

# Manufactured Housing Plant Injuries in a Rural Family Practice

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*The manufacture of mobile homes and prefabricated houses results in the second highest occupational injury and illness rate of any industry. The types of worker injuries sustained have never previously been characterized. This series of 138 injuries from a rural family practice categorizes the injuries sustained by workers in a manufactured housing plant. Most injuries were not judged to be serious, but did result in lost work time and morbidity. Forty-nine percent of all injuries involved lacerations or puncture wounds. Seventy-six percent of puncture wounds involved staple gun use. Two thirds of lacerations were from pieces of metal, siding, and other sharp objects; one third were from knives. Fingers, hands, and wrists were the most commonly injured anatomic sites. Nine cases of overuse injury were seen; two required carpal tunnel surgical release. Twelve injuries were serious enough to require hospitalization or consultation. There were no fatalities. Several suggestions for improved worker safety are presented. J FAM PRACT 1990; 31:273-276.*

Mobile home technology in the United States dates from the time of tepees and covered wagons. In the early 1900s, the nation's desire for "life on the road" led to the introduction of basic primitive trailers towed by horseless carriages. During World War II, a need for emergency housing for military personnel resulted in the development of portable sectional housing units. Personnel involved in government projects, such as the Tennessee Valley Authority and atomic bomb development at Oak Ridge, Tennessee, lived in camps of sectional houses. Thousands of 8 × 24-foot sections were shipped by flatbed trailer for assembly in these locales. During the 1950s, the single-wide trailer house became a popular, affordable means of housing for many Americans, and a distinctly American phenomenon, the trailer park, was born. The multiwide manufactured home of the 1980s is a direct descendant of the trailer house and sectional housing units of World War II.

In 1986, mobile home and prefabricated wood building manufacturers employed 70,400 people in the United

States. According to the Bureau of Labor Statistics,<sup>1</sup> the incidence of injuries and illnesses in 1986 was 20.6 per 100 full-time mobile home and prefabricated wood building workers. This rate ranks the second highest of any American industry, exceeded only by the meat-packing industry. Although the Occupational Safety and Health Administration (OSHA) requires that employers keep a list of injuries and illnesses, the logs are confidential and open only to former and current workers and government officials. A review of the medical literature and questions directed at OSHA revealed that the types of injuries incurred in the mobile home and prefabricated wood building industry have never been categorized.

This study describes injuries sustained by workers in a manufactured housing plant who were treated by a rural family physician. The plant began operation in 1968 in a rural western Kansas town with a population of 2500. Between 1968 and 1988, the plant produced 15,000 manufactured homes and employed a daily average of 100 workers. An average of three homes were completed during a working day. In 1988 the plant had a fiscal year payroll of \$1.75 million and provided fringe benefits of \$500,000.

The plant markets homes in five states and has annual sales of \$12 million. Homes range in size from 60 × 14-foot single-wide structures costing \$13,000 to 66 × 28-foot double-wide structures costing \$65,000.

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Manufactured homes are built from the floor up in an assembly line fashion. As crews complete their assigned specialized tasks, the house is moved on a trailer along a track similar to a railroad spur. First, the floor is installed. Then, exterior sidewalls are attached and the roof is added. Interior walls, plumbing, wiring, insulation, carpeting, and cabinetry are installed along the line.

Flooring consists of plywood or particle board that is nailed in place with nail guns powered by compressed air. Two-by-four-inch and 2 × 6-inch boards used for joists, wallboards, and rafters are secured with nail guns and staple guns. Roofing, shingles, and interior walls are similarly attached. Interior walls consist of plasterboard that is layered on one side with paneling. Interior wall trim is applied with a staple gun. Windows are installed with screws.

Various plant specialty shops supply materials required for assembly. In the sawmill, large table saws and planers cut lumber used for joists, rafters, and wallboards to a specified size. A cabinet shop builds kitchen and bathroom cabinets and counters from veneer-covered particle board. Carpet is cut to size with specialized carpet knives. In the final finish shop, knives and scrapers are used to remove glue from cabinets, curtains are hung, and vacuuming and final cleaning chores are performed.

