Monitoring HIV Drug Resistance: Early Warning Indicators to Assess Performance of Thailand's Antiretroviral Treatment Program

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Objective: *To describe trends in Thailand's antiretroviral treatment (ART) program performance assessed by HIV drug resistance early warning indicators (EWIs), as recommended by WHO, between 2009 and 2013.*

Material and Method: *Seven EWIs were monitored, viral load (VL) testing coverage, VL suppression, retention in ART, lost to follow-up (LTFU), antiretrovirals (ARVs) dispensing practices, on-time pill pick-up, and pharmacy stock-outs. Data from ART adult patients in National Health Security Office Scheme were analyzed except for pharmacy stock-outs, which were reported from hospitals. Aggregated averages were calculated for each EWI. Chi-square for trend was applied to measure significant changes.*

Results: *By September 2013, 174,284 adults were receiving ART at 929 hospitals. Over time, improvement in VL testing coverage (53.8% in 2009 to 79.8% in 2013) was observed. VL suppression and on-time pill pick up rates were well above 90%. Rates of retention in ART declined from 84.0 to 82.9%, whereas LTFU rates increased from 8.3 to 9.2% (p<0.001). Prescriptions with inappropriate ARVs decreased from 0.32 to 0.10% (p<0.001). Of reporting hospitals, 96.1%, 96.3%, and 96.2% observed no ARVs stock-out between 2011 and 2013.*

Conclusion: *EWI is a useful tool to monitor ART program performance and to identify area where improvement is needed.*

Keywords: *HIV, Drug resistance, Early warning indicator, Antiretroviral treatment, Thailand*

In 2002, Thailand initiated a program to scale up antiretroviral treatment (ART) for all people living with HIV[1]. In 2006, Thailand included ART benefits in the Universal Health Coverage (UC) scheme for Thai nationals, thus further accelerating ART access[2]. As of September 2013, 246,049 people living with HIV (PLHIV) were receiving ART, representing 80.3% of those qualifying for ART initiation, based on the eligibility threshold of CD4 350 cells/µl or less. Of those on ART, 92.3% were receiving ART free of charge through three public health welfare benefit

schemes: the National Health Security Office Scheme (NHSO, 71.4%), the Social Security Scheme (SSS, 17.8%), and the Civil Servant Medical Benefit Scheme (CSMBS, 3.1%)[3].

To be reimbursed for antiretroviral medicines (ARVs) and laboratory tests, ART clinics in Thailand must comply with national HIV/AIDS treatment guidelines, including compliance with the recommended regimen for first-line treatment (2NRTIs + 1NNRTI) and regular viral load (VL) testing to monitor ARV efficacy. National guidelines recommend VL testing of all patients six months after initiating ART and annually thereafter[4]. If VL test results are greater than 50 copies/ml, guidelines stipulate intensive adherence counseling with a follow-up VL test after three months. Patients with confirmed treatment failure identified by the second VL test, defined as VL greater than 1,000 copies/ml, or with verified compliant ART

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adherence are eligible for HIV drug resistance (HIVDR) genotyping. Authorization to switch to a second-line or alternative regimen, indicated by treatment failure as described in national guidelines, requires evidence of HIVDR mutation, and the agreement of certified HIV/AIDS specialists.

Despite the mandatory implementation of standard guidelines, there have been concerns about the potential emergence of HIVDR, which could hamper the efficacy of current ART regimens. Improper use of ARVs can lead to viral mutations associated with HIVDR. Appropriate patient education, adherence support, and good program management may help limit improper ARV use. A shortage of staff to provide counseling and treatment, in the context of accelerated program scale-up, may result in insufficient counseling and adherence support. Likewise, shortages of properly trained health care workers may impede appropriate clinical and laboratory monitoring. Inefficient drug procurement and supply chain systems may lead to stock-outs of medicines, potentially interrupting treatment. For patients, there are several factors that can enhance or hinder treatment adherence and continuity. Moreover, the recent change in the national strategy to initiate ART regardless of CD4 cell count in order to improve treatment outcomes and to promote a treatment-as-prevention strategy[5] has led to concerns about the risk of HIVDR emergence and transmission resulting from suboptimal adherence among asymptomatic and/or less-motivated patients.

