

# Factors Contributing to Appropriate Sharps Disposal in the Community Among Patients With Diabetes

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## ■ ABSTRACT

**Background.** Proper disposal of sharps has been well studied in hospital settings but not often addressed in the home setting. This lack of attention has resulted in erratic use of proper sharps disposal techniques and thus increased risk of needle-stick injuries and infections. This study aimed to evaluate methods of disposal and patient demographic factors associated with correct disposal of diabetes-related sharps in the community.

**Methods.** A survey was administered to diabetes patients at an endocrinology clinic of an academic tertiary care center. Correct disposal of sharps was defined as use of designated sharps or other leak-proof containers. Numerous patient factors were evaluated for a clinically significant association with correct disposal of sharps via  $\chi^2$  testing.

**Results.** Fifty-nine percent of patients reported disposing of their sharps correctly. Those with diabetes for >30 years had the lowest rate of correct disposal (36%). Age, sex, education level, type of diabetes, and type of diabetes regimen were not associated with correct disposal. Patients who received formal training on proper sharps disposal from a nurse or from other sources were more likely to dispose of sharps correctly (odds ratio [OR] 3.95, 95% CI 1.37–11.34, and OR 4.55, 95% CI 1.5–13.85, respectively). Married patients were less likely to correctly dispose of sharps (OR 0.36, 95% CI 0.14–0.92,  $P = 0.033$ ).

**Conclusion/Clinical Relevance.** This study was the first to examine disposal practices and associated risk factors for poor disposal methods among patients in a U.S. tertiary medical center. A large portion of patients was found to have improper sharps disposal practices. Prior formal training in sharps disposal was associated with higher rates of correct practices, suggesting that increased emphasis on provider-patient education can lead to significant improvement in disposal habits.

Approximately 21 million Americans are currently diagnosed with diabetes. Almost 30% of patients with diabetes use insulin as a means of managing their glucose levels in the home setting (1). Each year, more than 2 billion needles and syringes are used by self-injectors, largely for the treatment of diabetes (2). Proper disposal of sharps (e.g., syringes, needles, and lancets) in hospital settings and its impact on public and occupational health has been well

studied. This research has resulted in a standardized approach for sharps disposal that is widely implemented in the inpatient setting. However, sharps disposal habits in the home setting are less studied and often are not addressed, resulting in erratic use of proper disposal of sharps and, thus, increased risk of needle-stick injuries and infections in the community.

A limited number of prior studies have shown that, in the home setting, patients often use household con-

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TABLE 1. Patient Demographics and Percentage of Proper Sharps Disposal

	Age (years)*					Sex†		Race‡				Marital Status§		Level of Education		
	18-34	35-49	50-64	≥65	Male	Female	Caucasian	Black	Asian	Latino	Other	Married	Not Married	Pre-college	College	Graduate
n	19	21	67	41	78	69	113	4	10	12	4	90	57	43	76	29
Correctly disposed (%)	79	67	49	59	56	61	59	75	30	75	50	52	67	70	51	59
Incorrectly disposed (%)	21	33	51	41	44	39	41	25	70	25	50	48	33	30	49	41

\*P = 0.1062; †P = 0.6185; ‡P = 0.0642; §P = 0.0330; ||P = 0.1720.

tainers to dispose of sharps or throw them directly into household waste receptacles (3,4). In these studies, the reported amount of education regarding sharps disposal was also quite low. Patient demographic factors that contribute to incorrect disposal habits have not been specifically studied.

**Objective**

This study aimed to evaluate methods of disposal and patient demographic factors associated with correct disposal of diabetes-related sharps in the community.

**Methods**

This study was conducted at an endocrinology clinic in an academic tertiary care center (Stony Brook University Hospital in New York), which serves a county of about 1.5 million inhabitants. A 21-question survey was administered to patients with a diagnosis of diabetes who presented to our clinic for routine care. Patients who reside at long-term care facilities were excluded. A total of 160 patients were given the survey. Of these, nine patients were removed from the study because of an incomplete survey. “Sharps” were defined as syringes, pen needles, and/or lancets. Correct disposal of sharps was defined as use of designated sharps or other puncture-resistant container. Numerous patient factors such as formal training in sharps disposal, marital status, type of diabetes, injectable versus noninjectable therapy, time since diagnosis, educational background, race/ethnicity, age, and sex were evaluated for a clinically significant association to correct disposal of sharps. Additionally, confidence in proper disposal practice was assessed in the survey.

