Reuse of syringes for therapeutic injections in Pakistan: rethinking determinants

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Abstract

Background: Frequent reuse of syringes during medical injections is fuelling epidemics of human immunodeficiency virus and hepatitis C virus infections in many low- and middle-income countries including Pakistan.

Aims: To explore specific factors related to syringe reuse during therapeutic injections.

Methods: We randomly surveyed 319 healthcare providers from 2 socioeconomically diverse districts in Pakistan, along with 625 of their patients.

Results: Providers see 12–25 patients per day, and provide 7–14 therapeutic injections or intravenous drips. Comparing daily stocks with injections provided, we estimated that 38% of providers (Rawalpindi: 14%, Tando Allah Yar: 44%) likely reuse syringes 2 or 3 times. Rural location and longer duration of practice predict a higher likelihood of reuse. Physicians and non-physicians were equally likely to reuse. Most patients were unaware when a syringe had been reused.

Conclusions: High rate of syringe reuse is driven by high injection demand by patients, to which providers comply. Patients are generally unaware of the harm of injections with syringe reuse or that reuse happens. Our findings suggest that patient focused approaches may help reduce syringe reuse.

Keywords: injection demand, injection safety, syringe reuse, therapeutic injections, unsafe injections

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Introduction

Syringe reuse during therapeutic injections has contributed to the global epidemics of hepatitis C virus (*1,2*) and human immunodeficiency virus (HIV) (*3–6*) infection, and is well documented in high-income (*7,8*) and low- and middle-income countries (*9–11*). In Pakistan, high reuse of syringes during therapeutic injections (*13*) has led to a national prevalence of hepatitis C of 4.8% (*12*), with some districts as high as 12%, and has contributed to at least one community outbreak of HIV infection (*14*). Therapeutic injections in Pakistan range from 4.2–4.6 injections per person annually (*13*), with 17–50% of these injections being given with reused syringes (*12,13,15,16*). Currently, conventional disposable syringes are used in Pakistan. The Punjab Government introduced reuse-prevention (RUP) syringes in its health facilities in 2017 (*17*). The World Health Organization's injection safety guidelines recommend RUP for all injections and sharp-injury protection syringes, wherever feasible (*18*).

We have previously demonstrated that the total national supply of syringes in Pakistan is sufficient to meet the demand for the ~1.1 billion syringes used annually for immunization, diabetes, laboratory testing and drug administration in clinics or hospitals (*13*). Therefore reuse of syringes cannot be attributed merely to a national shortfall of syringes as had been previously thought. However, such national aggregates hide reuse by individual practitioners. The present study explored the extent and pattern of syringe reuse in Pakistan. We also explored a novel method to identify reuse to avoid providers' self-promotion and patients' recall biases, as well as paradigms behind injection demand and supply in communities.

Methods

Rawalpindi and Tando Allah Yar were identified in collaboration with the Pakistani Ministry of Health as districts exemplifying high and low human development indices (*19*), to understand injection reuse practices across the extremes of human development. Rawalpindi is a large metropolis with a large number of public and private, and primary, secondary and tertiary medical care centres and specialists. Although around half of the population of Rawalpindi District is rural, the villages are close to the city. Tando Allah Yar is completely rural and poor. Data were collected between February and April 2009.

In the first phase, all healthcare providers from all 19 Union Councils of Tando Allah Yar and 38 (1: 5) randomly selected Union Councils from Rawalpindi were listed. Thus, 6053 providers were identified as any individuals who see patients in communities, irrespective of their training or licensure. This list was used to construct a simple randomization–sampling frame to recruit healthcare providers. The study was powered for type I

error (α): 0.05 and type II error (β): 0.2; giving a total of 320 providers to be divided between districts (Epi Info). The relative number of the providers between districts was weighted for the providers per Union Councils included in the listing, giving 174 providers from Rawalpindi and 145 from Tando Allah Yar. At each healthcare provider's facility, 2 patients were approached to participate in a brief survey, from among those present at the time of study team visit and based on who was encountered first.

Provider and patient questionnaires were pretested to ensure validity and appropriateness. The providers' questionnaire asked about their training and practice pattern. The patients' questionnaire asked about their demographics and healthcare-seeking behaviour. Both were asked about knowledge about syringe reuse and its harm.

