

WHAT DO THE NEEDLES, SYRINGES, LANCETS AND REAGENT STRIPS OF DIABETIC PATIENTS BECOME IN THE ABSENCE OF A COMMON ATTITUDE?

About 1 070 questionnaires in diabetic clinics

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SUMMARY - The aim was to investigate the fate of injection and monitoring material after its use by diabetic patients in different countries (France, Belgium, Luxemburg, Switzzeland and Tunisia). Some suitable containers are available for disposal but little is known about the attitudes of patients and physicians to them. 1 070 questionnaires were completed by patients (age: 50 ± 18 years; diabetes duration: 15 ± 11 years; 2.8 ± 1.1 injections per day) visiting 109 doctors. Injections were done at home (72.6%), or both at home and at work (26.6%). At home: needles, syringes, lancets and reagent strips were thrown directly into the bin in 46.9%, 49.9%, 52.2% and 67.6% of cases, respectively; and in a closed plastic bottle in 29.6%, 28.5%, 28.9% and 19.9% of cases, respectively. Specific containers were used in 8.6% and 6.3% of cases for needles and syringes, respectively. 62% of the bottles and containers were thrown directly into the bin, whereas 15.5% were returned to a pharmacy (4.5% taken to hospitals, 2.9% were burned). At work: 63% of the patients brought their needles and syringes home for disposal, 6.9% kept suitable containers at work and 30% threw their materials directly into local bins. We conclude that awareness should be increased and the organization of the collection of used material improved.

RÉSUMÉ - Devenir des aiguilles, seringues, lancettes et bandelettes pour diabétiques en l'absence d'attitude consensuelle: analyse de 1 070 questionnaires.

L'objectif est d'évaluer le devenir des déchets souillés de patients diabétiques insulino-traités lors d'une enquête prospective de septembre 98 à janvier 99 par questionnaires remplis consécutivement (France, Belgique, Luxemburg, Suisse, Tunisie). 1070 patients ont participé à l'enquête. 68,8 % utilisent des aiguilles pour stylos, 11,6 % des seringues, 17,8 % les deux. A domicile : les aiguilles, seringues, lancettes et bandelettes vont directement à la poubelle du domicile respectivement dans 46,9 ; 49,9 ; 52,2 ; 67,6 % ; dans une bouteille en plastique fermée respectivement dans 29,6 ; 28,5 ; 28,9 ; 19,9 % des cas. Des containers spécifiques sont utilisés pour les aiguilles pour stylos ou les seringues dans respectivement 8,6 et 6,3 % des cas. Les bouteilles sont jetées directement à la poubelle dans 62 % des cas, retournées à la pharmacie dans 15,5 % des cas. Aucune différence pour l'âge ($p = 0,25$), le type de diabète ($p = 0,38$), ou le nombre d'injections par jour ($p = 0,89$) n'est observée entre ceux qui jettent directement le matériel piquant à la poubelle et ceux qui prennent des précautions à cet égard. Sur le lieu de travail, les aiguilles, seringues, lancettes et bandelettes vont directement à la poubelle du lieu de travail dans 30,1 ; 29,6 ; 35,4 ; et 51 %, la majorité des patients ramenant leur matériel à domicile. Ceux qui travaillent jettent plus volontiers leur matériel piquant à la poubelle que ceux qui restent à domicile : 52,0 vs 44,4 % ($\chi^2 = 4,45$; $p = 0,04$). En conclusion, une sensibilisation des patients mérite d'être pratiquée à l'égard du devenir des matériaux souillés.

Key-words: diabetes, needlestick injuries, nosocomial transmission.

Mots-clés : diabète, blessures par piqûres, infections nosocomiales.

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Health care workers are known to be at high risk of infection and transmission of diseases from patients via needlestick injuries [1, 2, 3]. Individuals in other lines of work such as street cleaners, dustmen, firemen, gardeners and police officers are also potentially exposed to needlestick injuries, but data concerning this risk are scarce [4].

Police officers are at risk of contamination due to needlestick injuries from the syringes of intravenous drug users [5]. Diabetic patients treated with insulin also use syringes or needles and therefore are also a source of risk.

