

An Integrated Data Management Model for the Road Traffic Injury Surveillance System's in Developing Countries

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Abstract:

The road traffic injuries are among the serious problems of the public health that occur mainly in low -and middle income countries. The prerequisite for improving the status of traffic accidents is a comprehensive data collection system that is managed correctly. The present study is a descriptive-applied one conducted to provide an integrated data management model for the road traffic injury surveillance system's in East Azerbaijan Province in 2017. By using a comparative study, the road traffic injury surveillance systems of six countries including Malaysia, Egypt, the United States, Italy, Peru, and Iran were studied. A questionnaire including the main management pivots of road traffic injury surveillance system was prepared and it was surveyed among twenty traffic health specialists through a Delphi method. Based on the comparative study of the road traffic injury surveillance system in different countries, traffic police, emergency department, hospital, legal medicine, and insurance are introduced as five data sources. Moreover, the integrated data management of road traffic injury surveillance system's was provided in five pivots including the minimum data sets of the road traffic injury surveillance system, data classification method, data collecting, data restoring, and data distribution of road traffic injury surveillance system. For reducing traffic accidents and the consequences arising from them, a surveillance system of the local and national traffic accidents had better to be established so that it will be possible to root the problems and implement preventive plans for the road traffic injury through accessing the integrated data.

Keywords: Data Management, Road Traffic, Surveillance System, Developing Countries.

Introduction

The road traffic injuries are among serious problems of the public health [1, 2]. On average, around 1.2 million deaths and nearly 50 million injuries every year in worldwide [3]. Most of the deaths and injuries occur in low or middle income countries [4]. It is predicted that the road traffic injuries will have been the third leading cause of the disability-adjusted life

years by 2030 [5]. The road traffic injuries in Iran are twenty times higher than industrialized countries and five times higher than countries being in the same level of development as Iran [6] According to the World Health Organization, a major limitation to decrease this burden is the lack of data management to provide comprehensive data [1]. The developed countries have managed to reduce the mortality caused by these injuries through giving priority to collecting data on those injured in traffic accidents [7]. In fact, the prerequisite of improving the situation of traffic accidents and injury prevention is a comprehensive data collection system on mortality and injuries [7]. Accurate and timely data and effective communication have an important role to adequately prepare individual health organizations for emergency events [8]. The road traffic injury surveillance system need to minimum data set of adequate details to identify the factors and select the preventive measures needed [9]. In countries where traffic problems have been solved, generally an authorized institution is responsible for planning and directing the activities to reduce accidents, and all organization are collaborating with this institution [10]. In Iran, the data collection systems in each organization are independently, incomplete and overlap with data collected by other organizations. However, one of the basic needs of planning for prevention of traffic accidents is that road traffic injury data collecting accuracy and correctly [11]. The successful development of a preventive strategy toward traffic accidents depends, on the data management [12]. At present, the data collected in the country not provide the national data needs nor conform to the recommendations of the World Health Organization [13]. Given the importance of collecting valid data to reducing traffic accidents in our country, the present study was conducted to provide an integrated data management model for road traffic injury surveillance system.

Materials and Methods

The present study is a descriptive-applied one conducted in 2017 in East Azerbaijan. At first, the data sources and elements of Malaysia,

Egypt, the United States, Italy, and Peru were analyzed through library studies. The data sources of the aforementioned countries included traffic police, emergency department, hospital, legal medicine and insurance organizations. In East Azerbaijan, the traffic accidents' forms, reports, and systems of the abovementioned organizations were studied as well, and the researcher considered the components that were available in two or more countries. Moreover, all the existing components of the organizations that have to do with traffic accidents in East Azerbaijan were considered in the primary suggested model.

The questionnaire was on the different management pivots of the surveillance system of traffic accidents that include minimum data sets of the surveillance system of traffic accidents, data classification method, data saving, data restoring, and data distribution of surveillance system of traffic accidents that were graded from 1 to 5 by the experts. The content validity of the questionnaire was confirmed by six health information management and medical informatics experts. A re-test method was used to test the reliability.

Then the questionnaire was given to 20 health experts in the field of traffic accidents. The inclusion criteria for the statistical population of the present study we can refer to being employed by traffic police, emergency department, hospital, legal medicine, and insurance organization and having at least 3 years' experience in traffic accidents. The exclusion criteria of the present study were the qualified individual's unwillingness to participate in the present study. After receiving the questionnaires of the first round of Delphi, items for which the collective agreement was more than 75 percent were included in the model, and items having less than 50 percent agreement were excluded from the model.

