p < 0.05$), in that a greater proportion of the younger respondents had taken a first aid course (Figure 1). Also, fewer persons with only nine-year, primary (compulsory) school had been trained in first aid ($p > 0.05$; Figure 2).

The training, as reported by 48% of the respondents, most frequently was organized by employers. The Swedish Armed Forces and primary and secondary schools were responsible for 17% and 16% of the training respectively, the Red Cross for 12%, and driving schools only for 1%. The remaining 6% were trained by the police, the medical and rescue services, sports associations, or in extramural courses. In this context, a significant gender difference ($p < 0.05$) was observed: more women than men had received their first-aid training through employers (33% and 23%, respectively) or schools (13% and 6%), whereas almost no women had been trained by the armed forces (2% and 15%). Also, slightly more women than men had been trained by the Red Cross (8% and 5%). In regard to age, of the respondents who were 18–24 years, 6% were trained by their employers, 55% by schools, and 33% by the armed forces; 33% of those aged

		All (n)	Yes, at a crash site (%)	Yes, for some other trauma (%)	Yes, at another emergency (%)	Yes, in education (%)	No (%)	Don't know (%)
All		883	7	11	11	13	70	2
Gender	Male	379	4	10	14	12	72	2
	Female	365	9	14	8	14	67	1
Age (years)	18–24	146	1	8	6	17	73	1
	25–34	163	5	18	12	16	66	1
	35–44	156	8	13	14	9	67	3
	45–54	197	10	9	11	15	68	2
	55–64	147	9	8	14	6	74	1
Education	65–74	70	9	10	4	10	71	6
	Primary school	213	8	8	8	9	75	3
	Secondary school	438	4	11	10	10	70	2
	University	219	11	14	16	20	64	0

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Table 3—Alternative responses to the following question: “Have you ever had practical use of your first-aid training?” (Respondents were allowed to choose more than one alternative)



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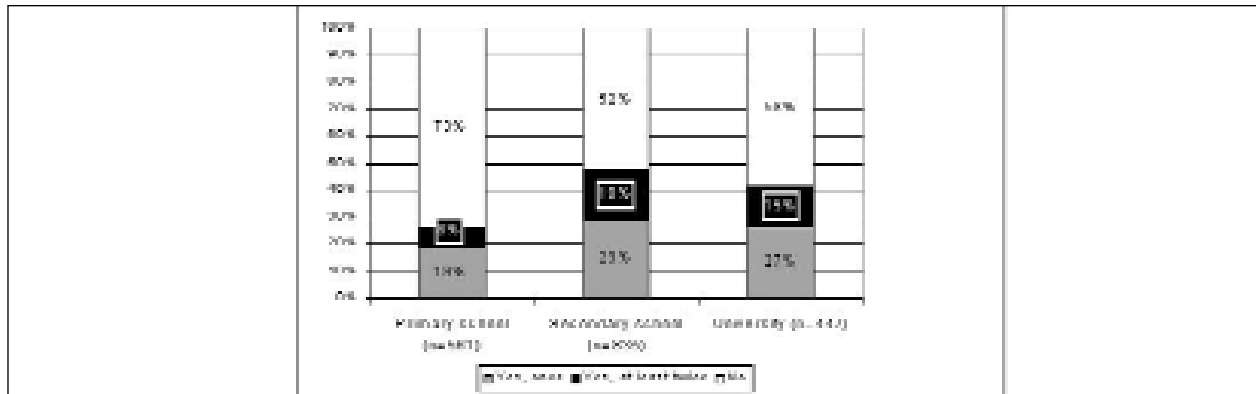
Figure 1—First-aid training during the past five years in relation to age

65–74 years were trained by the Red Cross.

Of those who had first-aid training, 52% were satisfied with the training they had received, and 7% thought it could have been improved, i.e., by offering longer or refresher courses, or by including more practical or more comprehensive instruction. The remaining 41% had no opinion. The rating of the training did not vary with gender, age, or level of education.