To ensure sustainable public funding and resources to support the national ART program, Thailand's national strategy has focused on optimizing the long-term efficacy and durability of current first-line regimens by minimizing patient- and program-level factors associated with the emergence of HIVDR. HIVDR surveillance and monitoring of early warning indicators (EWIs), recommended by the World Health Organization (WHO), is a fundamental element of the strategy to alert policy makers, health care providers and program managers of HIVDR situation and potential risks of HIVDR emergence. EWIs are patient, clinic and program factors known to be associated with increased risk in HIVDR emergence. The timely identification of these factors can prompt appropriate corrective actions, thus maximizing HIVDR containment and prevention efforts. Guidance on EWI definition and corresponding targets published by WHO in 2010[6] and revised in 2011[7] recommend a simple package of five EWIs that was adapted for implementation in Thailand.

In addition to the monitoring of EWIs, surveys to measure level of HIVDR were also conducted among pretreatment antiretroviral-naïve HIV infected patients (PDR). Between 2006 and 2013, Bureau of AIDS, TB and STIs (BATS), Department of Disease Control (DDC) had conducted four PDR surveys in sampled clinics. The results demonstrated an increasing trend of HIVDR prevalence among pre-treatment cases from 1.9% in 2006 to 2.8%, 3.8%, and 5.6% in 2007, 2008, and 2013, respectively. Furthermore, follow-up study to monitor acquired HIVDR (ADR) among HIV infected cases at 24 months after ART initiation was also conducted. It was observed that HIVDR prevalence rose from 1.9 to 2.8% among the cohort starting ART in 2006 and from 2.8 to 3.5% among the cohort starting ART in 2007[8,9]. Other studies' results found 2 to 17.6% of HIVDR prevalence among pretreatment antiretroviral-naïve patients during 2002 to 2011. The prevalence rates identified from each study varied depending on study sites and methodology[10-14].

In 2007, NHSO developed the National AIDS Program (NAP) database, an electronic, web-based patient monitoring system that was subsequently implemented nationwide. The primary purpose of the NAP database is to send real-time health care spending data to the NHSO so health care providers and hospitals can be reimbursed for the services they provide to patients. Data about medical services, including HIV counseling and testing, appointment keeping, ART prescription, and laboratory results are submitted online by HIV coordinators and laboratory technicians in hospitals. Patient records are web-based and linked in real-time with the national death registry using a national personal identification number to identify living persons. NAP data is processed centrally for the purpose of authorizing reimbursement of hospital expenditures associated with service delivery. NAP data is also used to monitor ART services and their performance. NHSO uses an anonymous unique identifier, the NAP-ID, to ensure patient privacy. The NAP-ID is generated at patient registration and used for data management. Access to patient information is password protected and limited to care providers providing services to the patient.

Since 2010, Thailand's BATS, the NHSO, the Thailand Ministry of Public Health (MOPH)-U.S. Centers for Disease Control and Prevention (U.S. CDC) Collaboration (TUC), and their partners have implemented a project to prevent HIVDR using EWIs. NAP data and pharmacy stock-out annual reports were used to measure HIVDR EWIs. This article presents

Thailand's experiences using EWIs to describe trends in ART program performance between 2009 and 2013.

Material and Method
Sampling frame
Data recorded in the NAP database about HIV-infected adults aged 15 years or older that health care costs were covered by Thailand's NHSO scheme and were enrolled between fiscal years 2009 and 2013, were used for analysis. The cut-off date for data used in this article was September 30, 2014.

Definition of EWIs for national program monitoring
Since 2010, EWIs for Thailand and their operational definition were slightly modified from

WHO guidelines to suit the country context. Consensus on modifications was established during several consultative discussions among national academics, Thailand ART program managers at various health system levels, and experts from the U.S. CDC and WHO. The list of EWIs was shown in Table 1.