In France, there are at least 2 million diabetic patients including 200 000 patients with type 1 diabetes [6]. Every year, almost 10% of type 2 diabetes are treated for the first time with insulin [7]. From the results of the DCCT and the UKPDS were published, it has been concluded that effective control of glycaemia can prevent complications [8, 9]. The optimization of glucose control often requires a larger number of insulin injections [10]. The disposal of waste is very strictly regulated and was recently the subject of a decree that defined the authorized methods of storage and collection, particularly for sharp objects [11]. Everybody who produces waste material in France is responsible for its suppression, and diabetic patients are clearly concerned by this law. Reactive programs have been set up by several hospitals to prevent needlestick injuries and to collect contaminated needles, but nothing is known about the fate of contaminated needles from diabetic patients [12]. The aim of this study was to investigate the fate of the injection and monitoring material used by diabetic patients in several French-speaking countries.

■ PATIENTS AND METHODS

Patient selection

The study was conducted prospectively from September 1998 to January 1999. Questionnaires were sent to diabetes specialists in France, Belgium, Luxembourg, Switzerland and Tunisia. Physicians asked 10 consecutive patients to participate in the study. For inclusion, patients had to have diabetes treated with insulin and the ability to understand the questionnaire. All patients participating in the study gave their informed consent after appropriate information. The physician himself filled in a separate questionnaire.

Detailed methods

Patients were asked sixteen open questions about the fate of used material at home and at work: syringes, needles for pen injectors, lancets and reagent strips. Physicians were asked questions to determine

what they knew about used materials and their needs in that area. All data were collected and analyzed anonymously by an independent organisation.

Data were analyzed using Statview 4.5 software (Abacus Concepts, Inc., Berkeley, CA). Results are given as means \pm SD, or as medians (ranges) if the distribution was skewed. Groups were compared using the χ^2 test for categorical variables, and analysis of variance (ANOVAS for comparison of ≥ 3 groups or Student's t-test for comparison of two groups for quantitative variables).

■ RESULTS

Characteristics of patients

109 physicians sent back the completed questionnaires (97 from France, 9 from Belgium, 2 from Switzerland and 1 from Tunisia). A total of 1 082 patients filled in the questionnaire and 1070 of these forms were exploitable. The characteristics of the patients are given in *Table I*. Median age and diabetes duration were respectively 50 ± 18 and 15 ± 11 years. Two thirds of the patients had Type 1 diabetes. The number of injections per day was high (2.7 ± 1.0) reflecting the type of diabetes, mostly type 1 diabetes. 68.8% used pen injectors, 11.6% syringes and 17.8% both (1.6% wore external insulin pumps and used catheters with needles).

894 questionnaires were filled by french patients whereas the others were coming from the other countries. Each administrative french region was represented ($n = 22$).

The fate of used materials at home

72.6% of the patients performed injections only at home. Results are depicted in *Table II* and *Figure 1*. Needles, syringes, lancets and reagent strips were thrown directly into the bin in 46.9%, 49.9%, 52.2% and 67.6% of cases, respectively. It is impossible to determine whether the patient broke or removed the needle before throwing syringes away, or whether they recapped back on needles or syringes. These materials were thrown away with no other protection. Needles, syringes, lancets and reagent strips were thrown away in a closed plastic bottle in 29.6%, 28.5%, 28.9% and 19.9% of cases, respectively. Generally, those who used a plastic bottle disposed all their used material in it (data not shown). Specific containers (bought at a pharmacy, into which either the needle alone or the entire syringe is placed) were used in 8.6% of cases for needles and 6.3% of cases for syringes.

62% of the bottles and containers were thrown directly into the bin and 15.5% were returned to a pharmacy (4.5% taken to hospitals, 2.9% were burned

TABLE I. Characteristics of the patients.

	all (n = 1 070)	Type 1 Diabetes (n = 599)	Type 2 Diabetes (n = 366)	p. value
Age (year)	50 ± 18	43 ± 17	62 ± 12	< 0.0001*
Diabetes duration (year)	15 ± 11	15 ± 12	15 ± 10	0.25*
Age at onset (year)	35 ± 17	26 ± 16	46 ± 13	< 0.0001*
Body mass index (kg/m ²)	21.4 ± 2.6	21.6 ± 2.6	29.7 ± 2.8	< 0.0001*
Injections done: only at home/at work (%)	72.6/26.6	62.3/37.0	90.4/9.3	< 0.0001*
Systolic blood pressure (mmHg)	134 ± 18	129 ± 16	141 ± 19	< 0.0001*
Diastolic blood pressure (mmHg)	76 ± 11	75 ± 10	79 ± 11	< 0.0001*
Number of injections (per day)	2.7 ± 1.0	3.1 ± 1.0	2.1 ± 0.9	< 0.0001#
Pen injectors with needles (%)	68.8	65.4	76.2	
Syringes (%)	11.6	9.9	14.8	
Pen injectors and syringes (%)	17.8	22.4	8.5	
Catheter for pumps (%)	1.8	2.3	0.5	

Data are means ± SD, type of diabetes was obtained from only 965 patients.* ANOVA; # χ^2 test

TABLE II. The fate of the used material at home (results were given in percentages).