Reuse of injections was identified by 3 measures: (1) the study teams observed providers while managing patients, including while giving injections; (2) recognizing that such observations may be subject to a Hawthorne effect (*20*,*21*), where providers' behaviour may change when they recognize that they are being observed, we also asked patients if they felt that the injection they received was given with a new or reused syringe; and (3) since many patients may not have known whether a syringe was reused, we also used a proxy measure. We asked providers how many syringes they stocked for the previous day and compared these against the number of injections they said they had provided yesterday. This difference identified providers that were sure to reuse syringes since they would have insufficient syringes for all the injections they gave. This established a minimum level of reuse since providers can potentially reuse even when they have insufficient syringes. Recall bias was limited by asking only about the previous day. Variables were compared using SPSS+ version 20. Proportions of those that gave injections, and reusers were compared using χ^2 tests. Predictors of reuse of syringes were explored using linear regression with predictors described in Table 5. These factors included all that were considered relevant to syringe reuse.

The study was reviewed and approved by the Ethical Review Committee of Bridge Consultants Foundation, Karachi, Pakistan. Informed consent was obtained from all participants.

Results

We interviewed 319 providers (145 from Tando Allah Yar and 174 from Rawalpindi). Their mean (standard deviation) age was 44.5 (11.8) years in Rawalpindi and 39.6 (10.2) years in Tando Allah Yar, and there were 265 (83%) men. Around half (57%) of all providers from Rawalpindi and 26% from Tando Allah Yar were physicians, with more urban than rural providers being physicians (Table 1). Urban providers from Rawalpindi saw a mean 27.5 patients a day and their rural counterparts saw a mean 16.7. Rural and urban providers from Tando Allah Yar saw a mean 19.9 and 21.8 patients a day respectively.

We interviewed 625 patients (273 from Tando Allah Yar and 352 from Rawalpindi). Their mean age was 34.4 (18.7) years in Rawalpindi and 32.2 (12.1) years in Tando Allah Yar; 603 (56%) were men (Table 2). Twenty percent of patients from Rawalpindi had no schooling, compared with 56% from Tando Allah Yar. Patients from Tando Allah Yar were more likely to be farmers, labourers or housewives, while those from Rawalpindi were mostly skilled labourers, housewives, office workers or students

Commonest reasons for medical visits were fever, influenza-like symptoms or body aches (51% of all patient visits) or abdominal symptoms such as pain, vomiting or diarrhoea (11% of visits). An injection was provided during 53% of patient visits in Rawalpindi and 92% in Tando Allah Yar (Table 2). Patients from Rawalpindi reported having received a mean of 5.4 injections during the previous year compared to 13.2 injections by patients from Tando Allah Yar.

Patients from Tando Allah Yar reported a mean 3.8 visits to a healthcare provider by a member of their household during the previous month, compared to 2.5 by those from Rawalpindi (Table 2). During all such visits, an injection was given. Overall, 56% patients felt that an injection was necessary. Such perceptions were higher in Tando Allah Yar than in Rawalpindi (79% vs. 39%) (Table 2). Providers reciprocated such perceptions in that 44–56% of providers felt that an injection was required for common ailments such as fever, influenza, body aches or diarrhoea (Table 4). In practice, it was highly likely that an injection would be given for fever (OR: 7.9, $P = 0.022$) but not for abdominal pain/ diarrhoea (OR 5.4, $P = 0.187$).

Providers from Rawalpindi charged a mean US$ 1.44 for a visit when no injection was given and US$ 1.51 if an injection was given; there were no rural/urban differences. Providers from Tando Allah Yar charged a mean US$ 0.59

Table 1 Demographics and practices of providers

	Total	Rawalpindi	Tando Allah Yar	*P*
Age of patients, yr, mean (SD)				
All	42.3 (11.4)	44.5 (11.8)	39.6 (10.2)	< 0.001
Rural	39.5 (10.7)	42.9 (11.5)	37.2 (9.5)	0.002
Urban	44.7 (11.4)	45.4 (11.9)	43.4 (10.4)	0.271
Male sex, n (%)				
All	265 (83%)	133 (77%)	132 (91%)	0.001
Rural	133 (88%)	52 (83%)	81 91%)	0.029
Urban	132 (80%)	81 (74%)	51 (91%)	< 0.001
Physician (vs. non-physician), n (%)				
All	135 (43%)	98 (57%)	37 (26%)	0.003
Rural	33 (22%)	18 (29%)	15 (17%)	0.015
Urban	102 (61%)	80 (73%)	22 (39%)	0.003
Patients seen daily, mean (SD)				
All	22.4 (18.6)	23.8 (20.5)	20.6 (15.9)	< 0.001
Rural	18.6 (16.8)	16.7 (17.7)	19.9 (16.0)	< 0.001
Urban	25.7 (19.6)	27.5 (20.9)	21.8 (15.7)	0.002