Measurement tools
NAP database
NAP data about medical and laboratory services provided to ART adult patients were used to analyze all EWIs except for the ARVs stock-outs. A query was developed and executed quarterly via structured query language (SQL) server to generate standard EWI reports for hospital and national levels

Table 1. List of early warning indicators (EWIs)

EWIs	Description	Target
VL coverage	Percentage of patients receiving ART at the site who had received VL testing during the first 12 months of ART - Numerator: number of patients who had at least one VL screening during 3 to 12 months of ART - Denominator: number of patients retained on ART at 12 months after initiation at the site who by national policy should have had a VL performed during 3 to 12 months of ART	Desirable: ≥90% Fair: 80 to 89% Poor: <80%
VL suppression	Percentage of patients receiving ART at the site whose VL was <1,000 copies/ml during the first 12 months - Numerator: number of patients whose VL (the latest VL tested during 3 to 12 months of ART) was <1,000 copies/ml - Denominator: number of patients retained on ART at 12 months after initiation who had at least one time VL screening during 3 to 12 months of ART	Desirable: ≥90% Fair: 80 to 89% Poor: <80%
Retention in care	Percentage of patients known to be alive and on treatment 12 months after initiation of ART - Numerator: number of patients who are still alive and on ART 12 months after initiation - Denominator: number of patients who were expected to achieve 12-month outcomes within the reporting year, including those recorded as dead, stopped therapy, or lost to follow-up during 12 months of ART	Desirable: >85% Fair: 75 to 85% Poor: <75%
Lost to follow-up	Percentage of patients lost to follow-up at 12 months of ART - Numerator: number of patients who did not return to the clinic >90 days after the last missed appointment or drug pick-up date during 12 months of ART - Denominator: number of patients who were expected to achieve 12-month outcomes within the reporting year, excluding those who were recorded as dead or transferred out during 12 months of ART	Desirable: <5% Fair: 5 to 10% Poor: >10%
Dispensing practices	Percentage of patients prescribed mono or dual ARV therapy - Numerator: number of patients receiving ART at the end of the reporting year and prescribed a regimen consisting of one or two ARVs at their last clinic visit - Denominator: number of patients receiving ART at the end of the reporting year	Desirable: 0% Poor: >0%
On-time pill pick-up	Percentage of patients who picked up ART no more than two days late at the first pick-up after baseline pick-up - Numerator: number of patients prescribed ART during a baseline month who returned for their next pill on time (within 2 days of their baseline month prescription running out if taken according to schedule) - Denominator: number of patients prescribed ART during the baseline month of the reporting year	Desirable: >90% Fair: 80 to 90% Poor: <80%
Pharmacy stock-outs	Percentage of months in a reporting year in which there were no ARV drug stock-out - Numerator: number of months in the reporting year in which there were no stock-out day of any ARV drug routinely used at the site - Denominator: 12 months	Desirable: 100% Poor: <100%

VL = viral load; ART = antiretroviral treatment; ARV = antiretroviral

in aggregated format without linkage to NAP-ID or any personal identifier. Percentage of ART clinics that met the desirable, fair, and poor target criteria of each indicator were monitored for each year. No informed consent was required as data used in this study are secondary anonymous data from the NAP database.

Hospital pharmacy stock-out report

According to the national ART program management, pharmacists at the ART clinics have been requested to report online drug stock-out status, either at one point-in-time or over a period of days, to BATS on an annual basis since 2011. The percentage of months in the reporting year in which there were no stock-out days of the ARV drug was calculated for each ART site. Percentage of ART clinics that meet the desirable target was monitored at national level annually and used for these EWI reports.

Data analysis

Variables included in the analysis were dates of key events (birth, clinic visit, VL tests, and death), ARV regimens prescribed, and VL tests performed and VL test results. Patient and service data were analyzed and EWI results were presented in aggregated average format with 95% confidence interval (CI). Tests of EWI performance trends over time were performed using Chi-square for trend by Epi Info™ 7 software[15].