**Statistical Analysis**

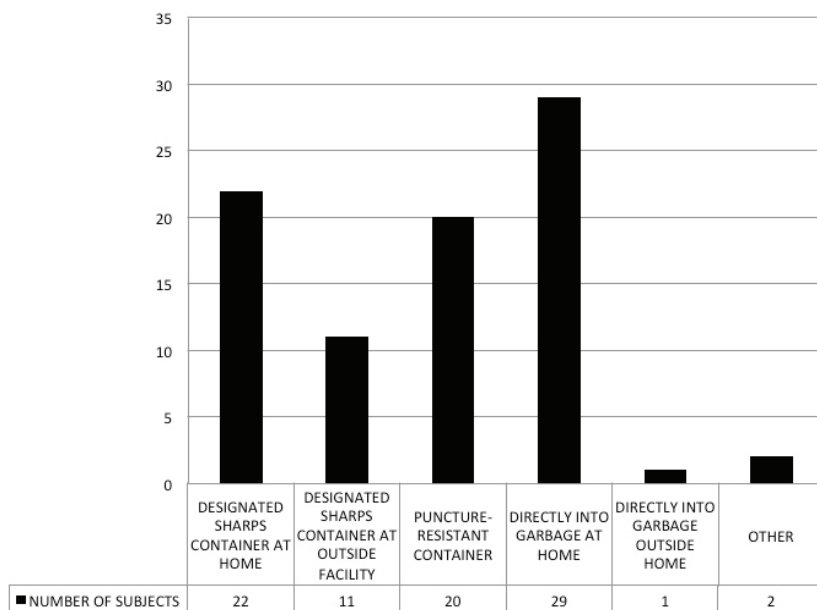
The  $\chi^2$  test with an exact P value based on Monte Carlo simulation was performed when comparing the answers of each question with respect to correct sharps disposal. Any variables that were significant at 0.1 in the univariate analysis were further

included in the multiple logistic regression. Education level and type of formal prior training patients received were always included in the multiple model because of the main interest in the effect of these two variables on the outcome. Forward selection was used in the multiple logistic regression because of the relatively small number of events of the outcome (5). Significance level was set at 0.05, and statistical analysis was performed using SAS 9.3 (SAS Institute, Cary, N.C.)

**Results**

The patients sampled in this survey were representative of an ambulatory diabetes practice. The largest age-group was between the ages of 50 and 64 years (45%). A total of 25% of surveyed patients had type 1 diabetes, 67% had type 2 diabetes, and the remainder included patients with gestational diabetes and prediabetes (Table 1). The majority of patients (69%) had been diagnosed with diabetes for <20 years. Most (74%) used injectable diabetes medications, whereas 25% used only noninjectable forms of treatment (e.g., diet or oral medications).

Of the 151 patients who completed the survey, 89 disposed of their sharps correctly (59%) and 41% disposed of their sharps incorrectly (Figure 1). A total of 52 patients (34%) stated they had no formal training on how to dispose of sharps. As shown in Table 2, of the 74 patients who had formal training, 35 (47%) were trained by nursing staff (e.g., in the hospital, in the clinic, or by a visiting nurse or a diabetes educator) and 39 (53%) were trained by other means (e.g., online, with pamphlets, or by attending a class). A total of 105 people (70%) described themselves as very confident or somewhat confident in the properness of their disposal methods. A total of 45 people (30%) described themselves as not sure, not confident, or not confident at all. Of note, 9 patients (6%) in our survey reported a needle stick injury in the household. Of those 9 patients, 5 reported that



■ FIGURE 1. Method of sharps disposal. Correct disposal was defined as use of a designated sharps or other puncture-resistant container.

they had proper training in sharps disposal.

Age, sex, and education level were not associated with correct sharps disposal. Interval duration of diabetes diagnosis was marginally associated with correct disposal. Individuals with diabetes for >30 years had the lowest rate of correct disposal (36%) when compared to individuals with diabetes <30 years (66%,  $P = 0.0321$ ). However, when controlling for other risk factors, interval duration of diabetes diagnosis was no longer associated with correct disposal. Type of diabetes and the type of diabetes regimen were not associated with correct disposal.