Lifting and carrying various heavy materials such as plywood boards and lumber is necessary. Bending, stooping, and kneeling are required to build floors and walls and install carpet. Carpet layers wear special kneepads to protect against extensive kneeling. Workers crawl onto and jump off the trailers upon which the manufactured home is positioned. Roofers and insulators balance themselves on rafters to shingle roofs and blow insulation into the attic. All workers are exposed to sawdust, and some workers are exposed to water-based paints and rock-wool insulation. Use of nail guns and staple guns requires a repetitive gripping motion to power the gun.

## METHODS

At the time the data were collected, the author was in solo practice in a rural western Kansas town with a population of 2500. Records of all workers injured at the housing plant who presented to the author's office or hospital emergency department between October 1983 and June 1988 were maintained and tabulated for analysis by retrospective chart audit. Between August 1985 and November 1986, the author had a partner, and 24 injuries treated by the partner were included in the basic data for analysis. The problem-oriented medical office and emergency department records using standard SOAP notes were used to categorize injured workers by age and sex, reconstruct

**TABLE 1. AGE DISTRIBUTION OF WORKERS INJURED IN A RURAL MANUFACTURED HOUSING PLANT (N = 138)**

Age (years)	No. (%)*
14	1(1)
19	12(9)
20-24	1(30)
25-29	26(19)
30-34	27(20)
35-39	18(13)
40-44	2(1)
45-49	7(5)
50-54	3(2)
55-60	0(0)
69	1(1)

\*Totals do not equal 100% because of rounding.

the mechanism of injury sustained, characterize the type and location of physical injury, and describe treatment decisions and outcome.

## RESULTS

A total of 138 different individual worker injuries were treated by this rural family practice between October 1983 and June 1988. Ninety-one percent of the injured workers were male. All injuries involved manufacturing activities requiring manual labor. There were no clerical, sales, or managerial workers injured. There were no fatal injuries.

Though workers may have visited other physicians and may have bypassed the plant injury reporting mechanism, the plant manager estimates that 95% of all injuries between October 1983 and June 1988 are captured in this study (personal communication, Pete Janatello, Schult Homes Corporation, Plainville, Kansas, January 2, 1990).

Injured worker ages ranged from 14 to 69 years (Table 1). Fifty-eight percent of injured workers presented between April and September.

Table 2 outlines the primary injuries sustained. Forty-nine percent of the injuries involved lacerations or puncture wounds.

Table 3 outlines the anatomic site involved in the injuries. Forty-six percent of injuries involved the fingers, hands, or wrists.

Seventy-four (54%) of injuries required consideration of tetanus status. Of those 74 cases, 50 (68%) had up-to-date tetanus status. Twenty-four (32%) required and received tetanus immunization.

Of the 138 workers' injuries, 73 (53%) required minimal or no treatment other than observation. Twenty-three of the 33 lacerations required repair. Ten lacerations were treated with adhesive bandages only. Fourteen injuries were treated with medication only (usually nonsteroidal

**TABLE 2. PRIMARY INJURY SUSTAINED IN 138 MANUFACTURED HOUSING INDUSTRY WORKERS**

Injury	No. (%)
Puncture wound	34(25)
Laceration	33(24)
Ligament/muscle strain	14(10)
Contusion	13(9)
Eye foreign body/abrasion	11(8)
Tendonitis/carpal tunnel syndrome	7(5)
Knee bursitis	5(4)
Fracture	5(4)
Shoulder separation/dislocation	4(3)
Abrasion	4(3)
Arthritis	2(1)
Concussion	2(1)
Isolated injury	4(3)

anti-inflammatory agents or antibiotics). Seven cases required splinting of the injured part.

Of 11 eye injuries, 4 required removal of a foreign body, and 7 were treated conservatively for irritation or abrasions from rock wool, sawdust, or chemicals. There were no serious eye injuries.

Of the 34 puncture wounds, 26 involved staples, and on nine occasions the treating physician had to remove the staple. Four workers stepped on nails. Three workers were injured by flying wooden projectiles, one of which required removal by the treating physician. One worker was struck in the forearm by a piece of metal flying off of a broken hammer head. No puncture wounds were judged to be serious.