Clinic's performance was categorized according to its ability to meet the desired target for each EWI (desirable, fair, or poor for VL testing coverage, VL suppression, retention, LTFU, and on-time pill pick-up; and desirable or poor for ARVs

dispensing practices and ARVs stock-outs). Where data was not available for a clinic or if a clinic did not report data on ARVs stock-outs, it was excluded from analysis. Proportion of clinics classified by performance was presented.

Results

As of September 2013, all of the 929 ART clinics providing treatment for adult patients in all 77 provinces of the country have monitored EWIs. Between 2009 and 2013, the number of patients aged 15 years or older, receiving ART through the NHSO scheme varied from 110,924 to 174,284 cases by year. Number of adult ART patients achieving 12 months of treatment after ART initiation ranged from 21,428 to 18,113 (Table 2).

Results of selected EWIs (VL coverage, VL suppression, retention in care, lost to follow-up, ARVs dispensing practices and ARVs on-time pill pick-up, ARVs stock-outs) between 2009 and 2013 are presented in Table 2 and the proportion of clinics that met desirable targets of all indicators in the same period are shown in Table 3.

The analysis of the VL indicators showed that coverage of VL testing at 12 months after ART initiation had significantly improved over time, increasing from 53.8% in 2009 to 79.8% in 2013 ($p<0.001$). VL suppression rate, however, has remained stable at 93 to 95% during the same years. The proportion of patients retained in care 12 months after ART initiation slightly declined from 84.0 to 82.9% ($p = 0.086$), and the proportion of patients lost to follow-up increased significantly from 8.3 to 9.2%

Table 2. Characteristics of clinics and population monitored and trends in EWIs, 2009 to 2013

	2009	2010	2011	2012	2013	*p*-value[a]
Patients receiving ART	110,924	128,144	145,777	160,044	174,284	
Number of clinics[b]	921	923	926	928	929	
Median per clinic (min to max)	73 (1 to 1,397)	84 (1 to 1,929)	95 (1 to 2,310)	102.5 (1 to 2,650)	110 (1 to 2,848)	
Patients achieving 12 months after ART initiation	21,428	20,149	19,709	20,154	18,113	
Number of clinics[c]	903	903	908	916	900	
Median per clinic (min to max)	14 (1 to 253)	13 (1 to 548)	13 (1 to 247)	12 (1 to 283)	11 (1 to 255)	
EWI results (%), (95% CI)						
VL coverage	53.8 (53.1 to 54.6)	65.5 (64.8 to 66.2)	73.7 (73.1 to 74.4)	77.7 (77.1 to 78.4)	79.8 (79.1 to 80.4)	<0.001
VL suppression	93.9 (93.4 to 94.3)	94.6 (94.1 to 95.0)	94.7 (94.3 to 95.1)	93.3 (92.9 to 93.7)	93.6 (93.2 to 94.0)	0.620
Retention in care	84.0 (83.5 to 84.5)	84.6 (84.1 to 85.1)	83.8 (83.3 to 84.3)	82.1 (81.5 to 82.6)	82.9 (82.3 to 83.4)	0.086
Lost to follow-up	8.3 (7.9 to 8.7)	7.6 (7.3 to 8.0)	8.0 (7.6 to 8.4)	9.8 (9.4 to 10.3)	9.2 (8.7 to 9.6)	<0.001
Dispensing practices	0.32 (0.29 to 0.36)	0.31 (0.28 to 0.34)	0.19 (0.17 to 0.21)	0.13 (0.11 to 0.15)	0.10 (0.08 to 0.11)	<0.001
On-time pill pick-up	91.1 (90.9 to 91.3)	91.7 (91.4 to 91.9)	91.9 (91.7 to 92.1)	90.6 (90.4 to 90.8)	91.6 (91.4 to 91.8)	0.960

[a] *p*-value by Chi-square for trend
[b] Number of clinics dispensing ART in the reporting period
[c] Number of clinics where there were patients who initiated ART during 12 months prior the reporting year and were expected to achieve 12-month outcomes within the reporting period

($p<0.001$). We observed a significant decline in the proportion of patients prescribed a mono or dual ART regimen, from 0.32% in 2009 to 0.10% in 2013 ($p<0.001$), while on-time pill pick-up leveled off at 91% over the five-year period.