Table 2 Sociodemographic characteristics of patients

Characteristics	Total Mean (SD)	Rawalpindi Mean (SD)	Tando Allah Yar Mean (SD)	P
Age	33.5 (16.2)	34.4 (18.7)	32.2 (12.1)	0.047
Male sex, n (%)	340 (54%)	178 (50%)	162 (59%)	0.588
Education				
No schooling, n (%)	224 (36%)	72 (20%)	152 (56%)	< 0.001
Years of education, mean (SD)	4.7 (4.830)	6.4 (4.663)	2.0 (3.756)	< 0.001
Was an injection prescribed during this visit, n (%)	614 (70%)	347 (53%)	267 (92%)	< 0.001
Injections received last year, mean (SD)				
All	8.2 (13.5)	5.4 (9.7)	13.2 (17.4)	< 0.001
Rural	10.7 (17.0)	6.4 (10.2)	15.8 (21.4)	< 0.001
Urban	6.4 (9.9)	4.9 (9.4)	10.1 (10.3)	< 0.001
Healthcare visits last month by a family member, mean (SD)				
All	3.1 (4.6)	2.5 (5.7)	3.8 (2.5)	< 0.001
Rural	3.2 (2.5)	2.6 (7.6)	3.6 (2.5)	0.003
Urban	3.1 (4.6)	2.5 (4.5)	4.0 (2.4)	< 0.001
Median injections received in these visits (SD)				
All	2 (5.09)	1.8 (5.1)	5.0 (6.5)	< 0.001
Rural	3 (6.65)	2.7 (7.8)	6.2 (7.8)	< 0.001
Urban	1 (2.80)	1.3 (2.6)	3.4 (2.7)	< 0.001
Felt an injection was necessary, n (%)				
Yes	351 (56%)	136 (39%)	215 (79%)	< 0.001
No, but the provider insisted	18 (3%)	17 (5%)	1 (0.4%)	0.840
Median provider fee for this visit (in USD), n (SD)				
All	1.10 (1.36)	1.48 (1.65)	0.61 (0.49)	< 0.001
Rural	0.95 (1.27)	1.46 (1.69)	0.56 (0.57)	< 0.001
Urban	1.24 (1.41)	1.49 (1.64)	0.69 (0.30)	< 0.001
Injection prescribed	1.42 (1.81)	1.51 (1.87)	0.59 (0.62)	< 0.001
Injection not prescribed	0.97 (1.08)	1.44 (1.42)	0.62 (0.48)	< 0.001

when an injection was provided and US$ 0.62 when not provided. Providers charged a mean US$ 0.56 in rural and US$ 0.69 in urban locations. Providers from Rawalpindi reported giving a mean of 8.8 intramuscular injections, 3.5 intravenous injections and 2.3 intravenous drip daily (Table 3). Providers from Tando Allah Yar gave a mean 10.0 intramuscular injections, 3.9 intravenous injections and 1.4 intravenous drip daily. We asked providers how many syringes they had stocked for the day: 140 (48%) providers from Rawalpindi and 122 (46%) from Tando Allah Yar gave more injections than their daily stock of syringes. Therefore, they would have been likely to reuse syringes regularly. For analysis, these were labelled as likely reusers. No urban provider from Rawalpindi fell into this category, while urban and rural providers in Tando Allah Yar were similar (Table 3). Around 38% of all providers were likely to reuse consistently (Table 4). These likely reusers gave a mean 14.4 injections daily compared to 12.3 by those who were less likely to reuse syringes. Since reusers stocked around 5 syringes a day, they would likely have reused syringes for 9 injections in any given day.

