



## Injuries associated with the farm harvest in Canada

Farm injuries have long been recognized as an important health problem encountered by rural physicians.<sup>1-3</sup> These injuries are especially notable because of their frequency, their patterns of recurrence<sup>4-6</sup> and the severe trauma that often results (unpublished data).

In this article we analyse agricultural injuries occurring during the harvest season in Canada and provide an overview of the harvest-related injuries resulting in death or admission to hospital, as well as problems treated in the outpatient setting.

### Methods

The data for this study were retrieved from existing registries that form part of the Canadian Agricultural Injury Surveillance Program: the Canadian registry of fatal farm injuries (for 1991–1995),<sup>7</sup> the Ontario registry of injuries caused by farm machinery and resulting in admission to hospital (for 1985–1994)<sup>8</sup> and data from the Manitoba Department of Labour database (for 1994–1996) for a sample of physician clinics in Manitoba.

For farm injuries resulting in death or admission to hospital, we defined “harvest-related injuries” as those involving the most common agents of acute traumatic injury associated with the harvest (i.e., tractors, power take-offs, balers, combines and harvesters, grain augers, conveyers and elevators, and farm wagons) and occurring in the months of July to

November inclusive. From the data provided in the registries, we could not identify all injuries related to harvest tasks, so we had to limit our analysis to injuries caused by certain types of farm machinery. Because of differences in coding for the different registries, a slightly different definition was used for outpatient cases: all injuries resulting from agricultural activities between July and November.

Our intention was to provide examples of the types and patterns of harvest injury and the specific diagnoses<sup>9</sup> that are likely to be observed in various clinical situations. Our approach was therefore descriptive.

### Results

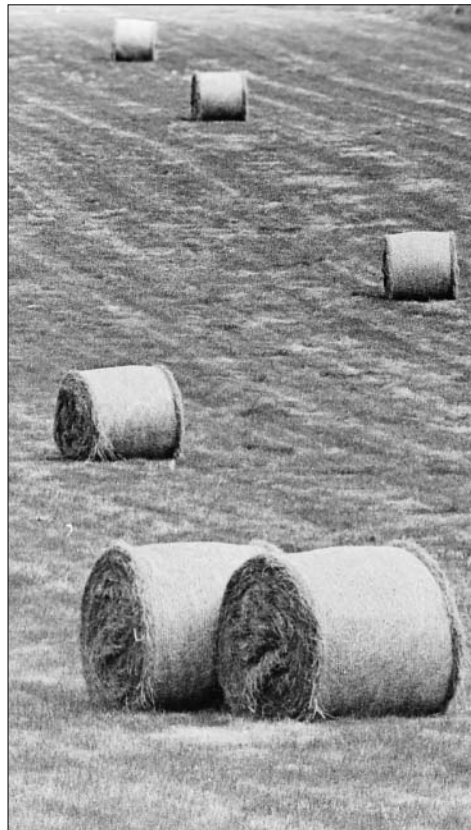
#### Overview

A total of 172 fatal harvest-related farm injuries occurred in Canada between 1991 and 1995. In Ontario 804 harvest-related injuries resulted in admission to hospital between 1985 and 1994, and a total of 219 outpatient encounters were recorded in Manitoba between 1994 and 1996.

Most (106 [61.6%]) of the 172 fatal injuries and most (568 [70.6%]) of the 804 injuries resulting in admission to hospital involved individuals of working age (15 to 64 years of age; Table 1). Adults 65 years of age or older accounted for an important proportion of fatal injuries (52/172 [30.2%]). Most fatalities were associated with tractor operation (140/172 [81.4%]). The machinery most commonly involved in injuries leading to admission to hospital were tractors (332/804 [41.3%]), combines and harvesters (129/804 [16.0%]) and grain augers (78/804 [9.7%]).

#### Admissions to hospital

The most common type of injury among those admit-



From the Canadian Agricultural Injury Surveillance Program. This program was established in 1996 with support from a variety of provincial, national and academic organizations. Its mandate includes the development of national registries of injuries and fatalities related to farm work and the interpretation of these Canadian data so as to assist in treatment and prevention efforts.



ted to hospital in Ontario (Table 2) was an open wound to an upper limb (15.7%); in almost half of these cases (62/126 [49.2%]), there was traumatic amputation of a finger. The second most common category was fracture of an upper limb (14.2%), most often involving the radius or the ulna (49/114 [43.0%]). Fractures of a lower limb

accounted for 110 (13.7%) of the 804 admissions to hospital, and 39 (35.5%) of these cases involved the ankle. Most of the open wounds (103/126 [81.7%]) and fractures (70/114 [61.4%]) involving an upper limb resulted from entanglement in machinery. Fractures of the lower limbs usually resulted from entanglement in machinery (34/110