Table 3 showed that the proportion of clinics meeting the desired target for VL coverage (greater than 90%). It increased from 12.6% in 2009 to 38.2% in 2013, although in 2013, 42.2% of clinics still reported a less-desirable uptake of VL testing (less than 80%).

With respect to VL suppression at 12 months after ART initiation, we initially observed an increased proportion of clinics meeting the desirable target of 90% or greater suppression rate (from 78.0 to 79.4% of the clinics in 2009 and 2011 respectively) before a decrease to 74.7% in 2013.

The proportion of clinics meeting the target of greater than 85% of the patients retained in care at 12 months was quite stable over time (from 55.4% in 2009 to 53.2% in 2013) while the clinics reporting more than 10% of patients lost to follow at 12 months increased from 27.9% in 2009 to 31.4% in 2013.

Although clinic's ARV dispensing practices improved over the five years, and in 2013 the vast majority (87.7%) achieved the desirable target of 0% prescriptions of mono- and dual-therapy, 114 clinics (12.3%) were still prescribing mono or dual ART regimens to some patients. In the same year, 64.5% of

clinics met the desired target of greater than 90% of the patients picking up their ARVs on-time, while 13.4% of clinics had poor performance on this indicator (less than 80% of patients on-time for ARVs pick-up).

BATS received the hospital pharmacy stock-out reports from 615, 455 and 340 ART clinics in 2011, 2012 and 2013, respectively. Of these, 96.1% (95% CI 94.2 to 97.3), 96.3% (95% CI 94.1 to 97.8), and 96.2% (95% CI 93.6 to 97.9) of clinics reported no ARVs stock-out days during 2011, 2012, and 2013, respectively.

Discussion

HIV drug resistance EWIs (VL coverage, VL suppression, retention in care, lost to follow-up, ARVs dispensing practices, and ARVs on-time pill pick-up) were monitored over a five-year period (2009 to 2013) in 921 to 929 clinics dispensing ART in Thailand. By using the routine national patient monitoring system, the analyzed data covered 70.8% of all cases, providing a very comprehensive picture of overall quality of care in the ART program.

Overall, significant improvements in VL testing coverage and appropriate dispensing practices were observed over the five-year period, although a sizeable proportion of clinics still lag behind. For other indicators such as VL suppression and on-time pill pick-up, average performance was sustained above the desired level. However, the average performance of

Table 3. Number and percentage of clinics that met the targets by EWIs and year, 2009 to 2013

Target	VL coverage		VL suppression		Retention in care		Lost to follow-up		Dispensing practices		On-time pill pick-up		Pharmacy stock-outs	
	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%
Year 2009														
Desirable	113/896	12.6	638/818	78.0	500/903	55.4	480/900	53.3	744/921	80.8	566/895	63.2		
Fair	93/896	10.4	109/818	13.3	239/903	26.5	169/900	18.8			207/895	23.1		
Poor	690/896	77.0	71/818	8.7	164/903	18.2	251/900	27.9	177/921	19.2	122/895	13.6		
Year 2010														
Desirable	188/893	21.1	661/837	79.0	500/903	55.4	481/900	53.4	708/923	76.7	594/901	65.9		
Fair	135/893	15.1	105/837	12.5	246/903	27.2	171/900	19.0			194/901	21.5		
Poor	570/893	63.8	71/837	8.5	157/903	17.4	248/900	27.6	215/923	23.3	113/901	12.5		
Year 2011														
Desirable	257/900	28.6	689/868	79.4	469/908	51.7	473/906	52.2	762/926	82.3	607/897	67.7	591/615	96.1
Fair	169/900	18.8	115/868	13.2	266/908	29.3	164/906	18.1			180/897	20.1		
Poor	474/900	52.7	64/868	7.4	173/908	19.1	269/906	29.7	164/926	17.7	110/897	12.3	24/615	3.9
Year 2012														
Desirable	300/904	33.2	650/872	74.5	441/916	48.1	420/915	45.9	789/928	85.0	576/906	63.6	438/455	96.3
Fair	202/904	22.3	133/872	15.3	264/916	28.8	168/915	18.4			194/906	21.4		
Poor	402/904	44.5	89/872	10.2	211/916	23.0	327/915	35.7	139/928	15.0	136/906	15.0	17/455	3.7
Year 2013														
Desirable	341/892	38.2	646/865	74.7	479/900	53.2	453/898	50.4	815/929	87.7	599/910	65.8	327/340	96.2
Fair	175/892	19.6	128/865	14.8	242/900	26.9	163/898	18.2			189/910	20.8		
Poor	376/892	42.2	91/865	10.5	179/900	19.9	282/898	31.4	114/929	12.3	122/910	13.4	13/340	3.8