Items for which the agreement was between 50-75 percent as well as the items suggested by the experts will be surveyed in round 2 of Delphi survey. Finally, the components of the final model for the integrated management of surveillance system's data of traffic accidents' were suggested.

• **Results and Discussion**

In the present study, 16 participants (80 percent) were male, and 11 participants (55 percent) were aged 40-50 years, and only 3 participants (15 percent) had more than 20 years of work experience (Table 1). With respect to the first pivot of the surveillance system's data

management of traffic accidents, data resources included traffic police, insurance, emergency department, hospital, and legal medicine. As for the traffic police, "the cause of accident" with the agreement rate of 100 percent had the highest score, and "the caller's information" with the agreement rate of 84 percent had the lowest score. As for the insurance company, "the car insurance status" with the agreement rate of 96 percent had the highest score; more than half of the experts maintained that the data element related to the "the details of damage declarer" is not necessary for MDS. As for the emergency department, except for the data element of "type of ambulance" with the agreement rate of 76 percent, other data elements had the highest score with an agreement rate of 100 percent.

As for the data elements related to the hospital, "the type of therapeutic measures" with an agreement rate of 98 percent had the highest score, and "services costs" with an agreement rate of 70 percent had the lowest score. As for the legal medicine, "the demographic characteristics of the deceased", with an agreement rate of 96 percent had the highest score; 56 percent of the experts maintained that the data element related to the "examination time of the corpse" was not necessary for MDS. The findings indicate that from the 266 data elements surveyed, 213 data elements were introduced as the main elements with agreement rates of 75 percent, and 42 elements were introduced as suggested elements with agreement rates of 50-75 percent.

"The details of damage declarer" for the insurance company with 5 data elements, and "the examination time of the corpse" for the Iranian Legal Medicine Organization with 6 data elements, were excluded from the final model for having an agreement rate of less than 50 percent. Three new data elements were suggested in round 1 of Delphi survey that include the driver's history of accidents, the driver's number of accidents, and number of years being qualified for insurance discounts. All three were unanimously agreed upon in round 2 of Delphi survey. The suggested data elements in the second round of Delphi survey were evaluated and all 42 data elements were selected, and no significant disagreement was observed on the importance of data elements among the experts (Table 2). As for the second pivot, ICD-10 with an agreement rate of 90 percent for the classification of the kind of injuries, ICD-9-CM with an agreement rate of 96 percent for the classification of therapeutic measure, ICECI with an agreement rate of 76 percent for the classification of the external causes of injuries, and ISS with an agreement rate of 85.5 percent for the classification of the

severity of trauma were selected, and all of them had been confirmed in round 1 of Delphi survey (Table 3). As for the third pivot, all aspects of collecting data for the surveillance system of traffic accidents were confirmed in round 1 of Delphi survey. However, the general surveillance over collecting data for road traffic injury surveillance system by responsibility for coordinating and monitoring data collection by one of the main stakeholders with an agreement rate of 96 percent (Table 4). As for the fourth pivot, all aspects of data saving as well as data restoring of the data related to the surveillance system if traffic accidents were confirmed by the experts in round 1 of Delphi survey.

However, creation of electronic medical records with unit number for the road traffic injured with an agreement rate of 100 percent (Table 5). As for the fifth pivot, one can say that all aspects of data distribution had scores higher than 90 percent among which, access to road traffic injured and died data by authorized persons when sharing data, had the highest score with the agreement rate of 99 percent (Table 6). The system for collecting information on traffic accidents is facing challenges and shortcomings and is in need of revising and implementing changes in different levels of tool design, data collection method, and data recording [9]. As for the first pivot, according to the experts' views, MDS was provided in 12 subsets including data elements of date and place information, general characteristics of the accident, road specification, driver's specifications, car's specification, vehicle insurance specifications, ambulance specifications, the specifications of the injured, on the spot therapeutic measures, hospital's specifications, therapeutic measures taken in the hospital, specifications of the deceased to transfer data among traffic police, emergency department, hospital, legal medicine, and insurance companies. The findings of the present study indicate that the suggested MDS conforms, to a great deal, to that of Malaysia.