**Table 1: Common farm machinery injuries in Canada leading to death or admission to hospital**

Machine causing injury	Age, yr; no. of fatalities*				Age, yr; no. of admissions to hospital†			
	≤ 15	15–64	≥ 65	Total (and %)	≤ 15	15–64	≥ 65	Total (and %)
Tractor	13	83	44	140 (81.4)	56	215	61	332 (41.3)
Rolled over	0	44	20	64 (37.2)	5	40	7	52 (6.5)
Ran over patient	12	14	9	35 (20.3)	22	60	26	108 (13.4)
Power take-off	0	3	4	7 (4.1)	5	59	4	68 (8.4)
Baler	0	9	0	9 (5.2)	10	51	11	72 (9.0)
Combine or harvester	0	5	2	7 (4.1)	8	110	11	129 (16.0)
Grain auger	0	5	1	6 (3.5)	14	56	8	78 (9.7)
Hay elevator or conveyer	0	0	0	0 (0)	16	44	2	62 (7.7)
Farm wagon	1	1	1	3 (1.7)	20	33	10	63 (7.8)
Total	14	106	52	172 (100)	129	568	107	804 (100)

\*Data for Canada, 1991–1995.<sup>7</sup>

†Data for Ontario, 1985–1994.<sup>8</sup>

**Table 2: Farm machinery injuries resulting in admission to hospital in Ontario, 1985–1994<sup>8</sup>**

Diagnosis	Injury code*	Age, yr; no. of admissions to hospital			
		≤ 15	15–64	≥ 65	Total (and %)
Fracture					
Skull	800–804	6	11	1	18 (2.2)
Spine or trunk	805–809	12	55	25	92 (11.4)
Upper limb	810–819	22	80	12	114 (14.2)
Lower limb	820–829	15	88	7	110 (13.7)
Dislocation	830–839	2	8	3	13 (1.6)
Sprain or strain of joint or adjacent muscles	840–848	0	10	1	11 (1.4)
Intracranial injury, excluding those with skull fracture	850–854	7	22	3	32 (4.0)
Internal injury of chest, pelvis or abdomen	860–869	9	22	5	36 (4.5)
Open wound					
Head, neck or trunk	870–879	6	10	5	21 (2.6)
Upper limb	880–887	17	96	13	126 (15.7)
Lower limb	890–897	5	35	4	44 (5.5)
Injury to blood vessels	900–904	0	3	0	3 (0.4)
Superficial injury	910–919	1	11	1	13 (1.6)
Contusion with intact skin surface	920–924	9	25	8	42 (5.2)
Crushing injury	925–929	8	35	7	50 (6.2)
Burns	940–949	0	4	0	4 (0.5)
Injury to nerves or spinal cord	950–957	0	5	2	7 (0.9)
Certain traumatic complications or unspecified injuries	958–959	4	28	3	35 (4.4)
Other or missing code		6	20	7	33 (4.1)
Total		129	568	107	804 (100)

\*Nature-of-injury codes from the clinical modification of the *International Classification of Diseases*.<sup>9</sup>



[30.9%]), being run over by machinery (30/110 [27.3%]) or being pinned, struck or crushed by machinery (24/110 [21.8%]).

### Outpatient care

Among injuries treated on an outpatient basis in Manitoba (Table 3), the most common type, open wound of an upper limb (57/219 [26.0%]), was the same as for injuries resulting in admission to hospital in Ontario. The next most common injuries were different: contusions with intact skin surface (26/219 [1.9%]) and sprains or strains of the joints and adjacent muscles (25/219 [11.4%]).

### Discussion

This article provides examples of the types of injury encountered by rural physicians during the busy harvest season. The risks for work-related farm fatalities in Canada are highest from July through October.<sup>7</sup> Indeed, the nature of farm work necessitates the conduct of a wide range of tasks over long periods during the harvest season. Weather conditions, mechanical breakdowns and financial factors can contribute to a high level of fatigue and uncertainty (and consequent anxiety) and are examples of the factors that might predispose a farmer to injury.

Farmers often work in isolation in remote areas, which may hinder prompt emergency medical response if an injury occurs. The farm family, by necessity, must often provide initial management of trauma. Small family farms are exempt from mandatory coverage by the Canadian workers' compensation system,<sup>10</sup> so the physical consequences of an injury may be compounded by financial distress and inadequate recovery time after the injury.

In Canada many harvest-related injuries caused by machinery are associated with the operation of tractors or entanglement in unguarded machinery. Although passive safety devices for tractors and farm implements have been available for several years, upgrading or modification of equipment is typically done on a voluntary basis. Those who are least able to afford to upgrade or modify their equipment are those most likely to be at risk.