clinics regarding retaining patient in care, minimizing lost to follow-up, preventing pharmacy stock-outs, and maximizing on-time pill pick-up did not achieve desired national targets.

Interpretation of VL coverage and suppression in the EWI setting must be done cautiously. The VL suppression indicator represents results among patients with VL test results, hence it should not be interpreted as including all patients on ART.

Thailand created two separate VL indicators, one for VL coverage and another for VL suppression, which differ from WHO recommendations[7]. The reason was to examine the possible role of low coverage of VL testing resulting in poor VL suppression. These additional data should allow program management to improve the quality of service by identifying areas and hospitals where VL testing coverage is insufficient, thus leading to further improvement.

As Thailand is moving towards its goal of Ending AIDS, it recently embraced the ambitious target of 90-90-90[16] which aims to let 90% of all PLHIV to know their HIV status, 90% of diagnosed HIV infection to receive sustained ART, and 90% of all people receiving ART to have viral suppression. It is therefore essential to advocate for more uptake of VL testing and revision of the targets in both indicators (VL coverage and VL suppression) is required in order to reflect the yield of ART to reach VL suppression of 90% among all ART cases. In the Thai context, a VL test can be offered to every individual patient on ART with certain frequency as it is included in ART benefit package provided by all health security programs. Costs for VL test performed on all patients on ART conducted twice a year during the first 12 months or up until VL are below suppression level are fully subsidized. VL tests can then be repeated once every year after the first year if VL is found to be suppressed.

The proportion of PLHIV retained in care declined from 84.0% in 2009 to 82.9% in 2013. This is slightly higher than retention rates reported elsewhere, i.e., the rate observed in cohorts of adult cases starting ART in 2007 in Vietnam was 81.2% in 2008[17]. The average rates of lost to follow-up increased from 8.3 to 9.2% ($p<0.001$). Comparing this rate with other countries might be difficult due to variation in the definition. Since the NAP database is linked to the national death registration system and ART cases who died will not be counted in the analysis of this indicator, the data shown here represented those who do not come back to receive continuous ART while data from other countries may include

deaths in their loss to follow-up setting. It was found that lost to follow-up in Thailand may be higher than in Vietnam (5.6%, in 2008)[17], China (1.4 to 5.6%, in 2006 to 2007)[18], and lower than what were observed in African countries such as in Cameroon (4 to 77%, in 2010)[19]. However, the results were greater than the loss to follow-up target of <5%. This observation raised a concern about ART program management and activities to foster patients to return for continuity of ART. In 2013, there were 49.6% of ART sites that did not meet the desired target for this indicator, suggested the need to improve follow-up activities.

Data from EWIs were used to identify ART sites where there were needs for further quality service improvement. This was done by regular review of the EWIs' results from each province, which was displayed on a public website, by the regional technical AIDS committee. Provinces where ART service performances in relation to EWIs poorer than the others were approached by the experts in the regional technical committee and interventions to improve service performances were implemented. Activities such as coaching to improve service quality were planned and launched, and EWIs analysis was repeated regularly in order to demonstrate change in their performance over time. One illustrative example was on the improvement of VL testing coverage which was the results of activities carried out by the regional technical committees. After reviewing the EWIs, the committee members visited the selected clinics and discussed with physicians and ART clinic management ways to improve uptake of VL tests, and based on these proposed activities, the VL test coverage increased.

