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A prospective multicentre study of healthcare provider preference in rapid HIV testing kits: Determine versus INSTI

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Abstract

Rapid HIV testing may circumvent the practical barriers to HIV testing in several settings. User preference of the testing kits available has been relatively underexplored. We examined healthcare provider (HCP) ratings of two validated rapid testing kits in clinical practice. From 1 July to 1 December 2012 we prospectively recruited HCPs (clinic nurses) from three outpatient clinics linked to Lausanne University Hospital, Lausanne, Switzerland. The HCPs had experience in taking blood samples but varying experience in rapid HIV testing. Participating HCPs performed rapid HIV testing using Determine™ Combo (DETE) or INSTI™ (INSTI), according to a predefined randomization sequence, and rated practical aspects of each test using a Likert scale. Seventeen HCPs of 23 approached (74%) were eligible and agreed to participate, performing a total of 336 HIV tests. Globally, the testing procedure was rated as easy or very easy by 97% (DETE) to 99% (INSTI) of tests performed. Among experienced HCPs, DETE was rated easier than INSTI for kit storage ($p < 0.001$) and blood collection ($P = 0.012$) while INSTI was rated easier than DETE for blood application ($P = 0.001$) and test interpretation ($P = 0.005$). Among less experienced HCPs, both tests performed equally with the exception of test interpretation ($P < 0.001$) and overall ease of use ($P = 0.05$) in favour of INSTI. Of all HCPs, 94% stated they would recommend INSTI over DETE based on the time to result, ease of test interpretation and overall ease of use. Rapid HIV testing was considered easy to perform, even by inexperienced nursing staff. Whilst both tests were considered easy to use, the HCPs in this study preferred INSTI to DETE overall, due to rapid time to result, ease of test interpretation and general ease of use.

Keywords

HIV testing, point-of-care test, rapid HIV testing kit, preference

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Introduction

In 2014, the joint United Nations Programme on HIV/AIDS (UNAIDS) published a target to help end the AIDS epidemic that by 2020, 90% of people living with HIV/AIDS should know their HIV status through HIV testing, 90% diagnosed should be on antiretroviral treatment and 90% on treatment should be virally suppressed.[1] Currently, it is estimated that only 46% of individuals living with HIV around the world are aware of their status,[1] a figure falling short of the first '90' target.

Despite the 2006 Centers for Diseases Control and Prevention recommendations on HIV testing[2] and the more recent recommendations of the United States Preventive Services Task Force,[3] which encourage screening of all adolescents and adults aged 15–65 years old, practical barriers to HIV testing have

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been described. Among healthcare providers (HCPs), these barriers include lack of training,[4] competing priorities,[5] time and space constraints[6,7] and concerns over result provision if the result is not available immediately.[6,7] Another practical obstacle when HIV testing injecting drug users (IDUs) is peripheral vascular damage with difficult venous access.[8] One approach to circumvent many of these barriers has been the introduction of rapid HIV testing using fingertip capillary blood.[9,10]

In Switzerland, where HIV seroprevalence is around 0.4% (UNAIDS), two validated rapid HIV tests are available which can be performed on fingertip blood, the Determine™ Combo test (DETE) and the INSTI™ test (INSTI). DETE is a fourth generation test, which simultaneously detects anti-HIV-1 and anti-HIV-2 antibodies and the HIV p24 antigen using immunochromatography; INSTI detects anti-HIV-1 and anti-HIV-2 antibodies using enzyme-linked immunofiltration. INSTI has been shown to be easy to use by untrained operators.[11] DETE and INSTI have practical differences: slightly different pipettes for blood sampling; blood application directly on to the testing strip (DETE) or into a reagent container (INSTI); different methods of reagent application and, finally, time to result: immediate with INSTI and 20 min with DETE.[9]

Although DETE and INSTI have been compared in terms of test accuracy,[9] user preference has been relatively underexplored. We conducted a prospective, randomized, multicentre study to compare DETE and INSTI for ease of use and overall preference in the medical outpatient setting in Lausanne, Switzerland.

Materials and methods

Ethics statement

This study was approved by the ethics committee on human scientific research of the canton of Vaud, Switzerland. Written informed consent was obtained from participating HCPs, all of whom were clinic nurses.

Rapid HIV tests

Two validated rapid HIV tests[8] were used for HIV screening: Determine™ HIV-1/2 Ag/Ab Combo (DETE) (Alere Laboratories, Chiba, Japan) and INSTI™ HIV-1/HIV-2 Rapid Antibody Test (INSTI) (BioLytical Laboratories, Richmond, British Columbia, Canada).

