Reuse of syringes for therapeutic injections in Pakistan: rethinking its definition and determinants

Adnan Ahmad Khan,[1] Arshad Altaf, [3] Huma Qureshi, [2] Mezjgaan Orakzai [1] and Ayesha Khan [4]

[1]Research and Development Solutions, Islamabad, Pakistan. [2]Pakistan Health Research Council, Islamabad, Pakistan. [3]Service Delivery and Safety Department, World Health Organization, Geneva, Switzerland. [4]Akhter Hameed Khan Resource Center, Islamabad, Pakistan. (Correspondence to: Adnan A. Khan**:** adnan@resdev.org)

Abstract

Background: Frequent reuse of syringes during medical injections is fuelling HIV and HCV epidemics in many low- and middle-income countries including Pakistan.

Aims: This study aimed to explore specific factors related to syringe reuse during therapeutic injections.

Methods: 319 healthcare providers from two socioeconomically diverse districts in Pakistan were randomly surveyed 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 2–3 times per syringe. A 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: The very high syringe reuse is driven by high injection demand by patients, to which providers comply. Patients are generally unaware of the harms of injections and syringe reuse or that reuse happens. Our findings suggest the patient focused approaches may help reduce syringe reuse.

Keywords: Therapeutic Injections, syringe reuse, injection demand, injection safety, unsafe injections

Citation: Khan AA; Altaf A; Qureshi H; Orakzai M; Khan A. Reuse of syringes for therapeutic injections in Pakistan: rethinking its definition and determinants. East Mediterr Health J. 2019;25(x):xxx–xxx. https://doi.org/10.26719/emhj.19.028

Received: 31/08/17; accepted: 28/06/18

Introduction

Syringe reuse during therapeutic injections has contributed to the global epidemics of Hepatitis C (*1,2*) and HIV (*3–6*), 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 (*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. Punjab government introduced reuse-prevention syringes (RUP) in its health facilities in 2017 (*17*). WHO's injection safety guidelines recommend RUP for all injections and sharp-injury protection (SIP) syringes, wherever feasible (*18*).

We had previously compared and demonstrated that the total national supply of syringes in Pakistan was sufficient to meet the demand for the approximately 1.1 billion syringes used annually for immunisation, diabetes, laboratory testing and for medicines in clinics or hospitals (*13*); therefore reuse of syringes cannot be attributed merely on national shortfall of syringes as had been previously thought. However, such national aggregates hide reuse by individual practitioners. This study explored the extent and pattern of such reuse. The study also explored a novel methodology to identify reuse to avoid providers' self-promotion and patients' recall biases as well as paradigms behind injection demand and supply in the communities.

Methods

Rawalpindi and Tando Allah Yar were identified in collaboration with the Ministry of Health, Pakistan – as districts exemplifying high and low human development indices (*19*) to understand injection reuse practices across the extremes of human development. Rawalpindi city is a large metropolis with a large number of public and private, 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.

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 individual who sees patients in communities, irrespective of their training or licensure. This list was used to construct a simple randomisation–sampling frame to recruit healthcare providers. The study was powered for type I error (α): 0.05 and type II (β): 0.2; giving 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 listing giving 174 providers from Rawalpindi and 145 from Tando Allah Yar. At each healthcare provider's facility, two 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 questionnaire were pre-tested to ensure validity and appropriateness. Providers' questionnaire asked about their training and practice pattern. Patients' questionnaire asked about their demographics and healthcare seeking behaviours. 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) recognising that such observations may be subject to a Hawthorne effect (*20,21*) where providers' behaviour may change when they recognise 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 know 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 would identify 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+ v20. Proportions (of those that give injections), reusers were compared using chi square tests. Predictors of reuse of syringes were explored using linear-regression with predictors described in Table 5.

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

Results

We interviewed 319 providers (145 from Tando Allah Yar and 174 from Rawalpindi). Their mean age was 45 years (SD: 11.8) in Rawalpindi and 39.6 years (SD: 10.2) in Tando Allah Yar and 83% were men. Half of all providers from Rawalpindi and a quarter from Tando Allah Yar were doctors with more urban than rural providers being doctors (Table 1). On average, urban providers from Rawalpindi see around 25 patients a day and their rural counterparts see around 12. Rural or urban providers from Tando Allah Yar see around 15 patients a day.

625 patients (273 from Tando Allah Yar and 352 from Rawalpindi) were interviewed. Their mean age was 34.4 (SD: 18.7) years in Rawalpindi and 32.2 (SD: 12.1) years in Tando Allah Yar; 603 (56%) were men. A fifth from Rawalpindi but two third from Tando Allah Yar had no schooling. 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 (Table 2).

