

# A Practice Based Study of Trauma in a Rural Community

Bruce C. Perry, MD, Eric W. Chrisinger, Michael J. Gordon, PhD, and Walter A. Henze, MD  
Seattle and Tonasket, Washington

A three-month study of trauma seen by a rural family practice in an isolated community found that 17.3 percent of all visits were for treatment of injuries. Falls caused the most injuries (28.7 percent), but accidents involving motorcycles, horses, and automobiles caused the more severe injuries. Orthopedic problems, lacerations, and eye injuries accounted for 64.0 percent of the injuries. Consultation was obtained in 9.9 percent of the episodes. This paper offers a model of trauma surveillance utilizing practice based studies and presents information that underscores the need for more intensive training in trauma care for family practice residents who plan to enter rural practice.

Injuries represent a massive public health problem in all segments of the population. The National Safety Council estimated that injury was the leading cause of death in ages 1 to 44 years with 104,000 deaths in the United States due to injury in 1977.<sup>1</sup> The National Health Survey estimated an annual injury rate in the United States of 311.9 per 1,000 population per year.<sup>2</sup> In rural areas, the magnitude of the injury problem is heightened by the hazardous nature of agricultural work. Logging and farming often involve long hours of strenuous work with hazardous equipment. Severe injuries may occur in locations isolated from ready transportation to medical facilities.

Tonasket, Washington, is an agricultural town with a population of 900 and is situated 125 miles from the nearest referral center. The family physicians in Tonasket became concerned at the volume and severity of the injuries treated in their practice. They came to believe that trauma had a

significant detrimental effect on the community and that injuries comprised a remarkably large portion of their practice. As a result, the Tonasket physicians, with assistance from the University of Washington Department of Family Medicine, designed and carried out a practice based study to answer the following questions:

1. What is the magnitude of the injury problem in this area?
2. What are the prevalent mechanisms of injury?
3. Can patterns of injury mechanisms be discerned so that corrective actions might be instituted?

## Methods

The clinic in Tonasket serves a sparsely settled agricultural area containing several small communities with a population base of approximately 8,000. The economy of the area is based on apples, cattle, and lumber. The ambulatory medical needs of the entire area are served by the clinic and hospital Emergency Room in Tonasket, and by two solo physicians in another town. The area is medically isolated since the nearest city with specialty services is 125 miles away. The Tonasket clinic

From the Research Section, Department of Family Medicine, University of Washington, Seattle, Washington. Dr. Perry is a Robert Wood Johnson Family Practice Development Fellow. Requests for reprints should be addressed to Dr. Bruce C. Perry, Research Section, Department of Family Medicine, RF-30, University of Washington School of Medicine, Seattle, WA 98195.

Table 1. Major Reasons for Cause of Injury Stated by Patient or the Family		
Cause of Injury	Number of Cases	Percent of Cases
Fall	139	28.7
Struck by Object	55	11.3
Tool Injury	52	10.7
Automobile	34	7.0
School Athletics	30	6.2
Struck Stationary Object	28	5.8
Chainsaw	15	3.1
Motorcycle	14	2.9
Altercation	14	2.9
Sport not Otherwise Specified	13	2.7
Insect Sting	11	2.3
Ingestion	10	2.1
Burn	10	2.1
Horse Related	7	1.4
Other	53	10.9
	485	100.0

and Emergency Room are staffed by three physicians and three physician extenders. The solo physicians did not participate in the study. However, it is known that the solo physicians had 1,300 encounters during the study period while the clinic recorded 4,734 encounters; hence, 72 percent of patient visits in the Tonasket area which occurred during the study period are included in this study.

The study population comprised all patients who sought care from the Tonasket clinic providers in either the clinic or the Emergency Room. The study period extended from August 15, 1978, through November 15, 1978. A trauma study form was completed if the physicians and physician extenders deemed that the encounter was due to trauma. Trauma was defined as any condition or event listed in category XVII of ICHPPC (excluding 989, adverse affects of medicinal agents, and 998, surgical and medical complications).