Study setting and participants

The study took place between 1 July and 1 December 2012 at three medical outpatient sites related to Lausanne University Hospital (LUH), Lausanne, Switzerland. The three sites were geographically separate and had different client populations. Site 1 was the voluntary counselling and testing centre at the Department of Ambulatory Care and Community Medicine, part of Lausanne University, which offers HIV testing without appointment. Site 2 was a downtown walk-in clinic, affiliated to the Department of Ambulatory Care and Community Medicine, which serves the local population. Site 3 was an addiction medicine centre which receives IDU clients enrolled in methadone substitution programmes.

The HCPs, all nurses, had experience of counselling and testing for HIV but had different levels of rapid HIV testing experience: Site 1 HCPs offered anonymous HIV screening with DETE on a daily basis (highly experienced group; study participation rate 100%); Site 2 HCPs used DETE testing but not every day (study participation rate 73%); and Site 3 HCPs had no experience of rapid HIV testing (study participation rate 100%). No HCP had prior experience with INSTI.

Of 23 HCPs working at the three sites, 20 (87%) agreed to participate. HCPs performing fewer than eight rapid tests during the study period were not included in the analysis.

Study design

Participating HCPs were requested to offer and perform rapid HIV testing during routine patient consultations using DETE or INSTI, according to computerized predefined randomization sequences which were generated for each HCP. Rapid testing was performed at Site 1 among patients requesting HIV testing, at Site 2 among patients requesting HIV testing or presenting indications for testing according to the Swiss national HIV testing recommendations[12] and at Site 3 among patients injecting since their last HIV test or presenting other HIV testing indications, again, according to national testing recommendations.

Patients presenting with symptoms and signs compatible with primary HIV infection and/or reporting an event at risk of HIV acquisition within three months, as defined by national HIV testing recommendations, were excluded from the study as rapid HIV tests, even those detecting the HIV p24 antigen such as DETE, have poor sensitivity during acute HIV infection.[13] For such patients, HIV testing on venous blood was performed in the LUH immunology laboratory with HIV-1/2 Antibody EIA and p24 antigen measurement combined with immunodot confirmation, according to the hospital HIV screening algorithm.

HCPs were asked to rate each kit, the order of kit rating being determined by the order in which the kits were assigned to each HCP following randomization.

HCPs were first asked to rate the clarity of the kit manufacturer's instructions (emailed to participating HCPs prior to beginning the study) and the testing procedure, using a five-point Likert scale ranging from very difficult to very easy (Appendix 1, Questionnaire 1, completed once only). HCPs were then asked to rate the kit material (including kit storage and reagent, given that INSTI includes reagents in each kit whereas the DETE reagents are separate) and practical aspects of the test (including sterile lancet use, blood sampling, blood application and test interpretation), using the same five-point Likert scale (Appendix 1, Questionnaire 2, completed after each rapid test). It should be noted that the pipettes in the DETE and INSTI kits used in this study had identical capacity (50 µl) but differed in shape and structure (Appendix 2, Pipette shape), with potential implications for blood collection.

HCPs were asked to document three time points: the time of blood collection, time beginning the test (from blood application) and time of reading the test result. For analysis, the time between beginning the test and reading the test result was used. With the exception of the blood sample used (the experienced group at study Site 2 used venous blood taken for other tests while the two other groups used fingertip capillary blood), rapid HIV testing following blood application was performed in the same way at all sites and in accordance with the manufacturers' instructions. If the result for either DETE or INSTI was other than positive or negative it was classified as 'invalid'. In this situation, an HIV test on venous blood was performed immediately in the LUH laboratory as described above.

Finally, HCPs were asked which test they would recommend, giving reasons from a list of options (Appendix 1, Questionnaire 3).

Statistical analysis

Data are expressed as means ± standard deviation (SD), medians with inter-quartile ratio (IQR) or range and percentages. Normal distribution was examined for continuous variables using the Shapiro–Wilk test of normality. For continuous variables not normally distributed, the Kruskal–Wallis test was used.

For analysis, HCPs were divided into experienced DETE users (Site 1) and less experienced users (Sites 2 and 3). Comparisons between groups were performed after analysis of variance and post hoc tests were performed after Bonferroni correction. Contingency table-based analysis was used for categorical data using the Chi square test or Fisher's exact test as appropriate. Contingency post hoc tests were performed by calculating adjusted residuals (the ratio of the residual defined as the difference between the observed and expected cell frequency, to the standard error of the contingency table cell).[14] Statistical analysis was performed using SPSS for windows (version 13.0, SPSS, Chicago, IL, US).