Commonest reasons for medical visits were fever, influenza-like symptoms or body (51% of visits) or abdominal pain, vomiting or diarrhoea (11% of visits). An injection was provided during 52% patient visits in Rawalpindi and during 90% in Tando Allah Yar. Patients from Rawalpindi reported having received a median of 3 injections during the previous year compared to 8 injections by patients from Tando Allah Yar.

Patients from Tando Allah Yar also report around 3.8 (SD: 2.5) visits to a healthcare provider by a member of their household during the previous month compared to 2.5 (SD: 5.7) by those from Rawalpindi. During all such visits, an injection was given. Overall, 351 (56%) of patients felt that an injection was necessary. Such perceptions were higher in Tando Allah Yar than in Rawalpindi (79% vs. 38%, $P < 0.001$) (Table 2). Providers reciprocated such perceptions in that 46–72% 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 charge around US$ 1.44 (SD: 1.42) for a visit when no injection was given and US$ 1.51 (SD: 1.87) if an injection was provided; there were no rural urban differences. Providers from Tando Allah Yar charged US$ 0.59 (0.62) when an injection was provided and US$ 0.62 (SD: 0.48) when not provided. Providers charged US$ 0.56 (SD: 0.57) in rural and US$ 0.69 (SD: 0.30) in urban locales. Providers from Rawalpindi reported giving a mean of 8.8 (SD: 9.6) intramuscular injections, 3.5 (SD: 3.7) intravenous injections and 2.3 (SD: 3.9) intravenous drip daily. Providers from Tando Allah Yar give 10.0 (SD: 9.6) intramuscular injections. We asked providers how many syringes had they 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. and therefore would be very likely to reuse syringes regularly. For analysis, these are labelled as “likely re-users”. No urban provider from Rawalpindi fell into this category, while urban and rural providers in Tando Allah Yar were very similar (Table 3). Around 38% of all providers were likely to reuse

consistently. These “likely re-users” give around 14 injections daily compared to 12 by those who are less likely to re-use syringes. Since re-users stock around 5 syringes a day, they would likely reuse syringes for 9 injections in any given day (Table 4).

Of the variables used in the linear regression model, 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 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 injections were necessary for common ailments.

The high injection demand and provision seen in our study is consistent with prior experience from Pakistan (*21*) or the 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% procure too few syringes for the injections 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; however, their fees remain largely the same whether they give an injection or not. These providers stock a median of 5 syringes and give 14 injections daily; meaning that each syringe is reused 2–3 times. Provider’s knowledge of potential harms of reuse and their incentives to reuse also mean that approaches such as information provision or availability of auto-disable 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. On the other hand, since providers’ savings from syringe reuse are hidden from the patients, there may be a potential role for a patient-focused approach where patients are made more aware of syringe reuse and its harm (*28*).

Community approaches that reduce information asymmetry between providers and patients have been promising (*29*). One intervention in Tando Allah Yar, Pakistan, improved patient awareness from 15% to 29% within 6 months (*30*). Other complements may be to use branding of providers that visibly do not reuse syringes as “safe providers”. Another option would be use positive deviance inquiry in communities to reduce injection demand and for syringe reuse (*31–33*).

Limitations

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

Conclusion

Our study highlighted the high prevalence of syringe reuse during therapeutic injections in communities 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.

Funding: None.

Competing interests: None declared.

References

1. Brewer DD, Khan AA. HCV and HIV prevalences strongly correlated in Asian communities with reservoirs of HIV in high-risk groups. *J Infect Dev Ctries.* Jul 2010;4(7):442-447.

2. Shepard CW, Finelli L, Alter MJ. Global epidemiology of hepatitis C virus infection. *Lancet Infect Dis.* Sep 2005;5(9):558-567.

3. Reid S, Van Niekerk AA. Injection risks and HIV transmission in the Republic of South Africa. *International Journal of STD & AIDS.* December 1, 2009 2009;20(12):816-819.

4. Brewer DD, Gisselquist D, Brody S, Potterat JJ. Investigating iatrogenic HIV transmission in Ugandan children. *J.Acquir.Immune.Defic.Syndr.* 6/1/2007 2007;45(2):253-254.

5. Potterat JJ, Brewer DD, Brody S. Miscarriage of HIV epidemiology in sub-Saharan Africa. *AIDS.* 4/4/2006 2006;20(6):955-956.

6. Brody S, Gisselquist D, Potterat JJ, Drucker E. Evidence of iatrogenic HIV transmission in children in South Africa. *BJOG.* 5/2003 2003;110(5):450-452.

7. Comstock RD, Mallonee S, Fox JL, et al. A large nosocomial outbreak of hepatitis C and hepatitis B among patients receiving pain remediation treatments. *Infect Control Hosp Epidemiol.* Jul 2004;25(7):576-583.