	Needles (n = 943)	Syringes (n = 351)	Lancets (n = 945)	Reagent strips (n = 928)
Directly into the bin	46.9	49.9	52.2	67.6
In a plastic bottle	29.6	28.5	28.9	19.9
In a specific container	8.6	6.3	6.1	3.2
In a container and into the bin whatever the container was (can, paper, plastic bag ...)	8.4	10.8	4.6	2.9
Other (burned, kept at home)	6.5	4.5	8.2	6.4

in the fireplace or in the garden). The duration of storage at home was not evaluated.

Among those using injector pens, there was no difference for age ($p = 0.25$), proportion of type 1 diabetes and type 2 diabetes ($p = 0.38$), or number of injections per day ($p = 0.89$) between those throwing needles directly into the bin and those taking additional precautions. However, a tendency to dispose of the material with caution was rather found before 20 and between 40 and 60 years of age, respectively 58.2% and 55.5%, versus 47.8%, and 44.5% of the diabetic patients aged 21-40, more than 61 years of

age. The duration of diabetes tended to be longer for those throwing needles directly into the bin than for the others: 15 ± 10 years versus 14 ± 11 years; $p = 0.058$. 63.1% of the patients with a duration of diabetes shorter than 5 years disposed of the material with caution, versus 52.3%, 48%, and 51.3% for those whose duration of diabetes ranged 6-10, 10-20 and more than 21 years, respectively ($\chi^2 = 15.7$; $p = 0.007$).

Those who disposed of their needles with caution were more likely to read medical journals from dia-

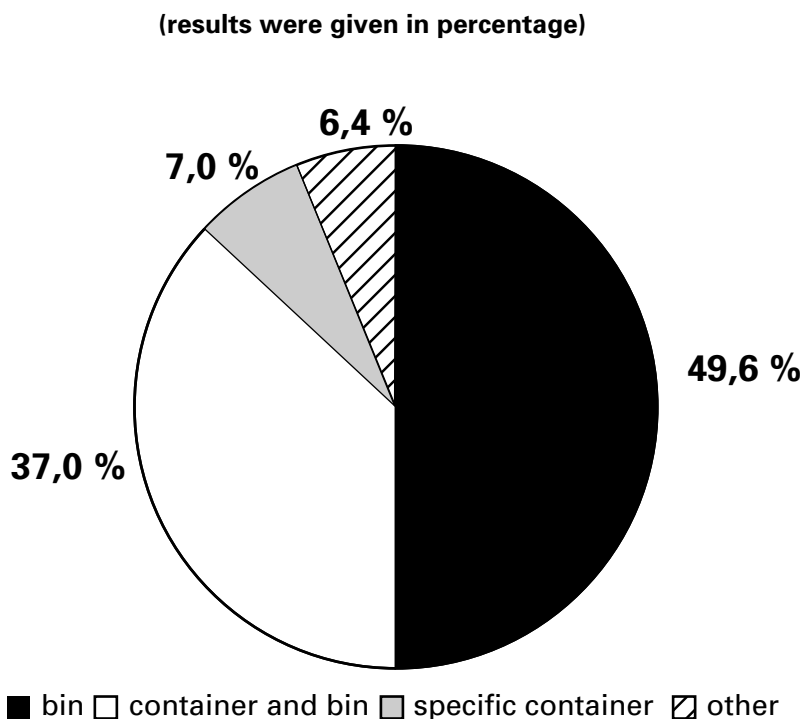


FIG. 1. The fate of the used material at home (results were given in percentages).

betic associations than those who threw their needles directly into the bin: $\chi^2 = 3.87$; $p = 0.049$.

People using syringes did not differ for age ($p = 0.40$), diabetes duration ($p = 0.32$), proportion of type 1 and type 2 diabetes ($p = 0.67$), or number of injections per day ($p = 0.22$) for the various means of disposing of materials.

The fate of used materials at work

26.6% performed injections at work. Of these, 63% brought their used material home for disposal whereas 30% threw it directly into the bin at work and 7% used specific containers. Patients who performed injections at work were more likely to throw their needles directly into the bin at home than those who did not perform injections at work: 52.0% vs 44.4%; $\chi^2 = 4.45$, $p = 0.04$.