Results

Participants and rapid testing

Of the 20 participating HCPs, two withdrew (one from the experienced group through lack of time and one from the inexperienced group without explanation), and one was withdrawn from study analysis through performing fewer than eight tests. The majority of the remaining 17 participants were female (82%) and those in the highly experienced group were older than those in the other two groups ($P < 0.001$, Table 1).

A total of 336 HIV tests were performed during the study period, all respecting the manufacturers' minimum time delay (median time for DETE: 23 min [IQR: 20;25]; for INSTI™: 4 min [IQR: 1;5]). Two positive tests and one invalid test were verified on venous blood and confirmed as negative.

Globally, the INSTI and DETE tests exhibited comparable scores in terms of clarity of kit instructions, material identification, reagent presentation and handling, sterile lancet use, pipette blood expulsion and overall ease of use ($P > 0.05$, Table S1). The DETE test was considered easier in terms of kit storage ($P < 0.001$) and blood collection ($P = 0.009$), whereas the INSTI test was considered easier in terms of blood application ($P = 0.001$) and test interpretation ($P < 0.001$) (Table S1). In the subgroup analysis, experienced HCPs considered the DETE test easier only in terms of kit storage ($P < 0.001$) and blood collection ($P = 0.012$), while the INSTI test was considered easier in terms of blood application ($P = 0.001$) and test interpretation ($P = 0.005$) (Table 2). Less experienced HCPs rated the two tests similarly with the exception of INSTI being considered easier than DETE in terms of test interpretation ($P < 0.001$) and with a trend towards INSTI scoring higher for overall ease of use ($P = 0.05$) (Table 3).

Overall preference

Sixteen HCPs (of 17, 94%) completed questionnaire 3 on the test they would recommend and why. Fifteen of these (94%) stated they would recommend INSTI over DETE: 14 HCPs (of 15, 93%) based their preference on the short time to result and 12 (80%) on ease of test interpretation and overall ease of use (multiple responses allowed). INSTI was preferred to DETE at all three sites. Concerning INSTI disadvantages, difficulty using the capillary tubes (blood collection) was most frequently cited (data not shown).

Table 1. Study participant characteristics, rapid HIV tests completed and overall ease of the testing procedure, presented by experience group.

	Highly experienced (Site 1)	Less Experienced (Sites 2 and 3)	*P* value
Participants			
Female gender, n (%)	4 (80)	10 (83)	1.0
Age, years, mean ± SD	49 ± 2	34 ± 8	<0.001
Experience, years, median (range)	11 (4–26)	7.5 (3–26)	0.4
Tests completed			
DETE, n (%)	79[a] (46)	92 (54)	0.9
INSTI, n (%)	77[b] (47)	88 (53)	
Tests considered as very easy[c]			
DETE, n (%)	58 (73)	64 (70)	0.11
INSTI, n (%)	58 (75)	72 (82)	0.11

DETE: Determine™ HIV Combo; INSTI: INSTI™ HIV-1/HIV-2 antibody; SD: standard deviation.
[a]Including one reactive test, subsequently confirmed as negative.
[b]Including one invalid test, subsequently confirmed as negative.
[c]'Very easy' is presented separately from 'easy' as 100% of HCPs from Site 1 and 98% of HCPs from Site 2 considered testing 'easy' or 'very easy' compared to 77% (DETE) and 85% (INSTI) of HCPs from Site 3. At all sites, transition from 'easy' to 'very easy' occurred as the number of tests performed increased (data not shown).

Table 2. Ease of use of testing kits by testing process for HCPs experienced in using the Determine test (Site 1). Numbers shown are percentages where the sum may not equal 100 due to rounding.

	Very easy	Easy	Neutral	Difficult	Very difficult	*P* value
Clarity of instructions						
INSTI	20	80	0	0	0	0.37
DETE	40	40	20	0	0	
Material identification						
INSTI	94	6	0	0	0	0.11
DETE	99	1	0	0	0	
Kit contents						
INSTI	94	6	0	0	0	0.27
DETE	98	2	0	0	0	
Reagent presentation						
INSTI	94	6	0	0	0	0.27
DETE	98	2	0	0	0	
Kit storage						
INSTI	53	43	4	0	0	<0.001
DETE	87	13	0	0	0	
Sterile lancet use						
INSTI	64	36	0	0	0	0.39
DETE	71	29	0	0	0	
Blood collection						
INSTI	42	51	7	1	0	0.012
DETE	66	33	1	0	0	
Pipette blood expulsion						
INSTI	68	23	8	1	0	0.13
DETE	62	36	3	0	0	
Blood application						
INSTI	78	20	3	0	0	0.001
DETE	53	47	0	0	0	
Reagent handling						
INSTI	88	11	1	0	0	0.55
DETE	87	13	0	0	0	
Test interpretation						
INSTI	93	5	0	1	0	0.005
DETE	77	23	0	0	0	
Overall ease of use						
INSTI	77	23	0	0	0	0.7
DETE	74	26	0	0	0	

DETE: Determine™ HIV Combo; HCP: healthcare provider; INSTI: INSTI™ HIV-1/HIV-2 antibody.