8. Fischer GE, Schaefer MK, Labus BJ, et al. Hepatitis C virus infections from unsafe injection practices at an endoscopy clinic in Las Vegas, Nevada, 2007-2008. *Clin Infect Dis.* Aug 1 2010;51(3):267-273.

9. Simonsen L, Kane A, Lloyd J, Zaffran M, Kane M. Unsafe injections in the developing world and transmission of bloodborne pathogens: a review. *Bull.World Health Organ.* 1999 1999;77(10):789-800.

10. Kermode M. Unsafe injections in low-income country health settings: need for injection safety promotion to prevent the spread of blood-borne viruses. *Health Promot.Int.* 3/2004 2004;19(1):95-103.

11. Miller MA, Pisani E. The cost of unsafe injections. *Bull World Health Organ.* 1999;77(10):808-811.

12. Qureshi H, Bile KM, Jooma R, Alam SE, Afridi HU. Prevalence of hepatitis B and C viral infections in Pakistan: findings of a national survey appealing for effective prevention and control measures. *East Mediterr Health J.* 2010;16 Suppl:S15-23.

13. Khan AA, Saleem M, Qureshi H, Jooma R, Khan A. Comparison of need and supply of syringes for therapeutic injections in Pakistan. *J Pak Med Assoc.* Nov 2012;62(11):1149-1153.

14. Ansari JA, Salman M, Safdar RM, et al. HIV/AIDS outbreak investigation in Jalalpur Jattan (JPJ), Gujrat, Pakistan. *Journal of Epidemiology and Global Health.* 2013;3(4):261-268.

15. Khan AJ, Luby SP, Fikree F, et al. Unsafe injections and the transmission of hepatitis B and C in a periurban community in Pakistan. *Bull.World Health Organ.* 2000 2000;78(8):956-963.

16. Hutin YJ, Hauri AM, Armstrong GL. Use of injections in healthcare settings worldwide, 2000: literature review and regional estimates. *BMJ.* 11/8/2003 2003;327(7423):1075.

17. Plan to introduce auto destructive syringes. Dawn (https://www.dawn.com/news/1296822/plan-to-introduce-auto-destructive-syringes, accessed 15 May 2019).

18. Brachman GO, Altaf A, et al. WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings. Geneva: World Health Organization; 2016 (http://apps.who.int/iris/bitstream/10665/250144/1/9789241549820-eng.pdf).

19. List of districts of Pakistan by Human Development Index. Wikipedia the Free Encyclopedia. (https://en.wikipedia.org/wiki/List_of_districts_of_Pakistan_by_Human_Development_Index, accessed 15 May 2019).

20. McCambridge J, Witton J, Elbourne DR. Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. *Journal of clinical epidemiology.* Mar 2014;67(3):267-277.

21. McCarney R, Warner J, Iliffe S, van Haselen R, Griffin M, Fisher P. The Hawthorne Effect: a randomised, controlled trial. *BMC Medical Research Methodology.*

22. Raglow GJ, Luby SP, Nabi N. Therapeutic injections in Pakistan: from the patients' perspective. *Trop.Med.Int.Health.* 1/2001 2001;6(1):69-75.

23. Anand K, Panday CS, Kapoor SK. Injection use in a village in north India. *Natl Med J India.* 2001;14(2):2.

24. Gyawali S, Rathore DS, Shankar PR, Maskey M, Vikash KK. Injection practices in Nepal: health policymakers' perceptions. *BMC Int Health Hum Rights.* 2014;14:21.

25. Altaf A, Janjua NZ, Hutin Y. The cost of unsafe injections in pakistan and challenges for prevention program. *J.Coll.Physicians Surg.Pak.* 9/2006 2006;16(9):622-624.

26. Bhunia R, Hutin Y, Ramkrishnan R, Ghosh PK, Dey S, Murhekar M. Reducing use of injections through interactional group discussions: a randomized controlled trial. *Indian Pediatr.* May 2010;47(5):409-414.

27. Kermode M, Muani V. Injection practices in the formal & informal healthcare sectors in rural north India. *Indian J.Med.Res.* 11/2006 2006;124(5):513-520.

28. Altaf A, Hasanain NAT, Barry J, et al. *WHO Guideline on the use of safety-engineered syringes for intramuscular, intradermal and sub-cutaneous injections in health-care settings.* Geneva, Switzerland: WHO;2015.

29. Kermode M, Holmes W, Langkham B, Thomas MS, Gifford S. Safer injections, fewer infections: injection safety in rural north India. *Trop.Med.Int.Health.* 5/2005 2005;10(5):423-432.

30. Altaf A, Shah SA, Shaikh K, Constable FM, Khamassi S. Lessons learned from a community based intervention to improve injection safety in Pakistan. *BMC Res Notes.* 2013;6:159.