A strong argument for use of the Thailand's EWIs system is that it is a service-based patient monitoring system for which hospital providers at all ART sites routinely record service delivery parameters and patient outcomes via real-time electronic data entry. This practice provides an opportunity to measure almost all of the EWI indicators including VL coverage, VL suppression, retention in care, lost to follow-up, dispensing practices, and on time pill pick-up. The country-wide, electronically, and continuous management enables program managers at clinic, provincial and regional levels to compare and identify ART clinics where performance is substandard and monitor their performance over-time. At present, software to analyze NAP data for each EWI has been developed and the results are published on the NHSO website[20].

The present analysis had some limitations. Firstly, the population used for the analysis was

restricted to adult patients receiving ART from the NHSO scheme. However, starting in 2014, there will be an opportunity to analyze data of patients who are receiving ART by the CSMBS and SSS. This was a result from a recent development on expanding NAP to monitor service delivery cascade and outcomes of all patients. Hospitals are required to enter ART data from all schemes of public health care insurances into the revised NAP database that was renamed as NAP+. Secondly, the number of ART sites in each year was not consistent and some of the variability in the indicators by time might reflect sites moving in and out of the calculations. In the present analysis, only ART sites with patients met the definitions of EWIs were recruited. The sites with small number of patients, i.e., small community hospitals, are more likely to be inconsistently recruited across time. Additional data analysis by aggregating data from all ART sites in each province to minimize the variability caused by moving in and out of small ART sites is being considered in order to minimize the variability and promote the data use as for provincial program improvement. Finally, there was the relatively small number of hospitals submitting the pharmacy stock-out reports. The annual reporting rates declined over time. The reason for this underreporting may be the complicated reporting process in which the pharmacy stock-out report was integrated with the other requirements on hospital service delivery profiles or unclear instructions. It was therefore decided to revise the system focusing the pharmacy stock-out report with clear instruction in the next round of the annual report.

EWIs play an important role in HIVDR surveillance and prevention program in Thailand. As recommended by WHO[21,22], other incorporated activities include a minimum package of pretreatment[23] and acquired HIVDR surveillance, and establishment of expert committees to manage issues related to HIVDR. For EWI management, there is a need for further improvement both in terms of quality of data, and utilization of the results by ART clinic staff and all stakeholders at various levels to ensure that patients will receive quality services.

Interpretation of the EWIs' data together with the results of the PDR and ADR surveys in Thailand which revealed increasing trends of HIVDR both in the pretreatment cases and in the follow-up of treated cases, pointed out the urgency of the ART program to further strengthen ART sites to deliver quality services to ensure VL suppression and cases' adherence to appropriated ARV regimen. These actions will benefit in the minimizing of HIVDR occurrence and stewardship of the current ART.

At present, a medium-term national action plan, starting from 2015 onward, has been developed in accordance with the WHO Global HIV Drug Resistance Network recommendation and from this plan the activities on HIVDR surveillance and prevention will be carried out. The implementation of HIVDR surveillance and prevention activities is critical to preserve the long-term effectiveness of available and affordable ARVs both in the context of treatment for all people with HIV and for HIV prevention.

Conclusion

EWI is a useful tool to monitor ART program performance and to identify area where improvement is needed.

What is already known on this topic?

EWIs are recommended by WHO for monitoring the potential risks of HIV drug resistance emergence in countries implementing ART program. EWIs monitor patient, clinic and program factors known to be associated with increased risk in HIVDR emergence. Experience of using EWIs and their results have been published by some countries except Thailand.

What this study adds?

This article presented EWI results of Thailand by using national database collected from all ART clinics under NHSO scheme from 2009 to 2013 for the HIV drug resistance monitoring. It assessed trends of Thailand ART program performance.

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Potential conflicts of interest

None.