Twelve workers' injuries were serious enough to require hospitalization or consultation. Hospitalization was required for one worker who suffered a vertebral fracture

**TABLE 3. ANATOMIC SITE OF INJURY IN 138 MANUFACTURED HOUSING INDUSTRY ACCIDENTS**

Anatomic Site	No. (%)*
Finger	41(30)
Hand/wrist	22(16)
Leg	17(12)
Foot	11(8)
Eye	11(8)
Arm	8(6)
Head	8(6)
Back	6(4)
Shoulder	4(3)
Toe	3(2)
Chest	2(1)
Neck	2(1)
Abdomen/inguinal	2(1)
Skin	1(1)

\*Totals do not equal 100% because of rounding.

**TABLE 4. MECHANISM OF INJURY IN 138 MANUFACTURED HOUSING INDUSTRY WORKERS**

Mechanism	No. (%)*
Punctured	34(25)
Staple	26(19)
Nail	4(3)
Wood	3(2)
Metal	1(1)
Cut by sharp object	25(18)
Other than knife	15(11)
Knife	8(6)
Unknown	2(1)
Struck by moving or falling object	15(11)
Lifting	11(8)
Injured in the eye by foreign body	11(8)
Falling	10(7)
Overusing tools	9(7)
Injured by power tools	7(5)
Miscellaneous injuries	7(5)
Striking stationary object	5(4)
Kneeling injuries	4(3)

\*Totals do not equal 100% because of rounding.

complicated by an ileus and for one worker who had a concussion. Surgery was required for carpal tunnel release (two cases), a thumb extensor tendon laceration, recurrent shoulder dislocation, inguinal hernia repair, tibia-fibula fracture, and a ruptured lumbar disc.

Consultation for a second opinion was obtained in three cases involving evaluation of a knee injury, recurrent back pain, and unresolved pain from a rectus muscle strain.

Mechanisms of injury are summarized in Table 4.

The most common injury involved staple wounds. Nine cases of repetitive motion injury from the overuse of staple guns and hammers, seven power tool injuries, and four cases of "housemaid's knee" from kneeling were recorded. There was one case of allergy and urticaria in a worker exposed to molded wood.

Two thirds of the lacerations were from pieces of metal, siding, and other sharp objects; one third were from knives.

## CONCLUSIONS

Fortunately, the majority of injuries in this series were judged not to be serious, but they did result in lost work time and some degree of morbidity. A clear, easy way to reduce injuries in this series was not apparent. The following several possibilities for improved worker safety, however, should be considered.

1. If possible, nail guns and staple guns should be reengineered for better protection from puncture wounds.

Worker safety education and correct, safe use of nail guns and staple guns should be emphasized in employee-training programs.

2. Ergonomic engineers should develop ways to reduce overuse injuries from the repetitive motion required to activate nail guns and staple guns in the manufactured housing industry. Though only nine overuse syndromes were identified, two required carpal tunnel release and prolonged absence from work. When treated conservatively, workers with overuse injuries required a change in job responsibilities and a loss of productive work time.

3. The use of goggles or safety glasses should be required to reduce the risk of eye injury.

4. Worker safety instruction programs, including topics such as proper lifting techniques and power tool safety, should result in fewer injuries.

The manufacturing plant involved in this series demonstrated a serious concern for employee safety and cooperated with the author to develop preemployment evaluations and worker injury precaution instructions. The plant has a mandatory safety glass program. Employee safety education may well prove to be the most effective means of reducing injuries.

The importance of this study is that worker injuries in the manufactured housing industry have never before

been categorized. Although the workers in this industry have the second highest injury and illness rate among all occupations in America, according to the Bureau of Labor Statistics, there has been no systematic study of manufactured housing plant injuries. Further analysis from other series of cases would be beneficial. Occupational safety and health is one of 15 priority areas targeted in the US Public Health Services Objectives for the Nation.<sup>2</sup>

The diverse goals of family physicians include patient advocacy, occupational safety for patients, and practice-based research. An interested family physician in even the most rural, isolated practice can accumulate a series of cases that can help define a never-before-characterized problem. It is the goal of this report to stimulate other family physicians to examine their practices for problems and data that may lend themselves to descriptive analysis.

#### References

1. Occupational Injuries and Illnesses in the United States by Industry. Bureau of Labor Statistics, Bulletin 2308. Department of Labor. Government Printing Office, 1988
2. Promoting Health/Preventing Disease: Objectives for the Nation. Public Health Services, Item 485. Government Printing Office, 1980