Of the variables used in the linear regression model (Table 5), only practicing in Tando Allah Yar (AOR 1.92, range 1.9–7.69) and a longer duration of practice (AOR 0.6% for each year in practice, range 0.1–1%) increased the likelihood for reuse. Physicians were just as likely to reuse as non-physicians. Our teams observed patient encounters for any injection reuse and we also asked patients if they had observed syringe reuse. Both of these modes of inquiry identified reuse during < 5% of observations/visits. Nearly all providers, but few patients, were aware of the possibility of acquiring injection site injuries or infections such as hepatitis or HIV infection from reused syringes.

Discussion

We found that around half of the patients had received an injection during their current visit and that at least 38% of the providers were likely to reuse syringes during injections. Reuse happens just as often by physicians or non-physicians and is irrespective of sex of providers or the fee charged. Both providers and patients felt that

Table 3 Injection provision

Injection provision	Total Mean (SD)	Rawalpindi Mean (SD)	Tando Allah Yar Mean (SD)	*P*
Intramuscular injections provided daily				
All	9.4 (9.6)	8.8 (9.6)	10.0 (9.6)	0.134
Rural	9.8 (9.3)	8.2 (7.6)	10.8 (10.0)	0.020
Urban	9.1 (9.8)	9.2 (10.4)	8.9 (8.7)	0.819
Intravenous injections provided daily				
All	3.7 (4.5)	3.5 (3.7)	3.9 (4.9)	0.298
Rural	3.6 (4.2)	2.8 (3.4)	3.9 (4.4)	0.057
Urban	3.7 (4.7)	3.8 (3.8)	3.9 (5.6)	0.938
Intravenous drips provided daily				
All	1.7 (3.8)	2.3 (3.9)	1.4 (3.8)	0.037
Rural	1.6 (3.3)		1.0 (1.6)	0.003
Urban	1.9 (4.4)	1.6 (1.5)	2.1 (5.7)	0.370
Injections of any kind daily				
All	15.7 (13.4)	17.6 (15.6)	14.8 (12.6)	0.083
Rural	15.4 (11.9)	17.1 (14.5)	14.8 (10.9)	0.302
Urban	16.0 (15.1)	18.1 (15.6)	14.8 (14.9)	0.193
Providers that are most likely to reuse syringes daily	***n (%)***	***n (%)***	***n (%)***	***n (%)***
All	262 (47%)	140 (48%)	122 (46%)	0.637
Rural	127 (49%)	49 (52%)	78 (48%)	0.538
Urban	135 (45%)	91 (46%)	44 (44%)	0.744

Table 4 Likely reusers of syringes

	Likely non-reusers	Likely reusers	*P*
Likely reusers	62%	38%	
Age, yr, mean (SD)	38 (10.5)	40 (10.9)	0.385
Physician or other, n (%)			
MB BS	196 (62%)	120 (38%)	<0.001
Non-MB BS	98 (41%)	142 (59%)	0.009
Sex of provider, n (%)			
Male	232 (50%)	228 (50%)	1.000
Female	52 (64%)	29 (36%)	0.019
Years since last completed degree (SD)	21 (10.8)	24 (8.8)	0.807
Years in practice (SD)	10 (18.0)	10 (9.5)	0.204
District			
Tando Allah Yar, n (%)	143 (54%)	122 (46%)	0.196
Rawalpindi, n (%)	151 (52%)	140 (48%)	0.489
Location			
Urban, n (%)	163 (55%)	135 (45%)	0.088
Rural, n (%)	131 (51%)	127 (49%)	0.749
No. of patient examined yesterday, mean (SD)	19.4 (16.7)	28.4 (20.1)	<0.001
No. of injections given daily, mean (SD)	12.3 (9.8)	14.4 (8.9)	0.055
Fee per visit, US$ (SD)	0.60 (0.79)	0.60 (0.69)	0.171
Do you think injection is necessary for, n (%)			
Fever	107 (54%)	91 (46%)	0.264
Influenza-like symptoms	72 (56%)	56 (44%)	0.182
Body aches	136 (53%)	122 (47%)	0.338
Diarrhoea	160 (54%)	136 (46%)	0.172