**Results**

During the three-month study period, the clinic personnel recorded 4,734 visits for all causes. Of all visits to providers, 818, or 17.3 percent, were

for injuries. These visits involved 438 patients treated for a total of 485 episodes of injury. Males were involved in 68.2 percent of injury episodes; 29.9 percent of all episodes of injury occurred on the job. Teenagers and young adults were the most frequently injured, with 55.7 percent of all injuries occurring in the 10- to 29-year age group.

Falls were the most common cause of treated injuries in this study, followed by being "struck by an object" and "tool injuries." Other causes of injury are tabulated in Table 1. A majority totaling 64.3 percent of all episodes involved injury to an extremity. Eye injuries comprised an additional 9.1 percent of episodes. Table 2 shows that the predominant types of injuries were contusions, lacerations, strains and sprains, and fractures. These four types of injuries accounted for 76.3 percent of all injury episodes. The categories of closed head trauma, blunt abdominal trauma, blunt chest trauma, fracture, and dislocation were combined to form a category of "serious injury." Serious injuries accounted for 20 percent of all treated injuries. Motorcycle, automobile, and horse related accidents accounted for most of the serious injuries.

**Table 2. Types of Injuries Treated by Providers  
(May Include More than One Type of Injury per Episode so that Percent  
Total is Greater than 100)**

Type of Injury	Number of Episodes	Percent of Episodes
Contusion	107	22.1
Laceration	102	21.0
Sprain and Strain	96	19.8
Fracture	65	13.4
Corneal Abrasion	30	6.2
Puncture	30	6.2
Foreign Body (Eye)	23	4.1
Closed Head Trauma	16	3.3
Burn	14	2.9
Foreign Body (Tissue)	12	2.5
Insect Sting	11	2.2
Secondary Infection	9	1.9
Dislocation	6	1.2
Ingestion	4	.8
Internal Ligamentous Injury (Knee)	4	.8
Blunt Trauma (Abdomen)	3	.6
Traumatic Iritis	3	.6
A-C Separation	2	.4
Lacerated Liver	2	.4
Rust Ring (Cornea)	2	.4
Finger Amputation	2	.4
Blunt Trauma (Chest)	1	.2
Amputation of Leg	1	.2
Bracheal Plexus Strain	1	.2
Other	41	8.5

The clinic's providers were interested in the characteristics of the people who had more than one episode of injury during the study period. A thorough search of available data was made to find variables significantly associated with repeat injury. School sport injuries and eye injuries tended to recur in the same patient more frequently than expected by chance (chi-square test,  $P < .05$ ). However, so many relationships were tested that these relationships may be spurious.

The most frequently performed procedures were for laceration and orthopedic care. The complete list of injury related procedures is tabulated in Table 3. Table 4 shows that consultation was obtained in 9.9 percent of patients treated for trauma. Referral occurred on the first visit in 2.7

percent of trauma patients and an additional 4.5 percent were referred at a later time in their course. Four percent required admission either at the local hospital or at the referral hospital.

The data were examined to determine if differences existed between the types of injuries seen by physician extenders and by physicians. Physician extenders tended to see a greater proportion of less serious injuries, such as contusions and abrasions (chi-square test,  $P < .05$ ), while the physicians saw proportionately more serious trauma.

### Discussion

The goal of this practice based trauma study was to answer questions posed by rural providers

**Table 3. Procedures Performed by Provider on Injured Patients  
(May Include More Than One Procedure per Episode)**

Procedure	Number of Episodes	Percent
Laceration Sutured	74	15.3
Dressing of Wounds	74	15.3
Splints	64	13.2
Eye Exam Including Fluorescent Dye Application	42	8.6
Casts	34	7.0
Elastic Bandage	30	6.2
Remove Foreign Body (Eye)	13	2.7
Ankle Compression Dressing	13	2.7
Insert Drain	12	2.5
Steril Strips Applied	10	2.1
Remove Foreign Body (Tissue)	9	1.9
Burn Dressing	9	1.9
Rib Belt	9	1.9
Fracture Reduction	9	1.9
Wound Revision	6	1.2
Drain Hematoma	6	1.2
Sling	6	1.2
Reduce Dislocation	4	.8
Debride Burn	2	.4
Peritoneal Lavage	2	.4
Skin Graft	1	.2
Thoracentesis	1	.2
Athrocentesis	1	.2
Other	85	17.5