In Malaysia, Mustafa et al have classified MDS in 8 subcategories including the date and place of accident, the general characteristics of the accident, caller's specification, specifications of the vehicle, driver's specifications, specifications of the injured, specifications of the deceased, and medical care's [2]. The

findings of their study conform, to a great deal, to those of the present study. As for the second pivot, the following were suggested; ICD-10 for the classification of the nature of injuries, ICD-9-CM for the therapeutic measures, ICECI for the external causes of the injuries, ISS for the classification of trauma severity. According to World Health Organization, the classification system of ICD-10 is used for coding the nature of injuries, and the classification system of ICECI is used for coding the external injuries [14].

The findings of the study conducted by Movahedi et al indicate that, the surveillance system of the traffic accidents in Iran needs to apply the international classification of diseases (ICD) and abbreviated injury scale (AIS), and like other countries of the region, it should apply a single language and framework for recording the traffic accidents [12]. The findings of their study conform to those of the present study. As for the third pivot, according to the views of the experts, one of the main organizations will be in charge of general coordinating and monitoring of data collection. The study conducted by Hatamabadi et al indicate that Iran is in need of coordinating center for the information of traffic accidents so that the data will be coordinated in a surveillance system of traffic accidents [7].

These findings of this study conform to those of the present study. As for the fourth pivot, according to the views of the experts, an electronic record will be created with an identification number for those injured in the traffic accidents. The findings of the study conducted by Fakhrzad et al indicate that applying the unique benefits of electronic health record can solve most of the problems of the country's healthcare system [15]. As for the fifth pivot, the authorized individuals' access to data (when sharing) had the highest score. There are some studies that indicate that the one of the main problems of electronic records is maintaining the confidentiality of the information. Given the importance of the records' confidentiality, there are some problems in this respect including the unauthorized access of the employees to this information; the access of other unauthorized individuals, and other infractions [15].

Table 1. The Frequency Distribution and Demographic Percentage of the Statistical Population

Demographic Factors		Traffic Control Expert	Insurance Expert	Health Information Management expert	Emergency Medicine Specialist	Legal Medicine Specialist	Epidemiologist
		No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
Sex	Female	0	1(5)	1(5)	0	0	2(10)
	Male	4(20)	2(10)	1(5)	4(20)	1(5)	1(5)
Age	40>	1(5)	1(5)	1(5)	1(5)	0	1(5)
	50-40	1(5)	1(5)	1(5)	3(15)	2(10)	2(10)
	>50	1(5)	1(5)	0	0	1(5)	1(5)
Working Experience	10>	1(5)	2(10)	1(5)	1(5)	0	2(10)
	20-10	1(5)	0	1(5)	2(10)	2(10)	2(10)
	>20	0	1(5)	0	1(5)	1(5)	0

Data Sets		Data Elements	Data Elements	Average Scores	Rate
Traffic police	Accident Date and place	Accident date	5	4.95	99
		Time of informing the police	8	4.35	87
		time of police proceedings	5	4.9	98
		Place of accident	4	4.95	99
	Accident information	Caller's information	4	4.2	84
		Type of accident	3	4.85	97
		Accident's manner of occurrence	8	4.35	87
	Road condition	Cause of accident	5	5	100
		Type of road	4	4.6	92
		Status of road	12	4.85	97
		Geographical location	2	4.5	90
		Allowed speed	2	4.55	91
	Driver information	Weather conditions	2	4.75	95
		Driver's demographic specifications	10	4.95	99
		Status of the driver's license	4	4.5	90
		Driver's physical status	3	4.5	90
	Vehicle information	Driver's performance	3	4.85	97
		Type of vehicle	6	4.95	99
		Model of vehicle	4	4.35	87
Colour of vehicle		2	4.55	91	
License plate of the vehicle		3	4.5	90	
Safety equipment of the vehicle		2	4.95	99	
Insurance company	Performance of safety equipment	2	4.85	97	
	Car Insurance information	The insurance status of the vehicle	2	4.8	96
		Name of the insurance company	2	4.75	95
		Type of insurance	3	4.6	92
		Specifications of policy	4	4.55	91
		Specifications of the insurance	5	3.5	70
		The amount of insurance obligations	2	3.9	78
Vehicle damage		2	3.2	64	
Emergency department	Ambulance information	Specifications of damage declarer	6	2.4	48
		Kind of ambulance	2	3.8	76
		Specifications of the personnel	2	5	100
	Injured information	Time of ambulance proceedings	5	5	100
		Demographic of the injured	6	5	100
		Type of trauma	3	5	100
		Injured vital signs	4	5	100
		Injured status	3	5	100
		Cause of trauma	4	5	100
	Medical care in Pre-Hospital	Severity of trauma	3	5	100
Transfer information		4	5	100	
type of medication		5	5	100	
Hospital	Hospital information	Result of treatment	5	5	100
		Name of hospital	3	4.35	87
		Admission date/time	5	4.8	96
	Medical measures at the hospital	Entry type of injured	3	4.85	97
		Medical diagnosis	3	4.85	97
		Type of procedures	4	4.9	99
		Hospital assessment of injury severity	4	4.8	96
Legal medicine	Died information	Require rehabilitation	2	4.8	96
		Services cost	24	3.5	70
		Demographic specifications of the died	12	4.5	90
		Death time/ date	5	4.35	87
		Examination time of the corpse	5	2.2	44
		Death place	5	3.2	64
		Final cause of death	3	3.9	78
		Intention	4	4.2	84
Hospital	Medical measures at the hospital	Location of died	3	4.35	87
		Transfer type of died	3	3.35	67
Legal medicine	Died information	Introductory reference of died	3	3.6	72