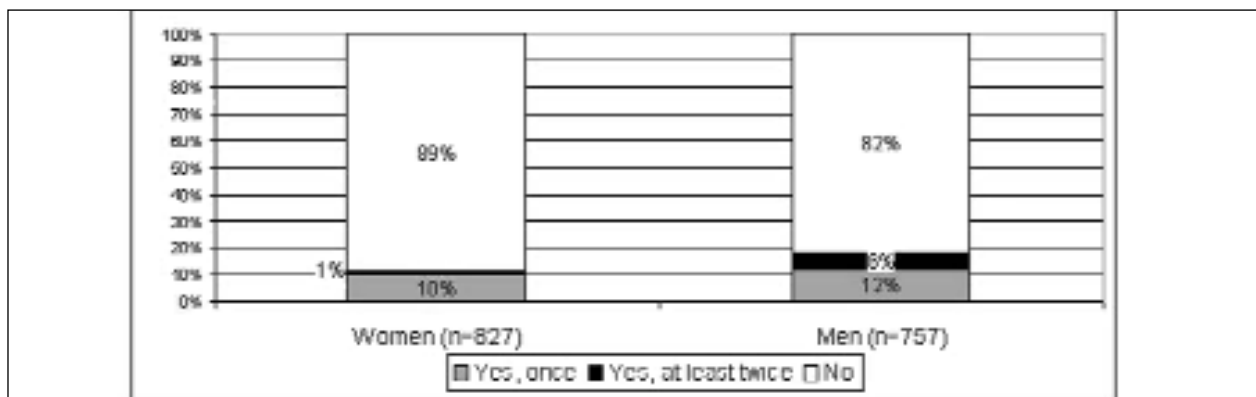
Forty-one percent of the whole study population was positive to the idea of participating in a first-aid course in the

near future, whereas 29% did not want to participate, and the same proportion were “hesitant”. No gender differences were observed. However, significantly more respondents with a secondary (35%) or university (43%) education were interested in taking first-aid training, as compared to those who had only attended primary schools (25%) ($p < 0.05$). There also was a correlation with age ($p < 0.05$): more persons wanted first-aid training who were aged 18–54 years (46%) than were those who were 55–74 years (30%).



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Figure 2—First-aid training during the past five years in relation to level of education



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Figure 3—Responses to the following question: "Have you been involved in a traffic accident or stopped at a crash site in the past five years?"

		All (n)	Yes, I did along with others (%)	Yes, I alone did (%)	Yes, others did (%)	No bystander could or dared give aid (%)	First aid seemed unnecessary (%)	Don't know (%)	All (%)
All		316	8	5	7	3	57	21	100
Gender	Female	111	4	4	5	2	65	19	100
	Male	156	13	4	6	2	58	18	100
Age (years)	18–24	40	5	0	8	0	72	15	100
	25–34	81	4	4	4	1	74	14	100
	35–44	62	11	5	10	2	50	23	100
	45–54	65	8	11	5	8	52	17	100
	55–64	40	18	2	5	0	40	35	100
	65–74	26	12	4	12	8	31	35	100
Education	Primary	89	6	4	3	4	45	37	100
	Secondary	143	8	4	8	2	62	17	100
	University	79	14	8	8	2	60	9	100

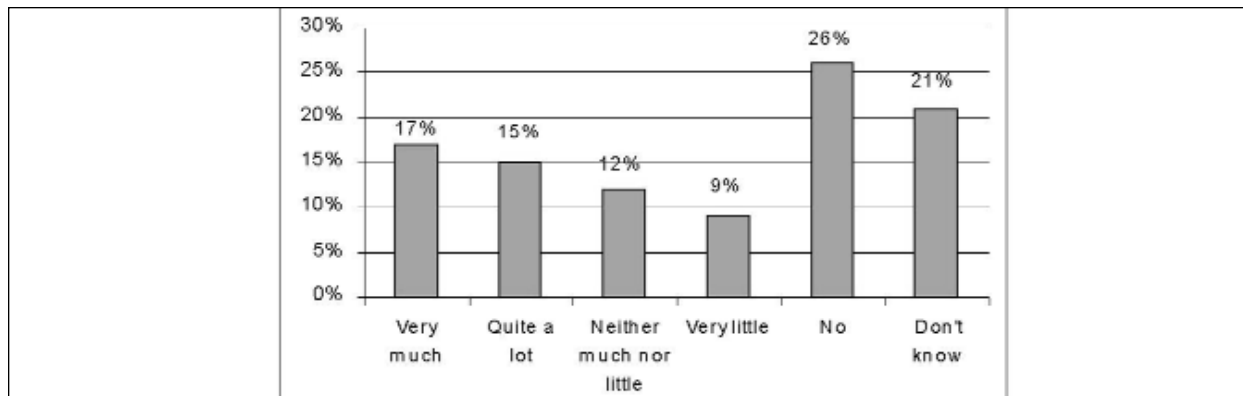
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Table 4—Responses to the following question: "Did a bystander give first aid at the crash site?"