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การติดตามตัวชี้วัดสัญญาณเตือนการเกิดเชื้อไวรัสเอชไอวีดื้อยา เพื่อประเมินผลการปฏิบัติงานของโปรแกรมการรักษาด้วยยาต้านไวรัสของประเทศไทย

ชีวนันท์ เลิศพิริยสุวัฒน์, อัจฉรา ธีรรัตน์กุล, ยลศิลป์ สุขนวนิช, นารถลดา จันทโรจน์วงศ์, กัญจนกร โภคะสวัสดิ์, พรทิพย์ ยุกตานนท์, นภารัตน์ ภัทรประยูร, สรกิจ ภาคีชีพ, ซิลเวีย เบอแท็กโนลิโอ, เทียรี่ โรลส์, สมบัติ แทนประเสริฐสุข

วัตถุประสงค์: *เพื่อบรรยายถึงแนวโน้มผลการปฏิบัติงานของโปรแกรมการรักษาด้วยยาต้านไวรัสของประเทศไทยระหว่าง พ.ศ. 2552 ถึง พ.ศ. 2556 ซึ่งถูกประเมินโดยใช้ตัวชี้วัดสัญญาณเตือนการเกิดเชื้อไวรัสเอชไอวีดื้อยา (ตัวชี้วัด) ตามที่องค์การอนามัยโลกได้แนะนำ*

วัสดุและวิธีการ: *ตัวชี้วัดที่ใช้ติดตามมีเจ็ดตัวชี้วัด ได้แก่ ความครอบคลุมของการตรวจหาปริมาณไวรัสในเลือด การกดปริมาณไวรัสในเลือด การคงอยู่ในระบบการดูแลรักษาด้วยยาต้านไวรัส การไม่มาตามนัด การจ่ายยาต้านไวรัส การมารับยาตามนัด และยาหมดจากคลังยา การวิเคราะห์ข้อมูลใช้ข้อมูลของผู้ป่วยผู้ใหญ่ที่รับการรักษาด้วยยาต้านไวรัสในโครงการหลักประกันสุขภาพถ้วนหน้า ยกเว้นตัวชี้วัดยาหมดจากคลังยาใช้ข้อมูลจากรายงานของโรงพยาบาล ตัวชี้วัดแต่ละตัวถูกคำนวณหาค่าเฉลี่ยรวม และใช้ค่าไคสแควร์สำหรับแนวโน้มวัดการเปลี่ยนแปลงอย่างมีนัยสำคัญ*

ผลการศึกษา: *ณ เดือนกันยายน พ.ศ. 2556 มีผู้ติดเชื้อผู้ใหญ่ 174,284 ราย กำลังรับการรักษาด้วยยาต้านไวรัสใน 929 โรงพยาบาล ตลอดช่วงเวลาที่ศึกษา พบว่ามีความครอบคลุมของการตรวจหาปริมาณไวรัสในเลือดดีขึ้น (ร้อยละ 53.8 ใน พ.ศ. 2552 เพิ่มเป็นร้อยละ 79.8 ใน พ.ศ. 2556) การกดปริมาณไวรัสในเลือดและอัตราการมารับยาตามนัดอยู่ในระดับดี มีค่ามากกว่าร้อยละ 90 อัตราการคงอยู่ในระบบการดูแลรักษาด้วยยาต้านไวรัสลดลงจากร้อยละ 84.0 เป็น 82.9 ขณะที่อัตราการไม่มาตามนัดเพิ่มขึ้นจากร้อยละ 8.3 เป็น 9.2 (p<0.001) การสั่งจ่ายยาต้านไวรัสที่ไม่เหมาะสมลดลงจากร้อยละ 0.32 เป็น 0.10 (p<0.001) มีร้อยละ 96.1, 96.3 และ 96.2 ของโรงพยาบาลที่ส่งรายงาน ไม่มียาต้านไวรัสหมดจากคลังยาในระหว่าง พ.ศ. 2554 ถึง พ.ศ. 2556 ตามลำดับ*

สรุป: *ตัวชี้วัดสัญญาณเตือนการเกิดเชื้อไวรัสเอชไอวีดื้อยาเป็นเครื่องมือที่เป็นประโยชน์ในการติดตามผลการปฏิบัติงานของโปรแกรมการรักษาด้วยยาต้านไวรัส และใช้หาพื้นที่ที่ต้องการการปรับปรุง*