When France is arbitrarily divided in 5 regions by 2 lines from Bordeaux to Lyon and from Amiens to Montpellier, the fifth region named "Ile de France" including the city of Paris, the percentages of diabetic patients who disposed of their needles with caution in the north-west, north-east, south-west, south-east, and Ile de France were respectively: 60.0%; 51.8%; 58.6%; 41.1% and 40.9%. Patients from Belgium took care before throwing their materials in 47.6% of cases. Data are too scarce in other countries to conclude.

Results from the physicians

Among the 109 physicians, 17.4% had an exclusive private practice, 46.8% worked only in a hospital and 35.8% did both. 68.5% said that they had already thought about what happens to the used materials. Physicians in private practice asked about disposal slightly, but not significantly, more frequently than those who worked exclusively in a hospital: 75.9% (private) versus 60.0% (hospital): $p = 0.08$. 16.7% of all physicians said they systematically gave advice about the disposal of used materials, and, according to the physicians, only 18.3% of patients asked about waste disposal. No difference was found for the duration of practice ($p = 0.79$), the kind of practice (private or hospital: $p = 0.29$) and the proportion of diabetic patients treated with insulin ($p = 0.81$) between those who gave advice and those who did not. 38.9% of those working in hospitals ($n = 95$) did not know if the nurses systematically gave advice. 53.3% (57 of 107) said that they did not know what kinds of specific container could be bought in a pharmacy, 87% (94 of 108) had no idea about their cost and 93.5% (101 of 108) thought that they did not receive enough information about these special containers.

DISCUSSION

This survey shows that almost half of the patients treated with insulin throw their used material directly

into the bin; one third use a closed plastic bottle. However, a plastic bottle is not solid enough to withstand heavy pressure and cannot prevent needlestick injuries [13]. To our knowledge, this is the first time that such information has been collected in this field.

The characteristics of the physicians and patients were similar to those in a previously studied larger cohort of French physicians [14] and are therefore likely to be representative of the population of diabetic patients followed by diabetes specialists. The attitude of the patients in this sample towards their used material can probably be extended to the population of diabetic patients treated with insulin as a whole. Presumably, deficiencies in the education of the diabetic population not seen by the diabetes specialists would increase the number of diabetic patients throwing used material into the bin without taking precautions. Although most of the physicians seemed to be aware of the problems of waste disposal, too few gave advice about disposal, and most required more information. This is a real public health problem as individuals in many occupations are at risk of needle pricks: for example, a retrospective analysis of the exposure of police officers to transcutaneous prick injuries concluded that the self-reported exposure rate was 38.7/10 000 police officers [5].

The risk of infection following such injuries is not low. The risk of transmission of hepatitis B to non-immune health care workers after a needle prick is from 2 to 40% (according to the presence or absence of hepatitis B e antigen) [15]. Less is known about the risk of hepatitis C virus transmission. Conflicting results have been obtained and the cumulative risk appears to be lower than that for hepatitis B virus [15, 16, 17].

The risk of HIV infection associated with occupational exposure to percutaneous injuries involving needles and other contaminated devices has been estimated to be 0.2% (9 infections after 3628 exposure incidents) [15]. A case control study revealed that 4 factors seem to be associated with a significant risk of HIV infection after occupational exposure: a deep injury, injury with a device that was visibly contaminated with blood from the source patient, procedure involving a needle placed in the source patient's artery or vein, and exposure to a terminally ill source patient. HIV transmission therefore seems to be significantly associated with injuries due to large-diameter needles (a gauge of less than 18) [2]. Thus, health care professionals seem to be the most exposed to the risk of transmission of the virus. Due to the fragility of the virus in the environment, the risk of transmission to street cleaners at some distance from the source is probably no more than moderate. However, it is not zero: HIV infection presumed to be due to injury from a needle thrown away without protection has been

reported in a street cleaner; the patient was initially seronegative and seropositive 4 months after the injury [18].

However, whether needle pricks injuries by accident were registered is not asked in the questionnaires and so it cannot be evaluated.

Lancets are potentially a cause of prick injuries but, to our knowledge, no case of transmission via lancets has been reported. Presumed HIV infection has been reported by a nurse wounded whilst determining capillary glycaemia in a patient, but the precise mechanism of transmission is unclear [18].

In conclusion, the use of devices designed to limit the risk of such injuries should be developed, and reactive programs set up by hospitals. Similar attitudes should be developed by diabetic patients to prevent and reduce the occurrence of needle prick injuries. Physicians, nurses and patients should be made aware of the various means of waste collection, to reduce the likelihood of these objects being thrown directly into the bin.

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