First-aid Interventions by Bystander

Of those who were trained in first aid, 70% reported that they had never used their skills at a crash site, whereas 7% had done so, and the remaining respondents, 23% had applied their knowledge during some other type of medical emergency (Table 3). A larger proportion of the men

($p < 0.05$) had used their first-aid skills at a crash site, and more of the women had given first aid in cases of acute illness. No gender difference was found among those who had never provided first aid. However, there were statistically significant differences ($p < 0.05$) between different age



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Figure 4—Responses to the following question: “Did you have much use of your first-aid training at the crash site?”

groups: the youngest respondents, 18–24 years and 25–34 years, had given emergency care at a crash site less often than the older groups at emergencies other than traffic accidents, had the youngest group provided first aid to a lesser extent than did those who were 25–34 years of age. Furthermore, first-aid intervention at a crash site was reported by a larger percentage of those who had studied at a university than those who had a lower level of education ($p < 0.05$; Table 3) The majority of the respondents (86%) stated that they had not been present at a crash site in the previous five years. Fourteen percent had witnessed a motor vehicle accident, and 4% of those individuals had been at the scene of two or more crashes. More men (18%) than women (12%) had been bystanders at one or more crash sites ($p < 0.05$); also more men (6%) than women (1%) had been bystanders at two or more crashes (Figure 3). Significantly younger persons 18–34 years of age (6%) than those who were 55–74 years of age (2%) had witnessed at least one traffic accident ($p < 0.05$).

Irrespective of first-aid training, more than half of the respondents who had been bystanders at a crash site had judged that emergency care was unnecessary. A bystander gave first aid at about 20% of the accidents, whereas no such actions had been taken because no bystander could or dared to give life-saving assistance at 3% of the sites (Table 4). There was no association with gender, but level of education was correlated with providing first aid ($p < 0.05$): respondents who had attended a university had rendered emergency assistance at crash sites more often than had those who had only a compulsory level of education. Compared to the older respondents, fewer persons below the age of 35 years had implemented first aid as bystanders at the scene of a traffic crash, and such intervention was provided to the greatest extent by those who were 35–44 years of age (Table 4).

Of those who were involved in or were bystanders at a traffic crash and also had had first-aid training, 32% reported that they had had “considerable” or “fairly much” use of their first-aid skills (Figure 4). A larger portion of the persons with a university education (44%), compared to those with only a primary (28%) or secondary (23%) education, reported that the skills they had learned in a first-aid course had been “substantially” or “fairly” useful ($p < 0.05$). There also was a statistically significant association with age ($p < 0.05$): among those 18–34 years of age, 60%

reported that the training had been of little or no use, and 14% said that it had made no difference. Among those 35–64 years of age, 44% reported having had “much” or “fairly much” use of their training at a crash site.

There was a statistically significant relationship ($p < 0.05$) between first-aid training in the past five years and having been a bystander at a crash site during the same period. The odds ratio was 1.9 (95% confidence interval = 1.45–2.47).

Behavior Changes after First-aid Training

Forty-one percent of the respondents agreed totally or partially with the statement that they took fewer risks in traffic as a result of first-aid training. There was a statistically significant difference between age groups ($p < 0.05$): respondents who were 18–44 years of age reported that they had not changed their behavior, whereas those who were 45–74 years of age had done so. This aspect also was associated with gender ($p > 0.05$): in general, men claimed that their risk-taking behavior had been affected very little or not at all, whereas women were more unsure of whether or not they had become more cautious. Furthermore, level of education was of importance: a larger proportion of those with only a compulsory education said that they had become less inclined to take risks in traffic ($p < 0.05$; Table 4).