concerning the types and magnitude of trauma problems encountered in their practice. The generalizability of the results of this study to the community served or to other populations is limited by several factors. First, the clinic personnel treated 72 percent of all patient encounters in the area during the study period. The possibility of bias exists since the magnitude and variety of injuries may be different in the remaining 28 percent seen by the solo physicians not participating in the study. Injured patients may have bypassed all local providers and sought care elsewhere. Secondly, the study was performed during the harvest time of year when heaviest medical utilization occurred. Annual injury rates extrapolated from these data could be inflated. Thirdly, the hazards of the rural area in which this study was conducted may not be representative of other rural areas.

This study documents a greater injury problem

than previous studies have shown. The Virginia statewide study found injury the third most frequent diagnosis accounting for 8.4 percent of all visits to physicians.<sup>3</sup> Other practice profiles have found injury to comprise 8 to 10 percent of all encounters.<sup>4,5</sup> In the Tonasket practice, 17.3 percent of all encounters were due to injury. This fact suggests that some rural practices may encounter more trauma than previously appreciated.

Rural physicians are in a position to observe closely the impacts of trauma in a small community. During the study, a 2-year-old and a 19-year-old died of injuries. The effects of these deaths and other incidents of severe trauma were felt throughout the community. Injured teenagers and young adults, comprising 64 percent of all trauma cases, often represent the loss of needed labor and income. Permanent disability may result with devastating consequences to families. Seri-

**Table 4. Consultation, Referral, and Hospital Admission of Injured Patients**

	Number of Cases	Percent
Consultation from Specialist	48	9.9
Referral to Specialist:		
Immediate	13	2.7
Delayed	22	4.5
Admission to Hospital	20	4.2

ous injuries, as defined in this study, accounted for 20 percent of all trauma. Future studies of trauma would be enhanced by the incorporation of a trauma severity scale such as that suggested by Baker.<sup>6</sup>

Practice based studies may be effective in identifying preventable patterns of injury. Specific mechanisms of injury may be prevalent in the community and not be noticed by health or occupational workers. For example, in this study eye injuries occurred in 9.1 percent of all encounters due to trauma. Further investigation revealed that most agricultural workers did not wear eye protection in the field or shop. After the results of this study became known, public education about eye protection was begun.

Knowledge of the proper management of injuries is essential to rural providers. In Tonasket the physicians and physician extenders provided a wide range of therapeutic modalities for trauma ranging from routine care of lacerations to methods for resuscitation of the gravely injured. Although not documented by this study, the subjective impression of the Tonasket providers is that there is a need for a high level of expertise in diagnosis and management of the acutely injured. Applying criteria postulated by him, Houtchens found deficiencies in handling major trauma by rural providers in the rural mountain West leading to excess mortality.<sup>7</sup>

The frequency and severity of rural trauma has major implications for family practice residency programs. Plastic surgery, orthopedics, and evaluation of the acutely injured should be essen-

tial elements of the curriculum of residents considering rural practice. As McGuinness stated in an article on his experience in rural England:

At present one may encounter senior students and even residents near the end of their training who have never reduced a simple fracture, never removed a corneal foreign body, and whose experience of suturing is limited to two or three cases. The fact that they are erudite in cytogenetics, molecular chemistry, and tumor immunology is unlikely to impress the father of a child with a shattered limb or the worker with a burned face.<sup>8</sup>

The role of the rural family physician is central to the treatment of the injured patient. It is hoped that mechanisms will be identified through which the family physician may also markedly reduce the incidence and sequelae of injury.

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