31. Friedman SR, Mateu-Gelabert P, Sandoval M, Hagan H, Des J, D.C. Positive deviance control-case life history: a method to develop grounded hypotheses about successful long-term avoidance of infection. *BMC.Public Health.* 2008 2008;8:94.

32. Marsh DR, Schroeder DG, Dearden KA, Sternin J, Sternin M. The power of positive deviance. *BMJ.* 11/13/2004 2004;329(7475):1177-1179.

33. Lapping K, Marsh DR, Rosenbaum J, et al. The positive deviance approach: challenges and opportunities for the future. *Food Nutr.Bull.* 12/2002 2002;23(4 Suppl):130-137.

Table 1. Demographics and Practices of Providers

	Total	Rawalpindi	Tando Allah Yar	*P*
Age of Patients - 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. Socio-demographic characteristics of patients

	Total	Rawalpindi	Tando Allah Yar	*P*
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	33.5 (16.2)	34.4 (18.7)	32.2 (12.1)	0.047
Male Sex – N (%)	603 (56%)	336 (53%)	267 (61%)	0.045
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 was 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

Table 3. Injection provision

	Total	Rawalpindi	Tando Allah Yar	*P*
	Mean (SD)	Mean (SD)	Mean (SD)	
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)	3.2 (5.55)	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 re-use 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 Re-Users of Syringes

	Likely non re-users	Likely re-users	*P*
Likely re-users	62%	38%	
Age – N (SD)	38 (10.5)	40 (10.9)	0.385
Physician or other – N(%)			
MBBS	196 (62%)	120 (38%)	<0.001
Non MBBS	98 (41%)	142 (59%)	0.009
Sex of provider – N(%)			
Male providers	232 (50%)	228 (50%)	1.000
Female Providers	52 (64%)	29 (36%)	0.019
Years since last completed degree	21 (10.8)	24 (8.8)	0.807
Years in practice	10 (18.0)	10 (9.5)	0.204
District			
Tando Allah Yar	143 (54%)	122 (46%)	0.196
Rawalpindi	151 (52%)	140 (48%)	0.489
Location			
Urban	163 (55%)	135 (45%)	0.088
Rural	131 (51%)	127 (49%)	0.749
Number of patient examined yesterday – Mean (SD)	19.4 (16.7)	28.4 (20.1)	<0.001
Number of injections given daily – Mean (SD)	12.3 (9.8)	14.4 (8.9)	0.055
Fee per visit (US$)	0.60 (0.79)	0.60 (0.69)	0.171
Do you think injection is necessary for			
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 re-user

R^2: 0.440	Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B			Exp(B) (Adjusted Odds Ratio - AOR)	95.0% Confidence Interval for AOR	
	B	Std. Error	Beta	Lower Bound	Upper Bound	Sig.		Lower Bound of AOR	Upper Bound of AOR
(Constant)	.405	.752		-1.110	1.919	.593	1.499	.330	6.816
Urban/Rural	.086	.188	.075	-.292	.464	.649	1.090	.747	1.591
District	**-.522**	**.194**	**-.434**	**-.914**	**-.130**	**.010**	**.593**	**.401**	**.878**
Age of doctor	.009	.017	.183	-.025	.044	.581	1.009	.976	1.045
Sex of doctor	.035	.059	.078	-.085	.155	.558	1.036	.919	1.168
Year since last degree was completed	-.008	.016	-.172	-.040	.023	.592	.992	.961	1.023
How long have you been practicing at this clinic	**-.006**	**.003**	**-.255**	**-.011**	**.000**	**.043**	**.994**	**.989**	**1.000**
Number of patient examine yesterday	-.011	.006	-.363	-.022	.001	.079	.989	.978	1.001
Number of Injection prescribed	.089	.056	1.621	-.025	.203	.123	1.093	.975	1.224
Number of intramuscular injections given yesterday	-.061	.053	-.882	-.167	.046	.257	.941	.846	1.047
Number of intravenous injection given yesterday	-.064	.055	-.471	-.174	.047	.252	.938	.840	1.048
Number of intravenous drips given yesterday	.012	.042	.038	-.073	.097	.776	1.012	.930	1.102
Re-use of injections observed	-.027	.219	-.015	-.470	.415	.902	.973	.625	1.514
Re-use reported by the patient	-.087	.273	-.044	-.638	.464	.751	.917	.528	1.590
Physician/prescriber fee	-.001	.001	-.058	-.003	.002	.663	.999	.997	1.002

Predictors: (Constant), Doctor/prescriber fee, Year since last degree completed, reuse of injections observed, Sex of doctor, Age of doctor, Number of Injection prescribed, Number of intravenous drips given yesterday, Number of intravenous injection given yesterday, Number of intramuscular injections given yesterday, reuse reported by the patient, Number of years at this clinic, District, Urban/Rural, Number of patient seen yesterday