Table 5 **Regression results of provider being a reuser**

	Unstandardized coefficients		Standardized coefficients	95% CI for B		Sig	Exp(B) (AOR)	95% CI for AOR	
	B	SE	β	Lower Bound	Upper Bound			Lower bound of AOR	Upper bound of AOR
(Constant)	0.405	0.752		−1.110	1.919	0.593	1.499	0.330	6.816
Urban/rural	0.086	0.188	0.075	−0.292	0.464	0.649	1.090	0.747	1.591
District	**−0.522**	**0.194**	**−0.434**	**−0.914**	**−0.130**	**0.010**	**0.593**	**0.401**	**0.878**
Age of doctor	0.009	0.017	0.183	−0.025	0.044	0.581	1.009	0.976	1.045
Sex of doctor	0.035	0.059	0.078	−0.085	0.155	0.558	1.036	0.919	1.168
Year since last degree was completed	−0.008	0.016	−0.172	−0.040	0.023	0.592	0.992	0.961	1.023
How long you have been practicing at this clinic	**−0.006**	**0.003**	**−0.255**	**−0.011**	**0.000**	**0.043**	**0.994**	**0.989**	**1.000**
No. of patients examined yesterday	−0.011	0.006	-0.363	−0.022	0.001	0.079	0.989	0.978	1.001
No. of injections prescribed	0.089	0.056	1.621	−0.025	0.203	0.123	1.093	0.975	1.224
No. of intramuscular injections given yesterday	−0.061	0.053	−0.882	−0.167	0.046	0.257	0.941	0.846	1.047
No. of intravenous injection given yesterday	−0.064	0.055	−0.471	−0.174	0.047	0.252	0.938	0.840	1.048
No. of intravenous drips given yesterday	0.012	0.042	0.038	−0.073	0.097	0.776	1.012	0.930	1.102
Reuse of injections observed	−0.027	0.219	−0.015	−0.470	0.415	0.902	0.973	0.625	1.514
Reuse reported by the patient	−0.087	0.273	−0.044	−0.638	0.464	0.751	0.917	0.528	1.590
Physician/prescriber fee	−0.001	0.001	−0.058	−0.003	0.002	0.663	0.999	0.997	1.002

Values in bold are significant. AOR = adjusted odds ratio; CI = confidence interval; SE = standard error; Sig = significance.

injections were necessary for common ailments.

The high injection demand and provision seen in our study were consistent with prior experience from Pakistan (*22*) or the surrounding region (*13,23–27*). Patients expect to receive injections for minor ailments such as fever or influenza-like symptoms and willingly pay for these, on the mistaken belief in the efficacy of injections to overcome common symptoms that eventually abate with time (*10*). Healthcare providers comply with such wishes and are convinced of the necessity of injections. This belief is common among providers irrespective of whether they are likely or not to reuse syringes.

Syringe reuse happens against a backdrop of frequent injections. Around 38% of injection providers procure too few syringes for the injections that they provide and will likely reuse consistently. They also see more patients and give more injections. They charge slightly less per visit than providers that do not reuse syringes; however, their fees remain largely the same whether or not they give an injection. These providers stock a median of 5 syringes and give 14 injections daily; meaning that each syringe is reused 2 or 3 times. Providers' knowledge of the potential harm of syringe reuse and their incentives to reuse also mean that approaches such as information provision or availability of autodisposable syringes will not work, unless these are the only type of syringes available. Additionally, simply demanding or making laws against reuse are not likely to succeed. However, since providers' savings from syringe reuse are hidden from the patients, there may be a potential role for a patient-focused approach by which patients are made more aware of syringe reuse and its harm (*18*).

Community approaches that reduce information asymmetry between providers and patients have been promising (*28*). One intervention in Tando Allah Yar improved patient awareness from 15% to 29% within 6 months (*29*). Other complementary approaches may be to brand as safe providers those that visibly do not reuse syringes. Another option would be to use positive deviance inquiry in communities to reduce injection demand and syringe reuse (*30–32*).

One limitation of our study was that because we compared the supply of syringes versus injections given, we could only estimate the minimum reuse by providers. In reality, a provider may reuse more often, although perhaps not by much, because they would then adjust their syringe procurement accordingly in the long run.

Conclusion

Our study highlights the high prevalence of syringe reuse during therapeutic injections in communities in Pakistan and suggests that patient-centred approaches (demand reduction and increased awareness of the harm of syringe reuse), but probably not provider-centred approaches, may help reduce syringe reuse. New research should explore why patients seek such unnecessary care and test behavioural approaches such as cognitive behavioural therapy, expectation management, or whether patients will pay for safe injections, to make medical practice and injections safer in poor communities.