Table 3. Ease of use of testing kits by testing process for HCPs less experienced in rapid HIV testing (Sites 2 and 3). Numbers shown are percentages where the sum may not equal 100 due to rounding.

	Very easy	Easy	Neutral	Difficult	Very difficult	*P* value
Clarity of instructions						
INSTI	33	50	17	0	0	0.68
DETE	25	67	0	0	0	
Material identification						
INSTI	73	25	0	2	0	0.48
DETE	74	21	2	3	0	
Kit contents						
INSTI	80	17	1	2	0	0.84
DETE	80	14	1	4	0	
Reagent presentation						
INSTI	83	15	0	1	1	0.56
DETE	82	13	1	3	0	
Kit storage						
INSTI	76	79	2	2	0	0.26
DETE	80	14	6	0	0	
Sterile lancet use						
INSTI	65	17	9	9	0	0.83
DETE	54	27	8	12	0	
Blood collection[a]						
INSTI	22	44	22	13	0	0.55
DETE	39	35	12	11	4	
Pipette blood expulsion						
INSTI	39	30	26	4	0	0.94
DETE	42	23	31	4	0	
Blood application						
INSTI	81	12	7	0	0	0.32
DETE	72	21	5	1	0	
Reagent handling						
INSTI	79	12	8	1	0	0.56
DETE	81	14	3	1	0	
Test interpretation						
INSTI	83	13	5	0	0	<0.001
DETE	47	44	9	0	0	
Overall ease of use						
INSTI	83	13	2	2	0	0.05
DETE	70	25	5	0	0	

DETE: Determine™ HIV Combo; HCP: healthcare provider; INSTI: INSTI™ HIV-1/HIV-2 antibody.

[a]Ease of blood collection was assessed at Site 3 only, as venous rather than capillary blood was used at Site 2.

Discussion

In this study performed in the medical outpatient setting, we observed that rapid HIV testing with DETE and INSTI was considered easy or very easy by the majority of participating HCPs. While DETE was rated easier for kit storage and blood collection, and INSTI for blood application and test interpretation, these differences lost significance among less experienced HCPs, among whom only test interpretation was considered significantly easier for INSTI compared to DETE. INSTI was preferred by 93% of the HCPs overall through short time to result as well as through general ease of use.

This study is novel as it examines the ease of each step of rapid testing from kit storage to obtaining a result. Although the study sites differed in HCP rapid testing experience, all three were university hospital-affiliated outpatient centres in a European setting, and all participating HCPs had nursing training. Although the HCPs read the manufacturers' instructions as part of this study, individuals lacking medical or nursing qualifications could be trained to perform rapid tests after seeing a demonstration of the test procedure, rather than by following instruction leaflets.[15] This has important implications for the UNAIDS 90% diagnosis target as the percentage of individuals unaware of their HIV status in resource-poor settings is higher than that in Europe (UNAIDS Gap project) while antiretroviral therapy is becoming increasingly available. For result interpretation, the INSTI test, which gives an immediate test result, is attractive in all healthcare settings. Performing testing and obtaining the result in a single consultation circumvents the problem of continuity of patient care and facilitates engagement in care of individuals testing positive. This in turn optimises the percentage of patients diagnosed who start antiretroviral therapy.

This study has limitations. First, the test preference observed among our HCPs might not be applicable in different settings. Second, although some HCPs in this study had no prior rapid HIV testing experience, all were trained in HIV counselling and testing. Therefore, although the study explored the steps of rapid HIV testing, the participating HCPs were already competent at offering testing. Finally, we have no information on patient preference regarding the two tests as this was not examined in this study. Against these limitations, our results show how the two rapid kits differ, in terms of storage, blood sampling and ease of test interpretation, and these comparisons may be applicable to other settings.

Conclusion

Rapid HIV testing in three outpatient clinics was considered easy to perform by the majority of HCPs, even those without prior rapid testing experience. In our study setting, where rapid result availability and ease of test interpretation were considered more important

than ease of kit storage, INSTI was considered by the participants as preferable to DETE.

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