Patients who expressed confidence in the properness of their disposal methods and those who disposed of their sharps containers at designated facilities were more likely to dispose of their sharps correctly ( $P < 0.0001$  and  $P < 0.0001$ , respectively). In addition, prior training was identified as being marginally associated with proper sharps disposal ( $P < 0.0001$ ). When controlling for education level and marital status, patients who received formal training on proper sharps disposal from a nurse (odds

ratio [OR] 3.95, 95% CI 1.37–11.34) or from other sources (OR 4.55, 95% CI 1.5–13.85) were more likely to dispose of sharps correctly than patients who never received training. When controlling for education level and resource of training, married patients were less likely to correctly dispose of sharps than unmarried patients (OR 0.36, 95% CI 0.14–0.92,  $P = 0.033$ ).

### Discussion

Sharps disposal is a standardized practice and widely acknowledged necessity in health care facilities. However, sharps disposal in the community and its possible health implications are not frequently addressed. As a result, millions of lancets, needles, and syringes are disposed of unsafely, placing patients, their families, and other exposed bystanders at unnecessary risk of needle-stick injuries. A limited number of studies in countries outside of the United States have looked at disposal practices in the community. Olowokure et al. (4) reported the incorrect disposal of lancets, syringes, and needles at a rate of ~30%, with sharps boxes as the least implemented method of disposal. In one of the few studies done in the United States,

TABLE 2. Factors in Diabetes Care and Percentage of Proper Sharps Disposal

	Type of Diabetes*		Interval Duration of Diagnosis (years)†		Form of Treatment‡			Disposal Trainings§			Confidence in Correct Disposal	
	Type 1	Type 2	<30	≥30	Noninjectable	Injectable	Nurse	Other	None	Confident	Not confident	
n	37	101	119	22	39	112	35	39	52	105	45	
Correctly disposed (%)	73	54	63	36	51	62	74	69	44	72	29	
Incorrectly disposed (%)	27	46	37	64	49	38	26	31	56	28	71	

\* $P = 0.1600$ ; † $P = 0.0495$ ; ‡ $P = 0.2572$ ; § $P = 0.0072$ ; || $P < 0.0001$ .

Costello and Parikh (3) reported that only 16% of patients were educated on proper disposal by a health care professional, although the type of health care professional was not specified. Crawshaw et al. (6) demonstrated that prior advice on how to dispose of sharps has been shown to significantly improve the rate of proper sharps disposal (6). While most of the existing studies remark on patient demographics, there has been little correlation made between patient demographics and disposal habits.

This study was the first to examine disposal practices in a tertiary medical center in the United States as well as examine possible associated risk factors to poor disposal. It showed that a large portion of our patients with diabetes do not dispose of their sharps in the appropriate manner and, in some cases, this poor disposal led to needle-stick injuries. Importantly, prior formal training in disposal methods was associated with higher rates of correct disposal practices, suggesting that increased emphasis on provider-patient education can lead to significant improvement in proper disposal habits. Our study did not demonstrate any impact of age, sex, race, educational status, type of diabetes, or type of treatment used on the likelihood of proper disposal. Because we did not elicit from patients their perceived reason for incorrect disposal, future studies may include evaluation of potential barriers

to correct disposal in the United States, including the varying regulations on sharps disposal from state to state and even county to county. Our institution offers a course certified by the American Diabetes Association as well as individual instruction by a nurse certified diabetes educator. Our survey was administered anonymously to protect patient privacy; therefore, details surrounding the specific type of education they received could not be confirmed. The inability to link type of education to disposal practices does represent a limitation to our study. Further studies are needed to better elucidate which specific education methods will best improve sharps disposal practices.

### Conclusion

Patients with diabetes who use sharps at home often do not dispose of sharps in a safe way, putting them and others at risk for needle-stick injuries. Education by a health care professional improves rates of proper sharps disposal in the community setting. Our study suggests that there may be many missed opportunities to educate patients with diabetes on proper disposal methods over the course of their medical care. Further efforts should be made to integrate sharps disposal education into the routine care of patients with diabetes, since education across various health care settings can yield significant improvement in proper sharps disposal.

### Duality of Interest

No potential conflicts of interest relevant to this article were reported.

### Author Contributions

L.H. contributed to discussion and wrote, reviewed, and edited the manuscript. S.K. researched data, contributed to discussion, and reviewed and edited the manuscript. J.Y. contributed to discussion and reviewed and edited the manuscript. C.A. researched data. M.M.C. researched data and reviewed and edited the manuscript. M.M.C. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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