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Réutilisation des seringues pour injections thérapeutiques au Pakistan : réflexion sur ses déterminants

Résumé

Contexte : La réutilisation fréquente des seringues lors des injections thérapeutiques alimente des épidémies d'infections par les virus de l'immunodéficience humaine et de l'hépatite C dans de nombreux pays à revenu faible et intermédiaire, y compris le Pakistan.

Objectifs : Étudier les facteurs spécifiques liés à la réutilisation des seringues lors des injections thérapeutiques.

Méthodes : Nous avons interrogé 319 prestataires de soins, de façon aléatoire, dans deux districts du Pakistan présentant une diversité socio-économique, ainsi que 625 de leurs patients.

Résultats : Les prestataires voient de 12 à 25 patients et effectuent de 7 à 14 injections thérapeutiques ou perfusions intraveineuses goutte-à-goutte par jour. En comparant les stocks journaliers avec les injections réalisées, nous avons estimé que 38 % des prestataires (Rawalpindi : 14 %, Tando Allah Yar : 44 %) réutilisent vraisemblablement les seringues deux ou trois fois. L'implantation rurale et l'ancienneté d'exercice laissent anticiper une plus grande probabilité de réutilisation. Les médecins et les autres membres du personnel soignant étaient aussi susceptibles de réutiliser les seringues. Lorsqu'une seringue était réutilisée, la plupart des patients n'en avaient pas conscience.

Conclusions : Le taux élevé de réutilisation des seringues est induit par une forte demande d'injections par les patients, à laquelle répondent les prestataires de soins. En général, les patients n'ont pas conscience de la dangerosité des injections effectuées avec des seringues réutilisées, ni même de la pratique de réutilisation. Les résultats de notre enquête indiquent que des approches centrées sur le patient pourraient aider à réduire la réutilisation des seringues.

إعادة استعمال المحاقن للحَقْن العِلاَجِيّ في باكستان: إعادة النظر في استعمال المحاقن ومحدداته

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الخلاصة

الخلفية: إن إعادة استعمال المحاقن تَكراراً من شأنه أن يؤجج الأوبئة المرتبطة بفيروس العوز المناعي البشري والعدوى بفيرو س التهاب الكبد C في كثير من البلدان المنخفضة الدخل والمتوسطة الدخل، ومنها باكستان.

الأهداف: هدفت الدراسة إلى استكشاف العوامل المُحددة المرتبطة بإعادة استعمال المحاقن للحَقْن العِلاجِيّ

طرق البحث: أجرينا مسحاً عشوائياً شمل ٣١٩ مرفقاً من مرافق تقديم خدمات الرعاية الصحية من منطقتين بينهما تبايُن من الناحية الاجتماعية والاقتصادية في باكستان، بالإضافة إلى ٦٢٥ مريضاً ممن يرتادون هذه المرافق.

النتائج: يفحص مقدمو الخدمة ما يتراوح بين ١٢–٢٥ مريضاً يومياً، ويعطون الحقن العلاجي أو التقطير داخل الوريد لما يتراوح ما بين ٧–١٤ مريضاً. وبمقارنة المخزون اليومي بعمليات الحقن التي تحدث، قدرنا أنه في ٣٨٪ من مقدمي خدمات الرعاية الصحية (روالبندي: ١٤٪، تاندو الله يار: ٤٤٪) يُرجح إعادة استعمال المحاقن بمقدار مرتين أو ٣ مرات. ويُرجح بنسبة أعلى إعادة استعمال المحاقن في المناطق الريفية وأثناء الممارسات الطبية التي تستغرق وقتاً أطول. ويتساوى الأطباء وغير الأطباء في احتمال إعادتهم استعمال المحاقن. وأفاد معظم المرضى بأنهم لا يكونون على دراية بأن المِحْقَنَة المُستعملة في الحقن مُعاد استعمالها.

الاستنتاجات: يرجع ارتفاع معدل إعادة استعمال المحاقن إلى ارتفاع الطلب على المحاقن من جانب المرضى، وتلبية مقدمي خدمات الرعاية الصحية لهذا الطلب. وعامة، لا يكون المرضى مُدركين لضرر الحقن عن طريق إعادة استعمال المِحْقَنَة، أو ربما لا يكونون مدركين في الأساس أن المحاقن يُعاد استعمالها. ووفقاً للنتائج التي توصلنا إليها، نرى أن النهوج التي تركز على المرضى قد تساعد في الحد من إعادة استعمال المحاقن.

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