Discussion

First-aid Training

The majority of the individuals in the studied population had not participated in any first-aid training during the previous five years. Younger persons and those with at least a secondary education reported a higher level of first-aid training compared to the other respondents, which implies that students gain knowledge of first aid through schools or extracurricular activities. Since most young people in Sweden today do obtain a secondary education, it might lead to more people receiving first-aid training in school. However, earlier studies have suggested that skills in first aid must be updated regularly.^{31–33} Thus, without participating in refresher courses, the training of those young persons becomes out of date. It has been demonstrated that the loss of knowledge and skills occurs primarily during the first year after training.³⁴

First-aid Interventions by Bystanders

Fourteen percent of the studied population recalled having been at the scene of at least one traffic crash in the previous five years. That rate may be even higher in countries with a greater number of traffic fatalities, but there have not been other investigations of the incidence of witnessed traffic crashes. Nonetheless, 14% is quite a substantial rate, which emphasizes the importance of extensive first-aid training of the general public. According to the findings, a bystander at a crash site often concludes that first aid is unnecessary. This can be a correct assessment or the result of insufficient knowledge of first aid to allow an accurate judgment of the injuries of crash victims. In an earlier study,²² it was found that professionals often were of the opinion that bystanders could have done more, which also indicates the need for further first-aid training of lay citizens. The higher level of emergency care given by respondents with a university education may be related to more extensive experience in decision-making, greater knowledge of first aid, or possibly better assimilation of the first-aid training.

At some of the crash sites, no first aid was given because none of the bystanders could or wanted to provide such assistance. This means that a number of injured persons did not receive the help they needed, because, among other things, bystanders had inadequate knowledge of emergency care. Clearly, studies should be conducted to examine the aspects that bystander take into consideration when deciding whether or not to offer immediate aid at the site of a crash or in other emergency situations.

The finding that the respondents with a higher level of education were more willing to participate in first-aid training might be related to a generally more positive attitude towards education. It also is possible that most first-aid courses are designed in such a way that they better suit people who are well-educated. Indeed, this is supported by several of the findings, e.g., the responses indicating that persons with a university education had been more apt to take action at crash sites and also had had most use of their first-aid skills. Perhaps, the courses should be altered so that they fit the needs of persons with different levels of education.

Barely half of the subjects expressed a desire to participate in first-aid training in the near future; this is rather discouraging. A majority of those who were interested in training had a higher education and were relatively young. Older people may be more negative towards first-aid training, because they are less active and do not expect to have much use of such skills. However, this assumption is incorrect, since there is a considerable risk that someone close to these individuals will suffer a cardiac arrest — heart disease is the most common cause of death among both men and women who are over 75 years of age.³⁵ Knowledge of first aid would better prepare older people to provide life-saving assistance.

A majority of the respondents indicated that they were satisfied with the first-aid training they had received, although a few changes were suggested including: longer, more practical, or more extensive training, and refresher courses. Improvements in first-aid training may be warranted, considering that some of the respondents reported that they had had no use for their first-aid skills. Other investigators have shown that refresher courses are needed,³¹⁻³³

and such training also may represent an important preventive measure.

Behavioral Changes

After first-aid training, 40% reported taking fewer risks in traffic, primarily respondents who were elderly and those who had no more than a compulsory education. However, to a large extent, these two groups represented the same individuals, since most of the respondents with only a primary education were 45-74 years of age. For the older persons, this effect may have been due at least partially, to longer experience of life resulting in a better ability to identify the actual risks. More cautious behavior also has been shown in a town in England, where about 1,200 of the 19,000 inhabitants took a first-aid course, and information from hospital registers and traffic crash data later indicated that the training in first aid had led to a reduced accident injury rate.²⁴

Considerably more of the respondents who were bystanders at traffic crashes during the previous five years also had participated in first-aid training. It is difficult to draw conclusions about this association from these data. However, it is conceivable that the respondents who had been trained in first aid, felt more competent to deal with an emergency situation, and, therefore, were more inclined to take actions. The opposite also is possible, that is, if those who had no first-aid skills stopped at a crash site, they might have had a feeling of incompetence, which provided the incentive to take part in a first-aid course. Another plausible explanation is that individuals who have received first-aid training, might find it easier to recall encountered crashes.^{36,37} A large proportion (14%) of the adult population (18-74 years) remembered having been bystanders at a crash site during the previous five years, and some of these individuals did not provide first aid. There seem to be good grounds to invest additional resources into initial first-aid training, as well as refresher courses for adults, considering all of the advantages of having citizens with extensive knowledge of first aid.^{1,3,10,14,24} Money and time are being spent on first-aid programs, however, the effects of such training hardly have been evaluated. Resources are needed to motivate the general public to acquire skills in emergency care.