### Implications for physicians

Clinical encounters between physicians and farm patients should address the need to minimize known hazards on farms. Rural physicians can, with credibility, use data from the Canadian Agricultural Injury Surveillance Program to inform their patients of the medical consequences of not taking appropriate preventive measures. Common

**Table 3: Farm injuries seen in sentinel outpatient settings in Manitoba, 1994–1996\***

Diagnosis	Injury code	Age, yr; no. of admissions to hospital			
		≤ 15	15–64	≥ 65	Total (and %)
Fracture					
Skull	800–804	0	1	0	1 (0.4)
Spine or trunk	805–809	0	7	0	7 (3.2)
Upper limb	810–819	1	10	2	13 (5.9)
Lower limb	820–829	1	10	0	11 (5.0)
Dislocation	830–839	0	2	0	2 (0.9)
Sprain or strain of joint or adjacent muscles	840–848	3	21	1	25 (11.4)
Intracranial injury, excluding those with skull fracture	850–854	3	3	0	6 (2.7)
Open wound					
Head, neck or trunk	870–879	2	9	0	11 (5.0)
Upper limb	880–887	4	48	5	57 (26.0)
Lower limb	890–897	5	5	1	11 (5.0)
Superficial injury	910–919	0	9	0	9 (4.1)
Contusion with intact skin surface	920–924	4	19	3	26 (11.9)
Crushing injury	925–929	1	4	1	6 (2.7)
Effects of foreign body entering through orifice	930–939	2	18	0	20 (9.1)
Burns	940–949	0	7	0	7 (3.2)
Other or missing code		2	5	0	7 (3.2)
<b>Total</b>		<b>28</b>	<b>178</b>	<b>13</b>	<b>219 (100)</b>

\*Nature-of-injury codes from the clinical modification of the *International Classification of Diseases*.<sup>9</sup>



reasons for farm injuries related to use of machinery include :

- failure to use protective guarding on machinery
- failure to install roll-over protection structures on tractors
- allowing extra riders (especially children) on tractors
- allowing children to accompany adults into a mechanized work situation
- allowing children to perform tasks beyond their capabilities.

Farm injuries are frequently complex, which makes cleansing and repair of wounds difficult. Healing may be compromised by contamination with soil and other foreign materials. The frequency of amputation and lacerations involving the upper limb indicates the need for rural physicians and emergency response teams to be aware of proper surgical management, such as replantation and microvascular repair techniques (where possible)<sup>11,12</sup> and amputation procedures (as required).<sup>13</sup>

Physicians should recognize that farming is among the most hazardous occupations in Canada and that rural physicians have an important role in the prevention and treatment of farm injuries.

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**References**

1. Hopkins RS. Farm equipment injuries in a rural county, 1980 through 1985: the emergency department as a source of data for prevention. *Ann Emerg Med* 1989;18:758-62.
2. Mayba II. Hay balers' fractures. *J Trauma* 1984;24:271-3.

3. Rourke J. Fatal farm accidents in Ontario. *Ont Med Rev* 1990;July:22-30.
4. Bell CA, Stout NA, Bender TR, Conroy CS, Crouse WE, Myers JR. Fatal occupational injuries in the United States, 1980 through 1985. *JAMA* 1990; 263:3047-50.
5. Hartling L, Pickett W, Brison RJ. Non-tractor, agricultural machinery injuries in Ontario. *Can J Public Health* 1997;88:32-5.
6. Myers JR, Hard DL. Work-related fatalities in the agricultural production and services sectors, 1980-89. *Am J Indust Med* 1995;27:51-63.
7. Canadian Agricultural Injury Surveillance Program. *Fatal farm injuries in Canada, 1991-1995*. Kingston (ON): Queen's University; 1997.
8. Hartling L, Pickett W, Dorland J, Brison RJ. Hospital costs associated with agricultural machinery injuries in Ontario. *Am J Indust Med* 1997;32:502-9.
9. *International classification of diseases*. 9th rev. Washington: US Department of Health and Human Services; 1989. DHHS publ no (PHS) 89-1260.
10. Elliott GF. Compensation programs for farmers. In: Dosman JA, Cockcroft DW, editors. *Principles of health and safety in agriculture*. Boca Raton (FL): CRC Press; 1989. p. 345-7.
11. Bowen J. Agricultural injuries to the upper extremity. In: Dosman JA, Cockcroft DW, editors. *Principles of health and safety in agriculture*. Boca Raton (FL): CRC Press; 1989. p. 352-4.
12. Simpson SG. Farm machinery injuries. *J Trauma* 1984;24:150-2.
13. Kostiuik JP. Amputations in farming. In: Dosman JA, Cockcroft DW, editors. *Principles of health and safety in agriculture*. Boca Raton (FL): CRC Press; 1989. p. 355-6.

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