Table 2. The Average Scores given to RTISS Data Element

Table 3. The Average Scores given based on RTISS Classification

Classification Method of RTISS Data	Classification Systems	Average Scores (1-5)	Agreement Rate
Nature of Injury	ICD-10	4.5	90
	ICD-10-CM	2.25	45
Procedures	ICD-10- PCS	2.4	48
	ICD-9-CM	4.8	96
External Causes of Injury	ICD-10	2	40
	ICECI	3.8	76
Measurement of Trauma Severity	Injury Severity Score (ISS)	4.29	85.8
	Revised Trauma Score (RTS)	2.25	45

Table 4. The Average Scores given to Different Aspects of Collecting RTISS Data

Aspects of collecting RTISS data	Average Scores (1-5)	Agreement Rate
The implementation of a national data collection system for road traffic accidents with the collaboration of police, emergency department, hospital, legal medicine, and insurance companies.	4.4	88
Responsibility for coordinating and monitoring data collection by one of the main stakeholders	4.8	96
Data collecting by the stakeholders in a consistent and uniform	4.5	90
Creating an effective relationship and data flow among organization	4.4	88

Table 5. The Average Scores given to aspects of RTISS Data Saving and Restoring

Aspects of recording and retrieving RTISS data	Average Scores (1-5)	Agreement Rate
Creation of electronic medical records with unit number for the road traffic injured	5	100
Possibility to record and retrieving the road traffic injured data in web-based	4.5	90
Confidentiality of recording and retrieving systems for RTISS data	4.95	99
Evaluation of the road traffic injury data validity by the responsible organization periodically	4.55	91
Maintenance of road traffic injured record in the organization's archive	4.35	87
Preparing a backup of the road traffic injured periodically	4.53	90.6
Keeping of the road traffic injured records for 15 years by summarizing the file	4.75	95
Keeping of the road traffic died records for 10 years by summarizing the file (after their death)	4.85	97

Table 6. The Average Scores given to Distribution Aspects of RTISS Data

Distribution aspects of RTISS data	Average Scores (1-5)	Agreement Rate
Access to road traffic injured records depending with opinion of the organization	4.5	90
There is a possibility of electronic data sharing among the organizations based on data transfer standards	4.9	98
Sending road traffic injured and died data on a daily and online	4.8	96
Encrypting road traffic injured and died data while distributing data	4.85	97
Access to road traffic injured and died data by authorized persons when sharing data	4.95	99
Determine the access level of each stakeholder to the responsibilities defined for the relevant organization's	4.85	97

Conclusion

In the present study, the integrated data management model for the road traffic injuries surveillance system was suggested through five pivots. For reducing the road traffic deaths and injuries as well as the consequences arising from them, it is recommended to establish the local and national road traffic injury surveillance system so that an important step is taken towards care improvement and road traffic deaths and injuries control and prevention by accessing the integrated data.

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