Methodological Considerations

It is a great advantage that the data are derived from a population-based study. Nonetheless, the analyses of relationships with gender may be misleading due to a high internal dropout regarding data on gender compared to the data collected for the other parameters (Table 1). Differences in responses in relation to gender, age, and level of education might be true differences, or could be explained by recall bias.^{36,37} The over all dropout rate of the study probably was not influenced by the nine added questions, since they were integrated in the comprehensive SNRA questionnaire. The construction of these questions was based on results obtained in previous studies.^{22,29} The findings can be used to improve such questions for use in future investigations. An example of ambiguity in the present queries is that they did not differentiate between whether a person simply had been a bystander at a traffic crash or was involved in some other way (e.g., had caused the crash). Furthermore, it

would be an advantage to know whether a person had participated in first-aid training before or after a crash, and it also would be useful to gain information about skills learned more than five years in the past. Presumably, training received long ago is better than no training at all.

Conclusions

A possible conclusion that can be drawn from the results is that it should be highly beneficial for a society to invest in first-aid training of persons who only have a compulsory

education. Such individuals were found to know least about first aid, and they reported that they took fewer risks in traffic after first-aid training. Accordingly, giving these people the incentive to learn first-aid skills could have several positive effects. Traffic crashes represent a large public-health problem, and adequate actions taken by bystanders at crash sites could reduce the negative impact of such trauma. At present, there is little information available on this subject, thus, further studies in this area are warranted.

