

Midwest Surgical Association

The impact of tree-stand falls on a Level 1 trauma center in West Michigan



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Height;
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Abstract

BACKGROUND: Falls from tree stands are common during the hunting season. We examined the impact of this injury mechanism on a Level 1 trauma center in West Michigan.

METHODS: Retrospective cohort study examining tree-stand fall patients between 2001 and 2013.

RESULTS: A total of 193 patients were included. Less than 3% of patients were wearing a harness. Falls from greater than 20 feet were associated with a higher injury severity score ($P = .018$). The injury severity score and Glasgow coma scale of the normal weight and overweight (OW) groups were the same. Overall 91.3% of normal weight patients were discharged home vs 63.5% of OW patients ($P = .009$). Median rehab stay was 12 days (3 to 92), and median charge was \$24,048 (2,398 to 134,752).

CONCLUSIONS: Tree-stand falls cause significant injury, especially from heights greater than 20 feet. OW patients more frequently require rehabilitation. The infrequent use of safety harnesses is alarming.

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Deer hunting is a popular activity in the state of Michigan, with nearly 600,000 participants annually.¹ The sport is commonly performed from a tree-stand, which is a platform that elevates the hunter between 15 and 30 feet high.² Tree stands are both commercially produced and homemade, and

many lack safety equipment. As a result, tree-stand falls are a mechanism of injury frequently encountered by the trauma surgeon during the hunting season.

The impact of tree-stand falls has been studied in several states including West Virginia, Pennsylvania, and Ohio.²⁻⁴ Injuries range from simple contusions to spinal paralysis.⁵ In West Virginia, investigators determined that the majority of injuries occur in those not using safety equipment.² In response to such practices, the Treestand Manufacturers Association (TMA) was established to develop testing guidelines and safety standards for commercially produced tree stands. Despite these efforts, the national tree-stand injury rate remains unchanged.⁶

The purpose of this study is to examine the impact of tree-stand falls in West Michigan. Specifically, this analysis

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aims to define the influence of body mass index (BMI) on clinical outcomes and to quantify the burden of this injury mechanism on a rehabilitation facility.

Methods

All patients admitted to the trauma service involved in a tree-stand fall between 01, January 2001 and 01, January 2013 were included in this retrospective cohort study. This study was approved by both Spectrum Health Hospital and Mary Free Bed Rehabilitation Hospital institutional review boards. Study variables included age, sex, race, BMI, injury severity score (ISS), admission Glasgow coma scale (GCS), hospital length of stay (LOS), protective gear status, disposition (home, rehab, skilled nursing facility, and death), time in rehab, rehab charges, and functional independence measure (FIM; Uniform Data System for Medical Rehabilitation, Amherst, NY). Patients were divided into 2 groups: normal weight (NW) defined as BMI less than 25 and overweight (OW) defined as BMI greater than 25.

Data were analyzed using IBM SPSS Statistics, version 21.0 (Armonk, NY). Quantitative data were analyzed using the *t*-test or Mann–Whitney *U* test and are shown as the mean \pm standard deviation or the median and range. FIM scores were analyzed using the Wilcoxon-signed rank test. Nominal data were analyzed using the chi-square test or Fisher's exact test and are shown as percentages. Significance was assessed at $P < .05$.

Results

Table 1 shows the demographic and clinical characteristics of the 193 patients who met the entry criteria for the

study. There were a wide range of injuries sustained. The most common were extremity fractures (35%), spine injuries (32%), and chest wall trauma (14%). The majority were male, and over 70% were discharged home after their hospital stay. Falls from greater than 20 feet were associated with a higher ISS ($P = .018$). There were 3 deaths. Of those patients where the data were available, only 2.3% (4 of 174) were wearing a protective device.

BMI data were available for 127 patients (Table 2). Twenty-three patients were classified as NW (BMI < 25), whereas the remaining 104 subjects were OW and/or obese. There were no significant differences between the groups for GCS, ISS, or LOS. However, the average age for the OW group was significantly greater compared with the NW group ($P = .009$). In addition, there was a significant difference in disposition from the hospital between the 2 groups, which appeared to be mainly because of a greater number of patients in the OW group who were discharged to a rehab facility.

A subgroup analysis of 23 OW-rehab patients revealed median stay was 12 days (3 to 92), and median charge was \$24,048 (\$6,774 to \$98,184). The FIM score at admission was a median of 53 (36 to 89), which significantly improved to a median FIM score of 95 (57 to 124) at discharge ($P < .001$). Two of the 4 patients who were wearing a protective device were OW, and in both cases, the safety harness broke.

Comments

Tree stands are both commercially produced and homemade, and many lack safety equipment. The TMA was established in 1995 to promote tree-stand safety and to

Table 1 Clinical and demographic data*

Variables	
Age (y) [†]	44.6 \pm 13.0
Sex (% male)	189/193 (97.9%)
Race (% Caucasian)	152/157 (96.8%)
GCS [‡] §	15 (3–15)
ISS [‡] §	12 (1–50)
LOS [‡]	4 (1–36)
BMI [*]	29.5 \pm 5.9
Disposition	
Home	137/193 (71.0%)
Rehab	50/193 (25.9%)
Skilled nursing facility	3/193 (1.6%)
Death	3/193 (1.6%)
Protective device	4/174 (2.3%)

BMI = body mass index; GCS = Glasgow coma scale; ISS = injury severity score; LOS = length of stay.

*n = 193 except where noted.

[†]Mean + standard deviation.

[‡]Median (range).

[§]n = 192.

^{||}n = 127.

Table 2 Comparisons between NW and OW and/or obese patients[‡]

Variables	NW (BMI < 25)	OW/obese (BMI ≥ 25)	<i>P</i> value
Age (y)*	38.0 \pm 12.3	45.6 \pm 12.5	.009
GCS [†]	15 (3–15)	15 (3–15)	.462
ISS [†] §	13 (4–26)	13 (1–50)	.393
LOS [†]	3 (1–12)	4.5 (1–33)	.054
Disposition			.002
Home	121/23 (91.3%)	66/104 (63.5%)	
Rehab	1/23 (4.3%)	36/104 (34.6%)	
Skilled nursing facility	0/23 (.0%)	2/104 (1.9%)	
Death	1/23 (4.3%)	0/104 (.0%)	

BMI = body mass index; GCS = Glasgow coma scale; ISS = injury severity score; LOS = length of stay; NW = normal weight; OW = overweight.

*Mean + standard deviation.

[†]Median (range).

[‡]n = 23 for the NW group and n = 104 for the overweight and/or obese group except where noted.

[§]n = 103 for the overweight and/or obese group.

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