References

- Cullu E, Savk S, Özkan I, Alparslan B, Ayaz S, Akin T: A survey on drivers' first-aid knowledge and experience in Aydin region, Turkey. *Journal of Traffic Medicine* 1998;26(3-4):139-144.
- Al-Momani T, Halalshah M, Trawneh M: Road traffic accidents — Medical point of view. *Journal of Traffic Medicine* 1998;26(1-2):31-36.
- Peterson TD, Russell DW: Bystander trauma care training in Iowa. *Prehospital Emergency Care* 1999;3(3):225-230.
- Trinca G: Road trauma prevention: Perspectives. *World Journal of Surgery* 1992;16:370-373.
- Collin C: *Transport Safety*. Luxembourg: Eurostat, 2000.
- Swedish Institute for Transport and Communications Analysis. *Table 22*. Statistics Sweden, 2000.
- Robertson L: Reducing death on the road: The effects of minimum safety standards, publicized crash tests, seat belts, and alcohol. *American Journal of Public Health* 1996;86(1):31-34.
- Rosén M: Har hälso-och sjukvården ett ansvar för att förebygga trafikolyckor? [Does healthcare have a responsibility for prevention of traffic crashes?] (in Swedish). *Socialmedicinsk tidskrift* 1983;8-9:445-448.
- Elvik R: How much do road accidents cost the national economy? *Accident Analysis and Prevention* 2000;32:849-851.
- Brodsky H: The bystander in highway injury accidents. *Social Science & Medicine* 1984;19(11):1213-1216.
- Hussain LM, Redmond AD: Are pre-hospital deaths from accidental injury preventable? *BMJ* 1994;1994(308):1077-1080.
- Henriksson M, Öström M, Eriksson A: *Fordonsrelaterade dödsfall. En analys av överlevnadsbara skador (Vehicle-related fatalities. An analyses of injuries possible to survive)*. (in Swedish). Umeå: Department of Forensic Medicine, 1998.
- Nygren Å, Alberts A, Brismar B, et al: *The Treatment and Rehabilitation of Traffic Accident Victims*. Stockholm: The Swedish Council on Technology Assessment in Health Care, 1994.
- Miles S: First-aid training. *BMJ* 1969;4:485-487.
- Shibata K, Taniguchi T, Yoshida M, Yamamoto K: Obstacles to bystander cardiopulmonary resuscitation in Japan. *Resuscitation* 2000;44:187-193.
- Raeder J, Vig I, Lereim I: *Førstehjelp ved trafikulykker. Et prospektivt ettersøkningsmateriale fra Trondheims-regionen [First aid in traffic accidents. A prospective one year study in the Trondheim region]* (in Norwegian). Tidsskrift for Den Norske Lægeforening 1988;108(33):3071-3074.
- Brenner B, Kauffman J, Sachter JJ: Comparison of the reluctance of house staff of metropolitan and suburban hospitals to perform mouth-to-mouth resuscitation. *Resuscitation* 1996;32:5-12.
- Hew P, Brenner B, Kaufman J: Reluctance of paramedics and emergency medical technicians to perform mouth-to-mouth resuscitation. *Journal of Emergency Medicine* 1997;15(3):279-284.
- Melanson S, O'Gara K: EMS provider reluctance to perform mouth-to-mouth resuscitation. *Prehospital Emergency Care* 2000;4:48-52.
- Shotland RL, Heinold WD: Bystander response to arterial bleeding: Helping skills, the decision-making process, and differentiating the helping response. *Journal of Personality & Social Psychology* 1985;49(2):347-356.
- Harrison JA, Wells RB: Bystander effects on male helping behavior: Social comparison and diffusion of responsibility. *Representative Research in Social Psychology* 1991;19(1):53-63.
- Mårtensson N, Alexanderson K: *Första hjälpen-insatser i samband med olycksfall och akut sjukdom - en pilotstudie [First-aid actions in relation to emergencies]* (in Swedish). Linköping: Social Medicine and Public Health Science, Department of Health and Environment, 1998.
- Pearn J: The earliest days of first aid. *BMJ* 1994;309:1718-1720.
- Glendon AI, McKenna SP: Using accident injury data to assess the impact of community first aid training. *Public Health* 1985;99(2):98-109.
- Lund I, Skulberg A: Cardiopulmonary resuscitation by lay public. *Lancet* 1976;2:702-704.
- Copley DP, Mantle JA, Rogers WJ, Russell RO, Rackley CE: Improved outcome for prehospital cardiopulmonary collapse with resuscitation by bystanders. *Circulation* 1977;56(6):901-905.
- Troest A, Larsen N, Clausen B: Førstehjælp, præhospital behandling, udført af lægmand [First-aid carried out prehospital by laypersons] (in Danish). *Ugeskrift for Læger* 1990;152(38):2711-2714.
- Miller G, Agnew N: First aid training and accidents. *Occupational Psychology* 1973;47:209-218.
- Mårtensson N, Alexanderson K: *Faktorer som påverkar lekmanns första hjälpeninsatser [Factors affecting bystander first-aid actions]* (in Swedish). Linköping: Social Medicine and Public Health Science, Department of Health and Environment, 2000.
- Kirkwood B. *Essentials of Medical Statistics*. Oxford: Blackwell, Blackwell Scientific Publications, 1991.
- Weaver F, Ramirez A, Dorfman S, Raizner A: Trainees retention of cardiopulmonary resuscitation. *JAMA* 1979;241(9):901-903.
- Wenzel V, Lehmkühl P, Kubilis P, Idris A, Pichlmayr I: Poor correlation of mouth-to-mouth ventilation skills after basic life support training and 6 months later. *Resuscitation* 1997;35:129-134.
- Fosell M, Kiskaddon R, Sterbach G: Retention of CRP skills. *Journal of Medical Education* 1983;58:568-575.
- Wilson E, Brooks B, Tweed W: CPR skills retention of lay basic rescuers. *Annals of Emergency Medicine* 1983;12:482-484.
- The National Board of Health and Welfare: *Causes of death* 1998. Stockholm: The National Board of Health and Welfare, Centre for Epidemiology, 2000.
- Raphael K: Recall bias: A proposal for assessment and control. *International Journal of Epidemiology* 1987;16(2):167-170.
- Smith M: The case control or retrospective study in retrospect. *Journal of Clinical Pharmacology* 1981;21:269-274.